THE KENNEL CLUB
DOG HEALTH

Breed Health and Conservation Plan

Chow Chow
Evidence Base

BHCP/Version 4/Sept 2020

CONTENTS

INTRODUCTION

The Kennel Club launched a 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 complete 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 and then monitored and reviewed on a regular basis.

DEMOGRAPHICS

The number of Chow Chows registered per year decreased markedly since a peak in the early 1980s up to 2009, but registration numbers appear to have begun to steadily rise since, as shown in Figure 1.

The number of Chow Chows registered by year of birth between 1980 and 2019 are shown in Figure 1. The trend of registrations over year of birth (1980-2019) was -11.76 per year (with a 95% confidence interval of -16.97 to -6.55) reflecting the overall decrease in the breed's numbers overtime.

[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.]

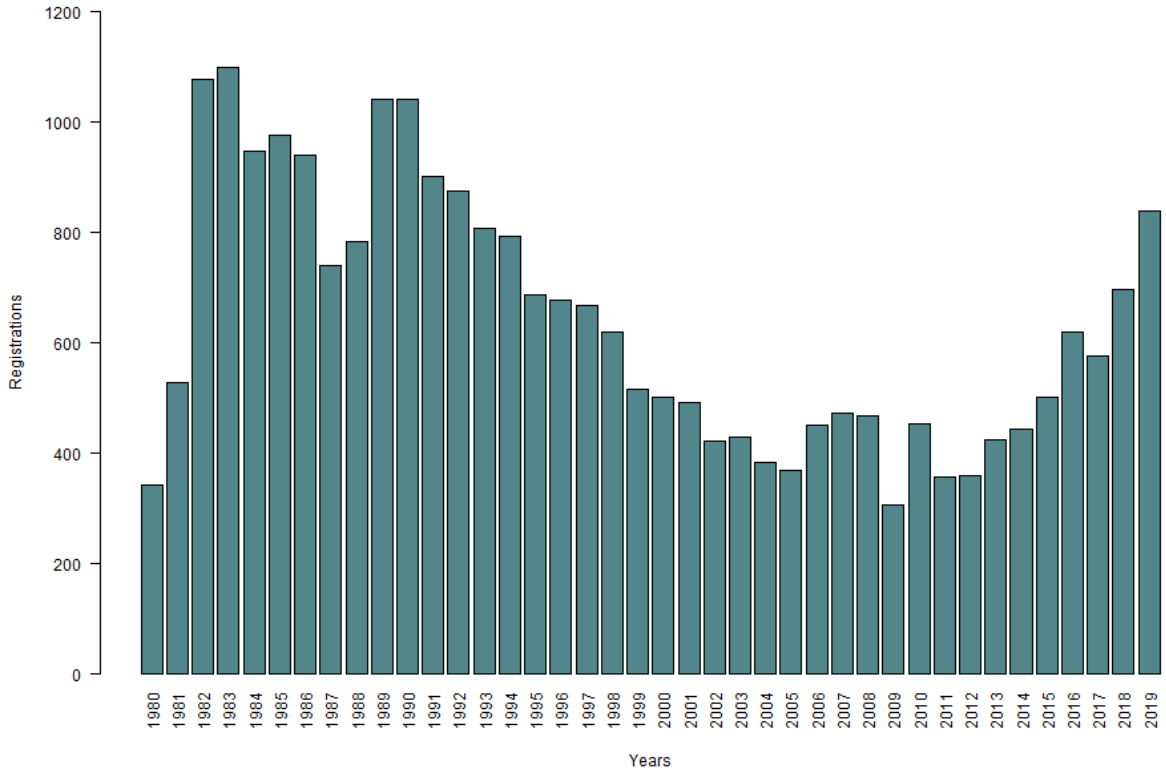

Figure 1: Number of registrations of Chow Chows per year of birth, 1980 - 2019

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 2019 Breed Health Coordinator's (BHC) Annual Health Report 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. Entropion
2. Elbow dysplasia
3. Bloat/ gastric dilatation volvulus (GDV)

In terms of what the breed has done in the last year to help tackle these listed health and welfare concerns, the breed has been encouraged to eye test their stock, worked with the Kennel Club to source a speaker for a seminar on elbow dysplasia, and approached the Kennel Club to assist in sourcing possible research avenues for bloat.

BREED CLUB HEALTH ACTIVITES

The breed has a Health Sub Committee, active Breed Health Coordinator and a dedicated health section on at least one of the Breed Clubs' websites.

BREED SPECIFIC HEALTH SURVEYS

Kennel Club Purebred and Pedigree Dog Health Surveys Results

The Kennel Club Purebred and Pedigree Dog Health Surveys were launched in 2004 and 2014 respectively for all of the recognised breeds at the time, to establish common breed-specific and breed-wide conditions.

2004 Morbidity results: The response rate for the Chow Chow was less than 15% in the 2004 Purebred Dogs Health Survey so a breed-specific report on the survey responses was not prepared. Responses were received for 114 individual Chow Chows with the five most frequently reported conditions being uterine inertia (12 reports, 11.7% proportion), infertility/ poor fertility (11, 9.6% proportion), cranial cruciate ligament rupture (11, 9.6%), entropion (11, 9.6%), and pyometra (6, 7.1%).

2004 Mortality results: A total of 80 Chow Chow deaths were reported. By far the most frequently reported causes of death were GDV (16 cases, 20%), old age (14 cases, 17.5%) and cancer (10 cases, 12.5%). Median age at death was nine years and 5 months (minimum 4 months, maximum 14 years and 2 months).

2014 Morbidity results: Health information was collected for 79 live Chow Chows of which 31 (39.2%) had reported no conditions and 48 (60.8%) reported to be affected by at least one condition. The most frequently reported specific conditions were entropion (18.5%, 20 out of 108 reported conditions) arthritis (17.7%, 19 out of 108 reported conditions), cruciate disease (12.0%, 12 out of 108 reported conditions), chronic itching (4.6%, 5 out of 108 reported conditions) and hip dysplasia (4.6%, 5 out of 108 reported conditions).

2014 Mortality results: 19 deaths were reported. The range of death for Chow Chows was one to14 years. The most frequently reported causes of death were brain tumour, cancer – unspecified, hepatic liver tumour, old age and stroke, with two recorded cases each. Brain tumours, unspecified cancers and hepatic liver tumours were reported as the first, second and third most common causes of death/reasons for euthanasia in the breed respectively.

BREED COUNCIL HEALTH SURVEY 2009

The Chow Chow Breed Council undertook a health survey in 2009, to look at owner's perceptions of the overall health of the breed with a focus on the hereditary conditions identified by the Kennel Club at that time to be associated with the Chow Chow based on insurance claims. A structured questionnaire was used, and 83

Chow Chow breeders, exhibitors and owners in the UK participated. The first section, reported here, looked at how many Chow Chow owners had any experience of the cited health conditions and the results are shown in Figure 2.

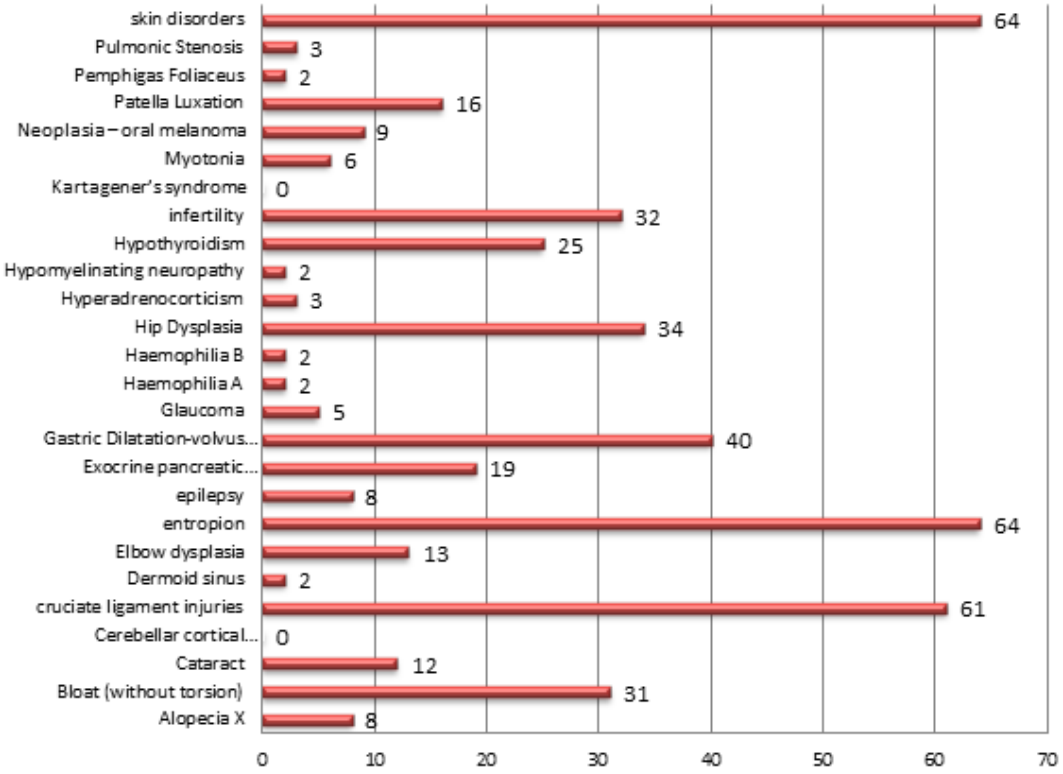

Figure 2: Owner's reported experience of various conditions associated with the Chow Chow, from 83 owners in the 2009 breed health survey.

BREED COUNCIL CRUCIATE SURVEY 2010

Subsequently in 2010 the Breed Council undertook another survey, looking specifically at cruciate ligament injuries. Some 25 owners participated in the survey and provided information relating to 357 Chow Chows. Of these 357 dogs, 42 (11.7%) were reported to have experienced cruciate ligament injuries. Interestingly, 53% of all affected dogs were reported to have suffered the injuries before one year of age. The full survey report is available here:
http://chowchowbreedcouncil.com/_images/cruciatesurvey.pdf

ONLINE HEALTH REPORTING SYSTEM

The breed collected health information as part of their new health scheme, with a report on the conditions reported in the breed below. Information regarding the health reporting can be found here:
http://chowchowbreedcouncil.com/healthscheme.htm

A total of 298 reports have been received up to June 2020 with 22% of these dogs being smooth coated and 78% rough coated, 63% female and 37% male. In total, 66% had not been bred from. Of 224 dogs reported for the majority (64%) had not experienced a health problem.

In total, 153 reports of health issues were included, which includes dogs affected with more than one condition. The top conditions recorded are shown in Table 1.

Table 1: Conditions Reported via the Breed Council Reporting System

System/ Condition	Count of Dogs Reported
Musculoskeletal	
Cruciate ligament injury	25
Arthritis	9
Hip dysplasia	9
Elbow dysplasia	7
Total reported	59
Ocular	
Entropion	33
Total reported	41
Dermatological	
Hypersensitivity	19
Dermatitis	4
Total reported	30
Reproductive	
Pyometra	8
Irregular seasons	4
Cryptorchidism	4
Total reported	13
Gastrointestinal	
Bloat/ gastric dilatation	4
Colitis	3
Torsion	2
Irritable bowel syndrome	2
Total reported	12
Cancers/ Tumours	
Stomach	3
Testicular	2
Mouth	2
Total reported	11

The Breed Council have also recently launched a puppy buyers survey in June 2020, which has received 169 responses since opening.

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 also attempted to acknowledge possible limitations of the studies reported, including when the research involved dogs in other countries. Whilst there are often strong links between populations of a breed in different countries, there are also often differences between the populations and issues seen in one country may not be seen (or may have a different prevalence) in another.

It is worth taking into account that although many studies including the Chow Chow have a small sample size and a small number of the breed represented, this breed makes up a numerically small percentage of the overall dog population. For example, in 2016 out of 250,611 Kennel Club registrations only 684 (0.27%) of these registrations were Chow Chows.

Dermatological conditions

Canine uveodermatological syndrome (Vogt-Koyanagi-Harada-like syndrome): This is a rare, immune-mediated condition which has ophthalmic and dermatologic manifestations and is considered hereditary (Kang et al, 2014). It has most commonly been reported in the Akita, but has also been reported in other breeds including the Chow Chow. No prevalence estimates could be found in the literature.

Gastrointestinal conditions

Exocrine pancreatic insufficiency (EPI): This is a disease in which there is inadequate production of digestive enzymes by pancreatic acinar cells, leading to weight loss, polyphagia and abnormal faeces. The Chow Chow was reported to be at increased risk of this condition, with an apparent prevalence of 63.2% (95% C.I.s 46.0 – 78.2; 24 cases out of 38 dogs tested) in a case series based on samples submitted to the University of Liverpool between 1990 and 2002 (Batchelor et al, 2007).

Gastric dilatation-volvulus syndrome (GDV): 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 an analysis of data collected in the 2004 Purebred Dog Health Survey, 20.0% (16 of 80) Chow Chows were reported to have died due to GDV giving a prevalence ratio of 8.5 (95% Confidence Intervals 5.4-13.3); this represented an increased risk of death due to the condition than dogs of other breeds (Evans et al, 2010).

Musculoskeletal conditions

Cranial cruciate ligament disease: The Chow Chow was reported to be at increased risk of cranial cruciate ligament disease, with an odds ratio of 1.73 (95% C.I. 1.55-1.93; 340 cases out of 7903 Chow Chows) compared to dogs of all breeds, based on dogs which had attended veterinary teaching hospitals in the USA between 1964 and 2003 (Witsberger et al, 2008). However, prevalence estimates or odds ratio

have not been determined in UK research, potentially due to the small number of dogs seen by vets.

Elbow dysplasia: The Chow Chow was reported to be at elevated risk of fragmented coronoid process and ununited anconeal process (both forms of elbow dysplasia), with breed-associated odds ratios compared to mixed breeds of 16.6 and 13.3 (95% C.I. 8.0-34.7 and 7.8-22.6) respectively, based on dogs which had attended veterinary teaching hospitals in the USA; however these results were only based on 28 cases and 34 non-cases in the breed (LaFond et al, 2002).

Hip dysplasia: The Chow Chow was reported to be at increased risk of hip dysplasia, with a breed-associated odds ratio compared to mixed breeds of 5.4 (95% C.I. 4.2-7.0) respectively, based on dogs which had attended veterinary teaching hospitals in the USA between 1985 and 1996; these results were based on 235 cases and 68 non-cases in the breed (LaFond et al, 2002). A subsequent study of dogs which had attended veterinary teaching hospitals in the USA between 1964 and 2003 reported an odds ratio for the Chow Chow compared to all other breeds of 1.9 (95% C.I. 1.73-2.07) with 521 of 8084 Chow Chows being diagnosed with the condition (Witsberger et al, 2008). Interestingly in this study Chow Chows were at greater risk of being diagnosed with hip dysplasia and cranial cruciate ligament disease concurrently or subsequently than with either condition alone, with an odd ratio of 2.42 (95% C.I. 1.85-3.16, 55 cases out of 7618 Chow Chows). However, prevalence estimates or odds ratio have not been determined in UK research, potentially due to the small number of dogs seen by vets.

Myotonia: This congenital condition involving muscle spasm and temporary inability to move has been described in the breed with onset of clinical signs at about two months of age and is considered to be inherited (Farrow and Malik, 1981; Shelton, 1999). No prevalence estimates could be found in the literature.

Panosteitis: The Chow Chow was reported to be at elevated risk of panosteitis, with a breed-associated odds ratio compared to mixed breeds of 1.7 (95% C.I. 1.3-2.2), based on dogs which had attended veterinary teaching hospitals in the USA; this result was based on 65 cases and 260 non-cases in the breed (LaFond et al, 2002).

Patellar luxation: The Chow Chow was reported to be at elevated risk of patellar luxation, with a breed-associated odds ratio compared to mixed breeds of 6.1 (95% C.I. 3.9-9.4), based on dogs which had attended veterinary teaching hospitals in the USA; however, this result was based on just 80 cases and 21 non-cases in the breed (LaFond et al, 2002).

VETCOMPASS

The Kennel Club work closely with VetCompass, a tool that has been developed to collect information from more than 1,100 national veterinary practices, which can be used to identify common breed-specific conditions, or condition-specific concerns which affect a range of breeds. Whilst no breed specific VetCompass paper has yet

been undertaken for the breed, the Chow Chow is included in the study detailed below.

Heatstroke: A recent VetCompass paper assessed 905,543 dog records at UK veterinary practices, and established 395 that were noted to have been affected by a heat-related illness event (Hall et al, 2020). The authors noted that the Chow Chow was a breed with a significantly higher risk of developing heatstroke, with an incidence of 0.5% (95% CI 0.21 – 1.16%) and odds ratio of 16.17 (95% CI 6.12 – 44.44). However, it is important to consider the large margins for the confidence interval for this odds ratio, which will be due to the small number of dogs included in the study.

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 insured population.
- Only clinical events that are not excluded and where the cost exceeds the deductible excess are included

However, insurance databases are too useful a resource to ignore as they fill certain gaps left by other types of research; in particular they can highlight common, expensive and severe conditions, especially in breeds of small population sizes, that may not be evident from teaching hospital caseloads.

UK Agria 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 for these conditions, nevertheless the number of settlements due to particular conditions 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; settlements under free policies, will have occurred in the five week free period and will therefore relate to young puppies. Between July 2017 and June 2018 there were 32 free exposures and 70 full exposures. 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 claims for each condition between 1st July 2017 and 31st June 2018 for Chow Chows insured on full policies with Agria UK

Condition	Number of settlements
Hip dysplasia developmental	14
Urinary bladder finding	12
Skin (cutaneous) disorder (unspecified)	10
Hypersensitivity (allergic) skin disorder (unspecified)	8
Entropion	6
Abdomen distended finding	6
Cruciate ligament rupture - caudal and cranial	4
Pain finding	3
Exocrine pancreatic insufficiency (EPI)	3
Elbow dysplasia (canine) - medial coronoid process disease fragment identified	3

Swedish Agria data

Swedish morbidity, but not mortality, insurance data were available from Agria for the Chow Chow. Rates are based on dog-years-at-risk (DYAR) which take into account the actual time each dog was insured during the period (2011-2016). The number of DYAR for the Chow Chow in Sweden during this period was 500 < 1,000 so these results should be interpreted with caution.

A summary is given below, with the full report available at: https://dogwellnet.com/

The most common specific causes of veterinary care episodes (VCEs) for Agria-insured Chow Chows in Sweden between 2011 and 2016 are shown in Figure 2. The top five specific causes of VCEs were dermatitis/ pyoderma/ folliculitis, pain/ locomotor signs, entropion, pyometra/endometritis, and otitis.

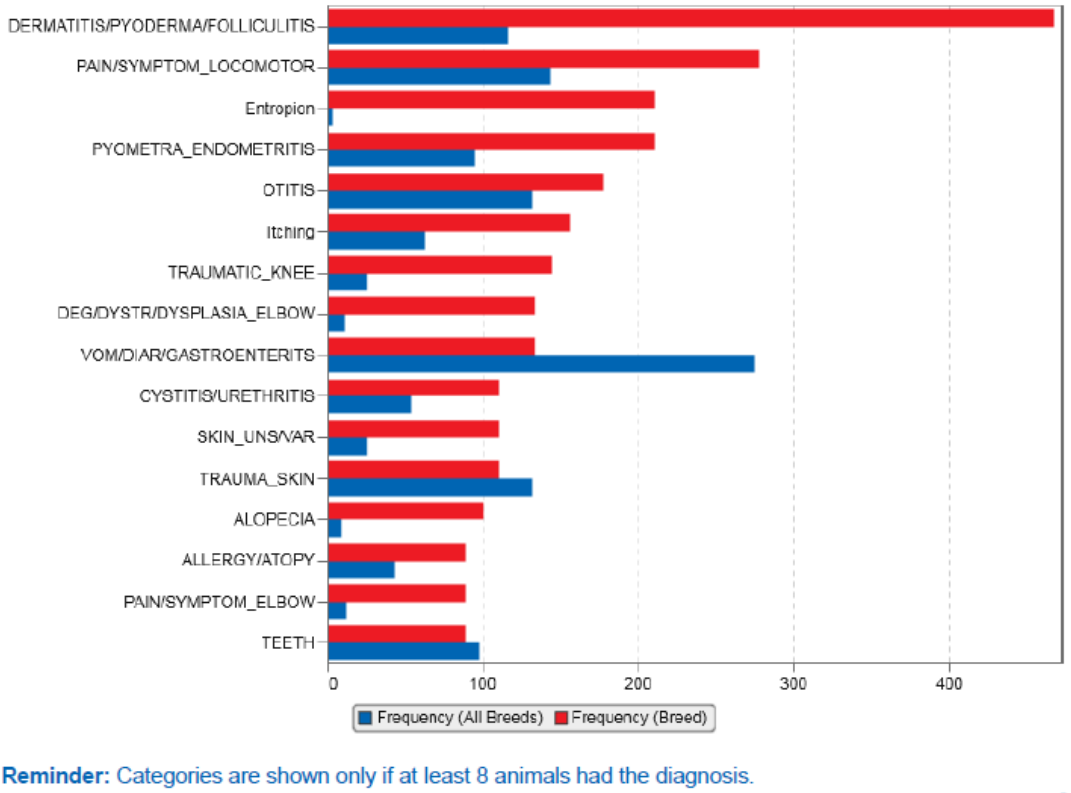

Figure 3: The most common specific causes of VCEs for the Chow Chow compared to all breeds in Sweden between 2011 and 2016, from Swedish Agria insurance data.

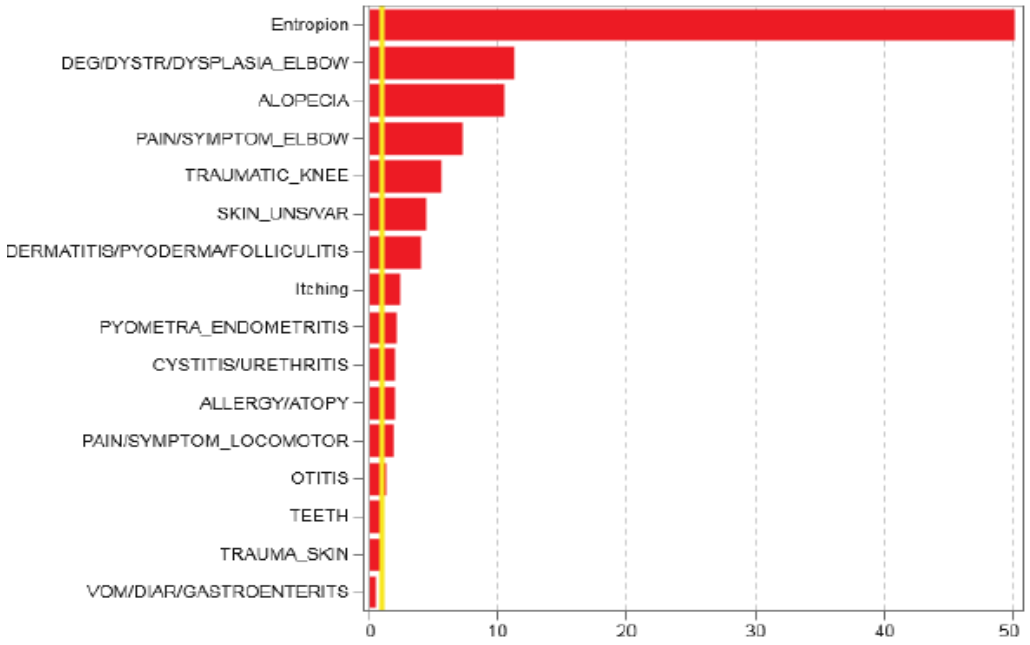

Figure 4: The specific causes of VCEs for the Chow Chow ordered by relative risk compared to all breeds in Sweden between 2011 and 2016, from Swedish Agria insurance data. The yellow line indicates the baseline risk for all breeds.

Further to this, the breed's morbidity of locomotory problems/ concerns was compared to all breeds (Figure 5). Unspecified/ various locomotor disorders were the most frequent type in the breed, with elbow disorders being the most frequent specific disorder.

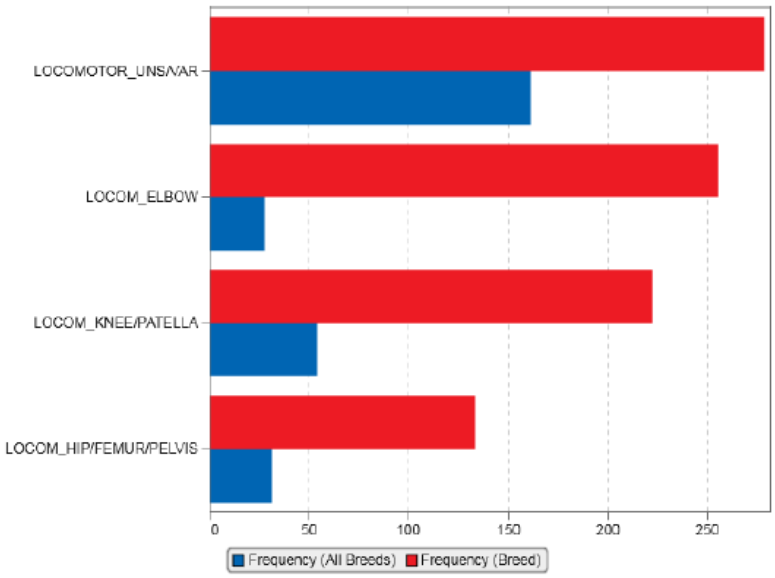

Figure 5: The morbidity of locomotor problems in the Chow Chow in comparison to all breeds in the Swedish Agria database between 2011-2016.

Similarly, the breed's relative risk morbidity of locomotory problems/ concerns was compared to all breeds (Figure 6). The analysis found elbow disorders to have the highest relative risk in the Chow Chow.

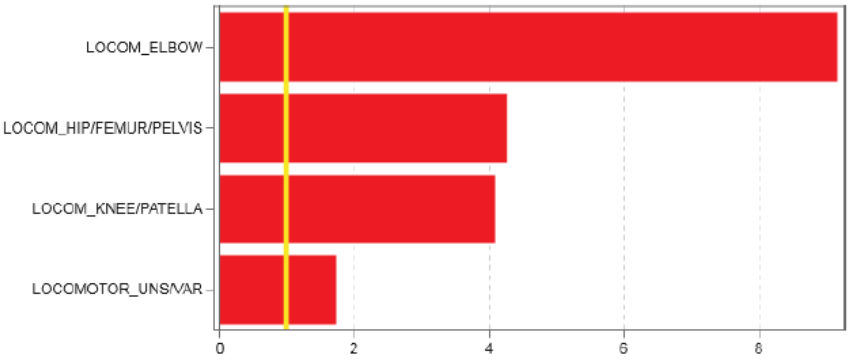

Figure 6: The relative risk morbidity of locomotor problems in the Chow Chow in comparison to all breeds in the Swedish Agria database between 2011-2016.

BREED WATCH

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

Table 2: Percentage of Chow Chows exhibited at Dog shows with points of concern for 2017 to 2019. Those with a * indicate new points of concern.

Point of concern	2017	2018	2019
Dogs showing respiratory distress including difficulty in breathing	0.00%	0.15%	0.13%
Excessive coat	0.00%	0.74%	0.66%
Eye/Eyelid abnormalities	3.01%	0.88%	0.80%
Narrow eyelid opening	0.13%	0.88%	0.80%
Unstable hocks	0.75%	1.47%	1.33%
*Audible breathing	0.00%	0.44%	0.40%
*Excessive hind angulation	0.00%	0.15%	0.13%
*Excessive skin on head or body	0.25%	0.00%	0.00%
*Laboured breathing	0.13%	0.00%	0.00%
*Significantly overweight	0.00%	0.00%	0.66%
Total dogs reported for	798	679	755

NB: As of the third quarter of 2019 judges are no longer reminded to complete their monitoring forms has changed, and consequently this is reflected in a reduced number of reports received across all breeds.

PERMISSION TO SHOW

As of the 1st January 2020 exhibits for which permission to show (PTS) following surgical intervention has been requested will no longer be published in the Breed Record Supplement and instead will be detailed in BHCPs, and a yearly report will be collated for the BHC. In the past five years one PTS have been granted for a Chow Chow (negating any caesareans or neutering requests) which was for removal of teeth/ tooth.

ASSURED BREEDER SCHEME

Currently within the Kennel Club (KC)'s Assured Breeders Scheme there are no requirements for Assured breeders. It is recommended that breeding stock are:

- Tested under the BVA/KC Hip Dysplasia Scheme
- Tested under the BVA/KC Elbow Dysplasia Scheme
- Tested annually under the BVA/KC/International Sheepdog Society (ISDS) Eye Scheme
- Participate in the breed council's health assessment to Bronze level

BREED CLUB BREEDING RECOMMENDATIONS

It is recommended that dogs used for breeding should have gained their Chow Chow Breed Council Bronze Health Assessment. Details are provided above under Breed Club health activities.

DNA TEST RESULTS

There are no DNA tests currently recognised for the Chow Chow.

Whilst other DNA tests may be available for the breed results from these will not be accepted by the Kennel Club until the test has been formally recognised; the process involves collaboration between the breed clubs and the Kennel Club in order to validate the test's accuracy.

CANINE HEALTH SCHEMES

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

HIPS

A total of 727 Chow Chows that have gone through the BVA/KC Hip Dysplasia Scheme since the scheme began up until June 2020, of which 323 were within the past 15 years. The 15 year median hip score was 9 (range 0-106) and 5 year median 10 (0-68).

Hip score categories received by Chow Chows 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 4 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. The trend has not been smoothly downwards, although in lower number breeds sampling variation does tend to make the year of birth trend rather bumpy.

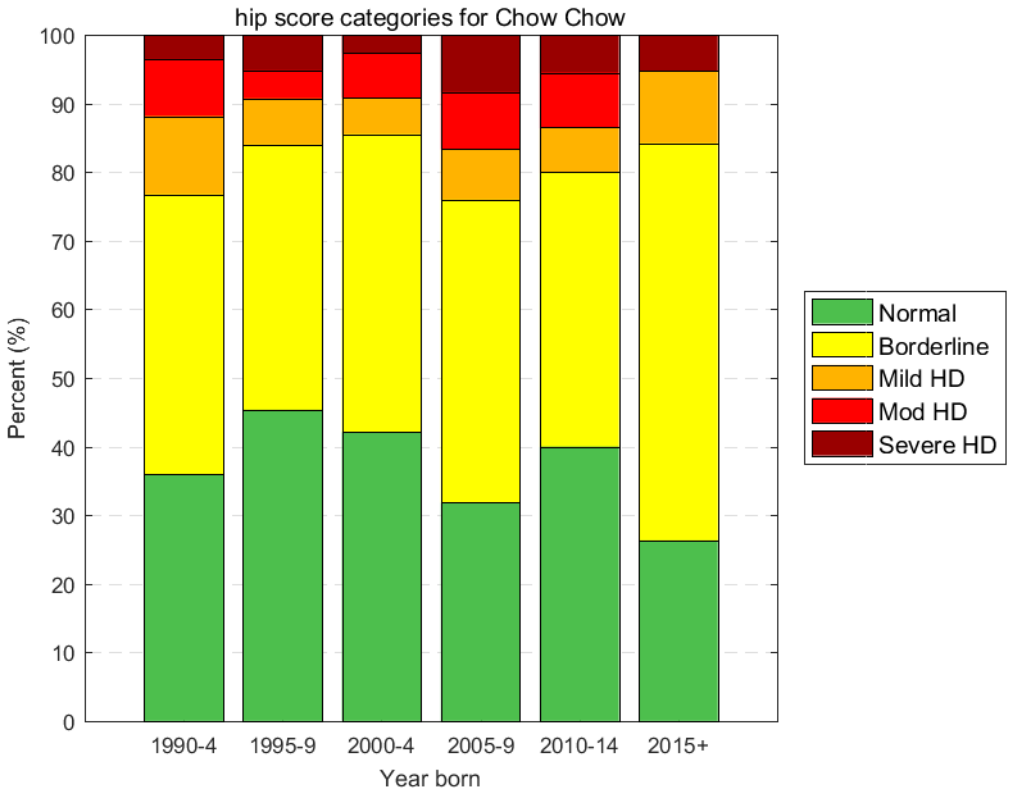

Figure 6: Hip score categories for Chow Chows which participated in the BVA/KC Hip Dysplasia Scheme between 1990 and 2016, in 5-year blocks.

ELBOWS

To date 149 Chow Chows 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 Figure 7 below. In total 61.1% (91 of 149) Chow Chows scored were diagnosed with some degree of elbow pathology.

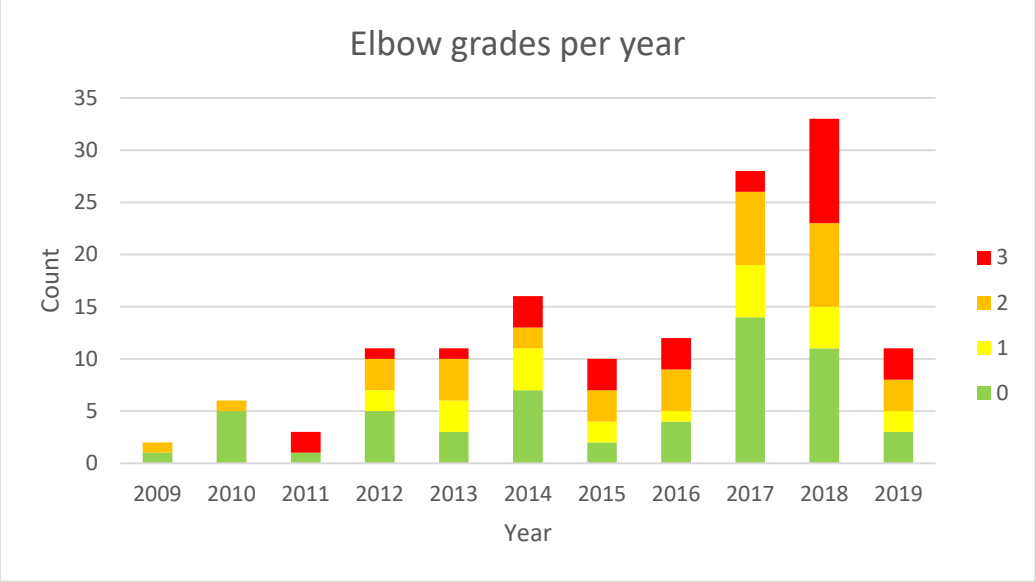

Figure 7: Elbow grades per year for Chow Chows between 2009 and 2019 (green = grade 0, yellow = grade 1, amber = grade 2, red = grade 3).

EYES

The Chow Chow is not currently on the BVA/KC/ISDS the Known Inherited Ocular Disease (KIOD) list (formally Schedule A) for any condition. KIOD 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 has been incorporated into an annual sightings reports, which records the results of conditions not listed on KIOD for dogs which have participated in the scheme. The results of Eye Scheme examinations of Chow Chows which have taken place since 2012 are shown in Table 3.

Table 3: Reports on Chow Chows which have participated in the BVA/KC/ISDS Eye Scheme since 2012.

Year	Number seen	Comments
2012	1 adult 1 litter	No sightings reported
2013	14 adults	2 – persistent pupillary membranes
2014	3 adults	1 – entropion
2015	3 adults 1 litter	1 - distichiasis
2016	6 adults	1 – posterior polar subcapsular cataract
2017	8 adults	No sightings reported
2018	51 adults	3 – distichiasis 9 – entropion 5 – persistent posterior subcapsular cataract (PPSC)
2019	*Awaiting report*	

AMERICAN COLLEGE OF VETERINARY OPHTHALMOLOGISTS (ACVO)

Between 2015 and 2019, 242 dogs of the breed were examined by the ACVO and prevalence data are shown in Table 4 alongside data from previous years, for conditions affecting over 1% of the tested population. Overall, 46.7% (113 of 242) of dogs of the breed examined between 2015 and 2019 had healthy eyes unaffected by any disease conditions. However, it is important to bear in mind that the dogs were from America and that the numbers of dogs tested are very small.

Table 4: Selected ACVO examination results for Chow Chows, 1991 - 2019

Disease Category/Name	**Percentage of Dogs Affected**	
	1991-2014 (n=1,260)	**2015-2019** (n=242)
Eyelids		
Entropion	27.9%	18.2%
Ectropion	1.7%	1.2%
Distichiasis	0.6%	1.2%
Cornea		
Pigmentary keratitis	2.0%	0.4%
Corneal endothelial degeneration	1.3%	0.0%
Uvea		
Persistent pupillary membranes, iris to iris	35.3%	28.1%
Persistent pupillary membranes, iris to lens	1.3%	0.4%
Persistent pupillary membranes, iris to cornea	4.3%	3.3%
Persistent pupillary membranes, lens pigment foci/no strands	1.0%	2.5%
Persistent pupillary membranes, endothelial opacity/no strands	0.2%	2.5%
Lens		
Cataracts (significant)	2.5%	0.8%

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

CHOW CHOW BREED COUNCIL HEALTH SCHEME

In 2015 the Chow Chow Breed Council initiated a Bronze Health Assessment, a basic veterinary health check to assess the health of Chow Chows over the age of 15 months. The assessment consists mainly of a visual check of the dog and auscultation of the heart and lungs. Particular attention is paid to checking for skin problems, any signs of hock instability and/or lameness as well as an assessment of the dog's ability to breathe normally.

By June 2020 a total of 150 Chow Chows had been assessed under this scheme and achieved Bronze level.

The majority of dogs assessed had no visual abnormalities reported, with 125 having no concerns, 22 having mild concerns and 3 having serious concerns – consisting of two dogs that had undergone surgery for entropion and cruciate ligament rupture, and one dog each found to be affected by skin complaints, immune mediated polyarthritis, bilateral hip and elbow dysplasia, auditory canal stenosis, surgery for patella luxation, hock abnormalities and atopy.

Of the dogs examined, one was found to have an abnormal heart/lung auscultation, two with visually impaired breathing, 21 with adnexal/ eyelid conformational concerns (of which 14 were affected by entropion), four with skin complaints, two with coat concerns and five with problems within the ear, four with behavioural problems, five with unstable hocks (of which one was severely affected) and a further four with movement problems.

A Silver level has also been launched by the breed, which incorporates testing under the British Veterinary Association (BVA)/Kennel Club (KC) Hip, Elbow and Eye schemes, as well as completing Bronze level. With this, it is hoped that subsidisation will be possible for owners participating in the scheme. To date 12 dogs have received silver certificates.

The Breed Council are also currently developing a Gold level.

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.
- In all breeds, there was an increase in the number of caesarean sections reported from 2012 onwards, as the Kennel Club publicised the procedure to vets.

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 5.

Table 5: Number and percentage of litters of Chow Chows registered per year and number of caesarean sections reported per year, 2009 to 2019.

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)*
2009	89	1	1.12%	0.15%
2010	92	1	1.09%	0.35%
2011	80	2	2.50%	1.64%
2012	84	11	13.10%	8.69%
2013	93	11	11.83%	9.96%
2014	98	11	11.22%	10.63%
2015	116	12	10.34%	11.68%
2016	117	16	13.68%	13.89%
2017	125	13	10.40%	15.00%
2018	149	14	9.40%	17.21%
2019	171	12	7.02%	15.70%

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. 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). In the population analysis undertaken by the Kennel Club in 2015, an estimated effective population size of **366.88** was reported (estimated using the rate of inbreeding over the period 1980-2019).

Annual mean observed inbreeding coefficient (showing loss of genetic diversity) and mean expected inbreeding coefficient (from 'random mating') over the period 1980-2020 are shown in Figure 7. 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. However, both the observed and expected inbreeding coefficients have declined in the last 10 years, indicating a preservation of genetic diversity in the breed.

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.

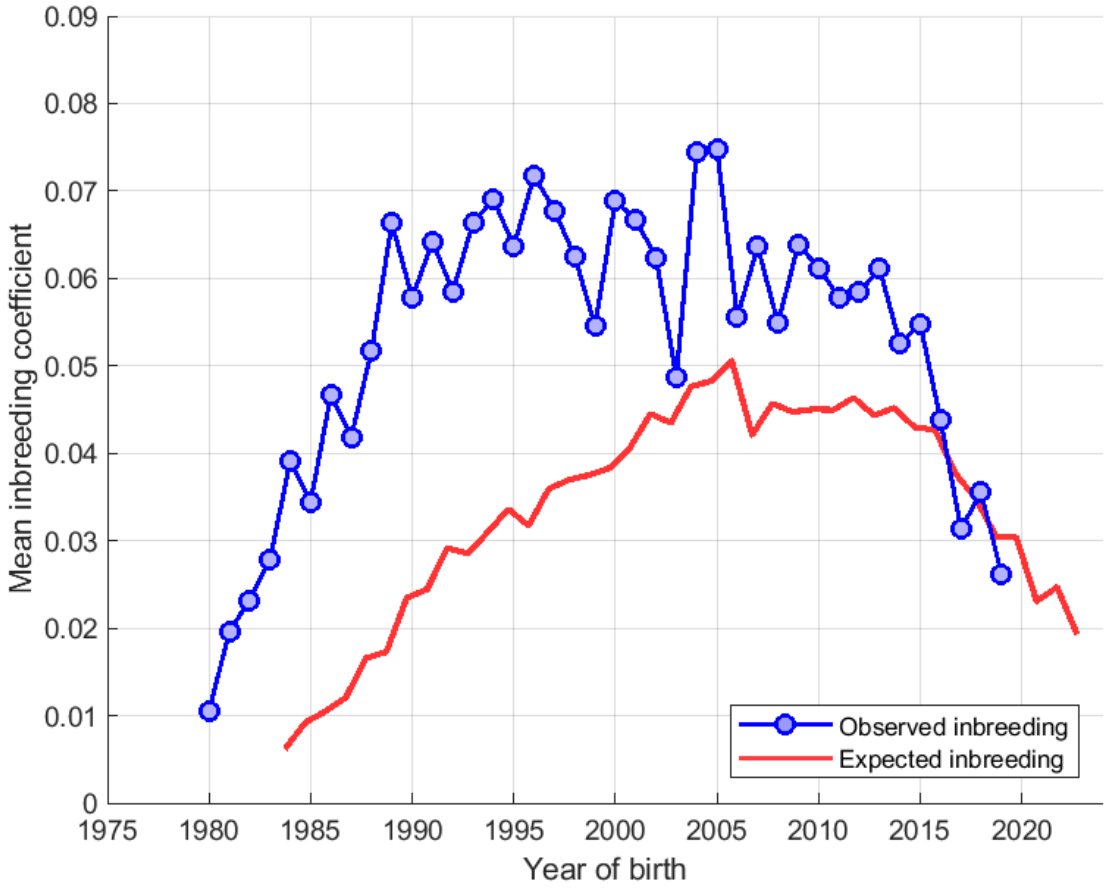

Figure 7: Annual mean observed and expected inbreeding coefficients

Below is a histogram ('tally' distribution) of the proportion of progeny per sire and dam over each of eight 6-year blocks (Figure 8). 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 8) although there is still moderate use.

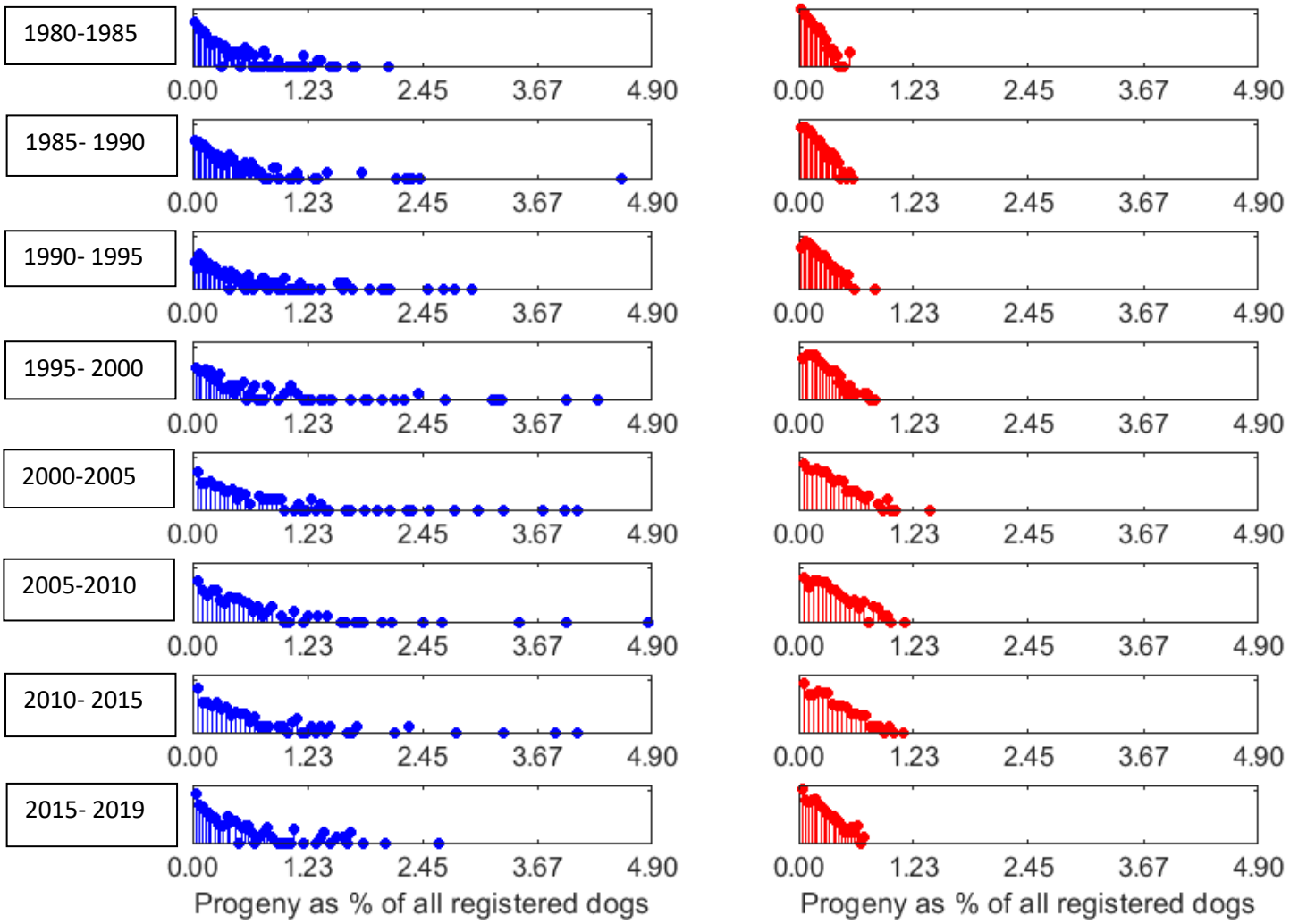

Figure 8: Distribution of the proportion of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-5 top, 2015-19 bottom). Vertical axis is a logarithmic scale.

CURRENT RESEARCH

The Chow Chow is one of the 75 breeds in the AHT's Give a Dog a Genome project; the health conditions given as concerns for the breed were alopecia X, elbow dysplasia, entropion, hip dysplasia and skin problems (non-specific). A healthy representative of the breed has now been sequenced.

The breed have also recently been added to the University of Nottingham's GDV list as part of a project to identify the underlying causes for disease.

PRIORITIES

A review meeting was held with the Chow Chow breed representatives in June 2020, following the discussion of the breed's BHCP in 2017. 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 group agreed from the evidence base and their own experience that the priorities will remain the same as:

- Eye conditions, particularly entropion
- GDV
- Hip dysplasia
- Elbow dysplasia
- Cruciate ligament disease
- Skin conditions

ACTION PLAN

Following the meeting between the Kennel Club and the breed regarding the evidence base of the Breed Health & Conservation Plans, the following actions were agreed to improve the health of the Chow Chow. Both partners are expected to begin to action these points prior to the next review.

Breed Club actions include:

- The Breed Clubs to undertake research alongside the Eurasier and Keeshond breed clubs with regard to elbow dysplasia

- The Breed Clubs to hold a GDV/bloat seminar – **ON HOLD**

- The Chow Chow Breed Council Health Sub-committee to continue encouraging participation in the BVA/KC/ISDS Eye Scheme with the potential to subsidise costs for participating owners - **ONGOING**

- The Breed Clubs to consider making a proposal for elbow grading under the Assured Breeder Scheme as a requirement

Kennel Club actions include:

- The Kennel Club to assist the breed in recruiting dogs for the GDV/ bloat survey with the University of Nottingham

- The Kennel Club to update the breed on any progress made on a cruciate ligament disease study - **ONGOING**

- The Kennel Club to share the breed's online reporting system on the Breed Information Centre

- The Kennel Club to discuss with the BVA the possibility of developing grading for entropion

- The Kennel Club to provide support in organising and publicising eye clinics – **ONGOING**

- The Kennel Club to continue to liaise with the breed regarding colour not recognised (CNR)

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