



THE KENNEL CLUB
DOG HEALTH

Breed Health and Conservation Plan



French Bulldog
2018

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

The French Bulldog is currently a category two breed which indicates that it has Breed Watch points of concern. The particular points of concern listed for the breed in Breed Watch are:

- Difficulty breathing
- Pinched nostrils
- Overly short neck
- Excessively prominent eyes
- Incomplete blink
- Incorrect bite
- Screw tail
- Lack of tail
- Inverted tail
- Tight tail
- Exaggerated roach in the top line
- Signs of dermatitis in skin folds
- Hair loss or scarring from previous dermatitis

Demographics

The number of French Bulldogs registered per year has increased dramatically over the past decade, as shown in Table 1.

Table 1: Number of French Bulldogs registered per year between 2006 and 2016.

Year	Number of new registered French Bulldogs	Percentage of French Bulldogs in KC registered population per year
2006	526	0.19%
2007	692	0.26%
2008	1025	0.38%
2009	1521	0.62%
2010	2204	0.86%
2011	2771	1.14%
2012	4648	2.03%
2013	6990	3.12%
2014	9670	4.34%
2015	14607	6.64%
2016	21470	9.43%

This marked increase is illustrated graphically in Figure 1 which shows the number of French Bulldogs registered per year between 1980 and 2016. Numbers were low and stable between 1980 and around 2005. The trend of registrations over year of birth (1980-2014) is +127.40 per year (with a 95% confidence interval of +72.38 to +182.42), reflecting this increase in numbers. [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.]

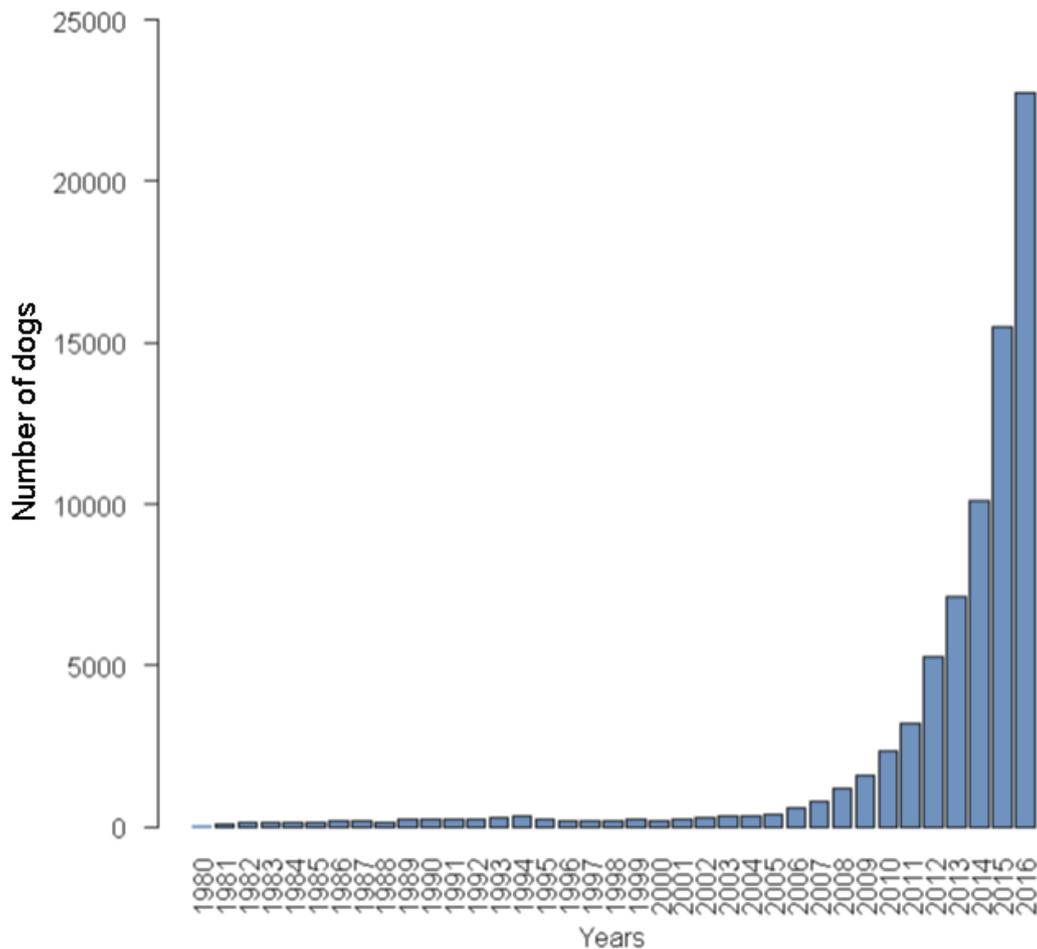


Figure 1: Number of registrations of French Bulldogs per year of birth

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. However, it may also be useful for UK breeders to be aware of conditions occurring in the breed in other countries which have not yet been seen in the UK population, especially given that movement of breeding stock does occur between countries.

Although registration numbers are now relatively high, until about 10 years ago the French Bulldog was quite a rare breed in the UK with only around 500 registrations a year on average. This is reflected in the few studies reported, often small sample size and a small number of the breed represented. It is anticipated that the number of scientific references relating to the breed will increase dramatically in coming years.

Cardiovascular conditions

No scientific references to conditions in this category could be found for the breed.

Dermatological conditions

Atopic dermatitis: A multicentre study compared apparent breed predispositions for atopic dermatitis in different geographical locations and found an apparent overrepresentation of the breed with the condition in Hamburg, Germany with an odds ratio of 46.9 (95% C.I. 16.7-131.3) compared to dogs of other breeds (Jaeger et al, 2010). In that study, affected dogs of the breed were most likely to present with otitis externa and facial lesions. More recently, the French Bulldog was reported one of the breeds that was affected most often with allergic/atopic skin clinical signs, based on a survey of dog owners in Finland, with 33.8% of the 71 French Bulldogs in the survey reported to be affected (Anturaniemi et al, 2017).

Congenital hypotrichosis: This form of alopecia has been described in one female French Bulldog in the UK (Marks et al, 1992). No other reports of the condition in the breed were found in the scientific literature.

Endocrine conditions

No scientific references to conditions in this category could be found for the breed.

Gastrointestinal conditions

Histiocytic colitis/granulomatous colitis: The French Bulldog has been described as predisposed to this condition, which resembles a similar condition seen in the Boxer. A case report describing the condition in six members of the breed in America reported that it was associated with the presence of invasive *E. coli*, and successful treatment requires eradication of these harmful bacteria (Manchester et al, 2012).

Persistent vomiting: A German survey of 39 French Bulldogs found that 41% (n=16) showed vomiting/regurgitation at least one daily, 5.1% (n=2) at once weekly, 5.1% (n=2) at least once monthly and 5.1% (n=2) rarely (Roedler et al, 2013). The authors considered this to be part of 'brachycephalic syndrome', affecting primarily the respiratory and gastrointestinal systems. Some 25.6% (n=10) were found to choke on food daily, 7.7% (n=3) at once weekly, 2.6% (n=1) at least once monthly and 10.3% (n=4) rarely. The authors also recorded the prevalence of dyspnoea during feeding, 20.5% (n=8) experienced this daily, 5.1% (n=2) at least once weekly, 2.6% (n=1) at least once monthly and 17.9% (n=7) rarely.

Haematological conditions

Haemophilia B (Factor IX deficiency): This X-linked recessive coagulopathy (blood clotting disorder) has been reported as a breed predisposition in the French Bulldog, but no prevalence estimates were provided (Brooks, 1999).

Hepatic conditions

No scientific references to conditions in this category could be found for the breed.

Immunological conditions

No scientific references to conditions in this category could be found for the breed.

Musculoskeletal conditions

Some authors consider the French Bulldog to be a chondrodystrophic /chondrodysplastic breed (Brisson, 2010; Aikawa et al, 2014; Mayousse et al, 2017). Chondrodystrophy describes abnormal cartilage and bone growth resulting in characteristic disproportionate dwarfism. This is considered to be a breed characteristic in the French Bulldog and a number of other breeds (including Basset Hounds, Dachshunds, Corgis and Bulldogs) rather than a disease condition. However, in a genetic study of chondrodysplasia the French Bulldog was categorised as an unaffected breed (Parker et al, 2009), so the picture is not clear cut.

Hemivertebrae and intervertebral disc disorder are discussed under neurological conditions.

Neoplastic conditions

Mast cell tumours: A retrospective study of 9,375 histopathologically confirmed diagnoses of cutaneous Mast Cell Tumours (MCTs) from a nationwide veterinary diagnostics laboratory in the USA, 108 of which were French Bulldogs, found that the French Bulldog demonstrated a higher relative risk of developing MCTs (Mochizuki et al, 2016). The relative risk for the breed was estimated as 2.79 compared to all purebred dogs.

Neurological conditions

Congenital deafness: Congenital deafness has been reported to occur in the French Bulldog, but no prevalence estimate was provided (Strain, 2004).

Hemivertebrae: Congenital vertebral malformations such as hemivertebrae are common in the thoracic vertebral column of brachycephalic 'screw-tailed' breeds such as the French Bulldog, Boston Terrier, Bulldog and Pug (Gutierrez-Quintana et al, 2014). A study of 105 French Bulldogs in Germany investigating hemivertebrae reported a prevalence of 0.85 (89 of 105 dogs of the breed affected). Heritability estimates for the number and grade of hemivertebrae were 0.58 ± 0.15 and 0.53 ± 0.16 , respectively (Schlensker and Distl, 2016). Interestingly, the presence of a larger number of coccygeal vertebrae correlated with a lower number and less severe grade of hemivertebrae, suggesting that genetic progress could be made quite quickly by utilising long tailed dogs, although limited numbers of these exist.

Intervertebral disc disorder (IVDD): The French Bulldog was the second most frequently affected breed with IVDD in a study of electronic patient records of 90,004 dogs examined at the University of California-Davis Veterinary Medical Teaching Hospital, USA, between 1st January 1995 to 1st January 2010 with a breed-specific prevalence of 27.06% compared to a mixed breed-prevalence of 4.43% (Bellumori et al, 2013). A recent study of 178 French Bulldogs which had been treated at the Royal Veterinary College (RVC) between November 2010 and September 2016, 77 of which had IVDD and 101 which were unaffected, found that dogs of the breed with kyphosis (excessive curvature of the spine) were at almost two times increased odds (odds ratio (OR) = 1.98, 95% C.I. 1.04-3.78) of being affected by cervical or thoracolumbar IVDD than those without kyphosis (Inglez de Souza et al, 2018).

Necrotising leukoencephalitis (NLE): The breed has been described as being predisposed to this inflammatory brain condition (Flegel, 2017). However, no prevalence estimates could be found in the literature.

Ocular conditions

Prolapse of the gland of the nictitating membrane (prolapsed gland of the third eyelid, 'cherry eye'): In a study of cases of this condition at the National Veterinary School of Alfort, France, and three private practices in France, Belgium and Switzerland, 34 breeds were represented and the French Bulldog was the most commonly affected breed with 14 cases. The authors reported that the observed percentage of cherry eye (8.48%) was much higher than that expected (0.99%), suggesting a breed predisposition (Mazzucchelli et al, 2012).

Other ocular conditions: Literature produced by the American College of Veterinary Ophthalmologists (ACVO) for breed ocular predispositions reported the French Bulldog to be susceptible to several conditions: distichiasis, entropion, prolapsed gland of the third eyelid, corneal dystrophy, exposure/pigmentary keratitis, persistent pupillary membranes, cataract and retinal dysplasia (Genetics Committee of the American College of Veterinary Ophthalmologists, 2015). The following prevalence estimates were reported (Table 2). Overall 86.5% of the dogs examined in 2015 had normal eye conformation and were unaffected by ocular disease. It should be remembered that these were American dogs.

Table 2: ACVO examination results for French Bulldogs, 2000 - 2015

Disease Category/Name	Percentage of Dogs Affected		
	2000-2009 (n=1654)	2010-2014 (n=1354)	2015 (n=363)
Eyelids			
Distichiasis	6.0%	8.3%	5.0%
Nasolacrimal			
Imperforate lower nasolacrimal punctum	0.3%	0.9%	2.5%
Uvea			
Persistent pupillary membranes (iris to iris)	2.1%	2.7%	5.8%
Persistent pupillary membranes (iris to cornea)	1.7%	1.3%	1.7%
Persistent pupillary membranes (endothelial opacity/no strands)	0.1%	2.4%	1.1%
Lens			
Cataracts (significance unknown)	2.2%	3.3%	2.5%
Incipient cataract (anterior cortex)	1.2%	0.6%	1.4%
Incipient cataract (equatorial cortex)	0.2%	0.3%	1.1%
Vitreous			
Persistent hyaloid artery/remnant	0.4%	0.4%	1.1%

Reproductive conditions

Dystocia: In a study to investigate the percentage of litters born by caesarean section, the French Bulldog had the third highest reported caesarean section rates. Using data collected during the 2004 Purebred Dog Health Survey, of 248 litters reported in the breed, 81.3% (65 of 80) of litters were delivered by caesarean section (Evans and Adams, 2010). It was not possible to determine in that study whether the caesarean section was an elective or emergency procedure. Textbooks refer to a breed predisposition to obstructive dystocia due to a narrow maternal pelvic canal and fetuses with large heads, but no primary literature sources could be found.

Respiratory conditions

Brachycephalic obstructive airway syndrome (BOAS): A VetCompass study of upper respiratory tract disorders, which included 1,503 dogs of the breed, found a random sample of the French Bulldogs in the dataset had a 20.0% prevalence of upper respiratory tract disorders, of which 12% were nares/nasal cavity disorders and 6.0% tracheal disorders, 10.5% were multi-site disorders and 1.5% were categorised as BOAS (O'Neill et al, 2015).

A large research project into BOAS has been underway at the Queen's Veterinary School Hospital, University of Cambridge, for several years. A study of 89 French Bulldogs, 19 of which had been referred as BOAS cases and 70 of which were presented to participate in the research by their owners, reported a prevalence of

0.54 (95% C.I. 0.43–0.65) across the whole study group and 0.43 (95% C.I. 0.31-0.55) if the clinical cases were excluded (Liu et al., 2015).

A subsequent study of 214 dogs of the breed (17.3% of which were clinical cases and 82.7% were volunteered) found that 10.7% had a BOAS functional grade of 0, 30.4% grade I, 43.5% grade II and 15.4% grade III (Liu et al, 2017). Considering the nares (nostrils), 10.8% had open nares, 13.6% had mild stenosis, 29.0% had moderate stenosis and 45.3% had severely stenotic nares.

Urological conditions

Cystinuria/cystine urolithiasis: The French Bulldog is reported to be predisposed to this condition (Harnevik et al, 2006). However, no prevalence estimates could be found in the literature.

Purebred/pedigree dog health survey results

2004 Morbidity results: Health information was collected for 154 live French Bulldogs of which 73 (47%) were healthy and 81 (53%) had at least one reported health condition. The top categories of diagnosis were ocular (20.8%, 27 of 130 reported conditions), musculoskeletal (17.7%, 23 of 130 reported conditions), reproductive (13.8%, 18 of 130 reported conditions) and aural (9.2%, 12 of 130 reported conditions). The three most frequently reported specific conditions were corneal ulcers (11.5%, 15 of 130 conditions), otitis externa (7.7%, 10 of 130 conditions) and patellar luxation (6.9%, 9 of 130 conditions).

2004 Mortality results: A total of 71 deaths were reported in the breed. The median age at death for French Bulldogs was 9 years (min = 5 months, max = 14 years and 8 months). The most frequently reported causes of death by organ system or category were cancer (38.0%, 27 of 71 deaths), neurological (16.9%, 12 of 71 deaths), old age (8.5%, 6 of 71 deaths), respiratory (7.0%, 5 of 71 deaths) and musculoskeletal (4.2%, 5 of 71 deaths). The three most frequently reported specific causes of death were cancer – type unspecified (22.5%, 16 of 71 deaths), brain tumour (7.0%, 5 of 71 deaths) and epilepsy (5.6%, 4 of 71 deaths).

2014 Morbidity results: Health information was collected for 330 live French Bulldogs of which 210 (63.6%) had reported no conditions and 120 (36.4%) reported affected by at least one condition. The most frequently reported specific conditions were hypersensitivity (allergic) skin disorder (6.46%, 17 of 263 conditions), Brachycephalic Obstructive Airway Syndrome (BOAS) (6.08%, 16 of 263 conditions), narrowed nostrils (5.70%, 15 of 263 conditions) and otitis media (4.94%, 13 of 263 conditions). Further analysis of the morbidity results suggested that the French Bulldog was at increased risk of BOAS, otitis media, persistent vomiting and rash between skin folds and at a decreased risk of arthritis and lipoma compared to the average risk for dogs of all breeds.

2014 Mortality results: Just 21 deaths were reported in the breed. The median age at death for French Bulldogs was 5.9 years (min = 0 years, max = 14 years). The most frequently reported causes of death were cardiac (heart) failure (19.0%, 4 of 21

deaths), cancer – unspecified (9.52%, 2 of 21 deaths), aggression (4.76%, 1 of 21 deaths), allergies and bone tumour (4.76%, 1 of 21 deaths).

VetCompass results

A breed-specific VetCompass study is underway, however there is currently no indication of when it will be complete. This should yield useful prevalence information.

Insurance data

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 were not available 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 4, refer to dogs outside of the initial five week free period; settlements under free policies, shown in Table 5, will have occurred in the five week free period and will therefore relate to young puppies. It is possible that one dog could have more than one settlement for a condition within the 12-month period shown. 'Benefit other than vet fees' refers most commonly to a claim for death of the dog but can also cover travel costs, boarding fees and advertising for lost dogs.

Table 4: Top 10 conditions and number of settlements for each condition between 1st August 2016 and 31st July 2017 for French Bulldogs insured on full policies with Agria UK

Condition	Number of settlements
Skin allergy ^{\$}	126
Atopy ^{\$}	105
BOAS	89
Corneal ulcer (non-traumatic)	63
Fractured humerus	54
Medial patella luxation	41
Meningoencephalitis	29
Disc herniation	27
Benefit other than vet fees (explained above)	22
Disc herniation - cervical	12

^{\$} N.B. - Allergy is any exaggerated immune response to a foreign antigen regardless of mechanism. A dog can be allergic without being atopic. Atopy is a genetic predisposition to an exaggerated Immunoglobulin E (IgE)-mediated immune response to allergens in the environment. The treatment of atopy will be different to the treatment of non-atopic allergy.

Table 5: Top 10 conditions and number of settlements for each condition between 1st August 2016 and 31st July 2017 for French Bulldogs insured on free (puppy) policies with Agria UK

Condition	Number of settlements
Vomiting and diarrhoea	27
Fractured humerus	26
Benefit other than vet fees	23
Diarrhoea	22
Acute gastroenteritis	20
Prolapsed nictitans gland (cherry eye)	14
Injury to elbow	6
Canine parvovirus	6
Idiopathic epilepsy	4
Pyloric stenosis	3

Swedish Agria data

Swedish morbidity and mortality insurance data were available from Agria for the French Bulldog. 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).

Swedish Agria insurance morbidity data

The most common specific causes of Veterinary Care Events (VCEs) for Agria-insured French Bulldogs in Sweden between 2006 and 2011 are shown in Figure 2. The number of DYAR for the French Bulldog in Sweden during this period was between 500 and 1,000, so these results should be interpreted with caution. The top five specific causes of VCEs were vomiting/diarrhoea/enteritis, dermatitis/pyoderma/folliculitis, allergy/atopy, otitis and itching. When relative risk of specific causes of VCEs was compared for the French Bulldogs 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 five specific causes of VCEs ordered by relative risk were malformation or developmental abnormalities of the respiratory tract, oesophagus, trauma to the eyeball, trauma to the cornea/sclera and breathing problem (upper).

Highest risk (most common) Specific Causes of VCEs (Diagnoses Level_1) 2006-2011

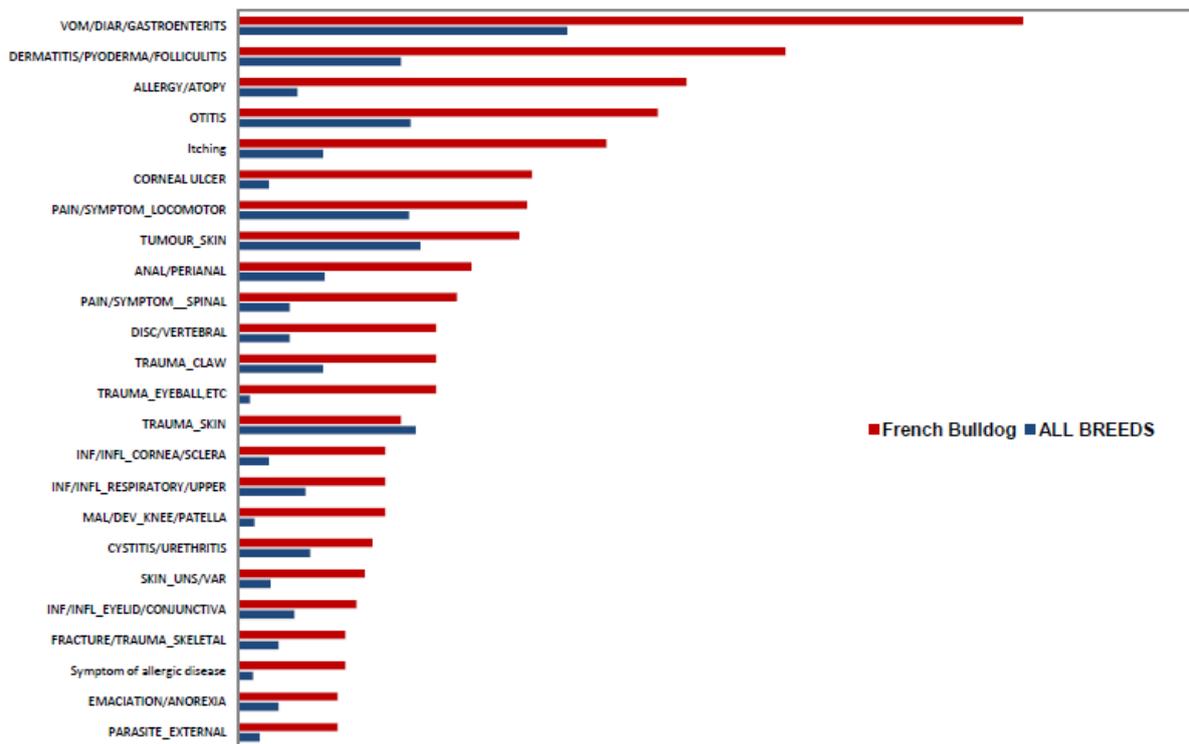


Figure 2: The most common specific causes of VCEs for the French Bulldog compared to all breeds in Sweden 2006 - 2011, from Swedish Agria insurance data.

Specific Causes of VCEs Ordered by Relative Risk: French Bulldog compared to All Breeds 2006-2011

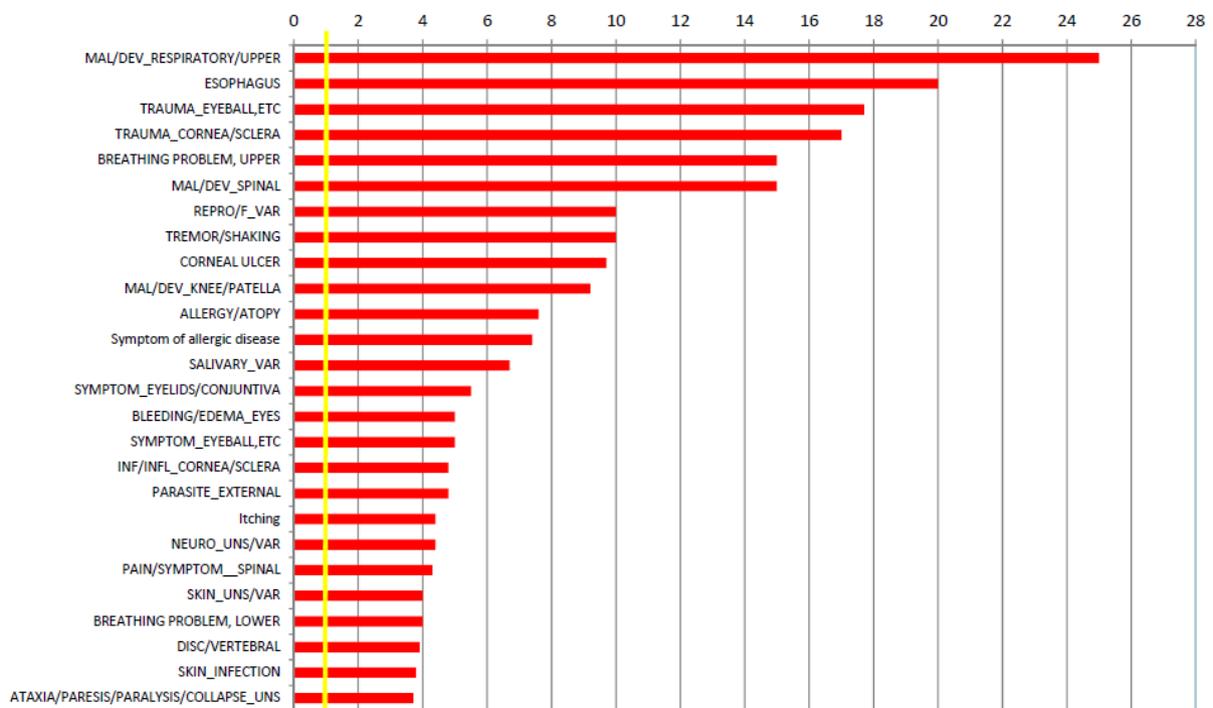


Figure 3: The specific causes of VCEs for the French Bulldog ordered by relative risk compared to all breeds in Sweden 2006 - 2011, from Swedish Agria insurance data.

Swedish Agria insurance mortality data

The median age at death for French Bulldogs from Swedish Agria insurance data was 2.5 years for males and 3.75 years for females. The most common specific causes of death were disc/vertebral, being hit by a car/train/vehicle, breathing problem (upper) and malformation or developmental abnormalities of the respiratory tract (Figure 4).

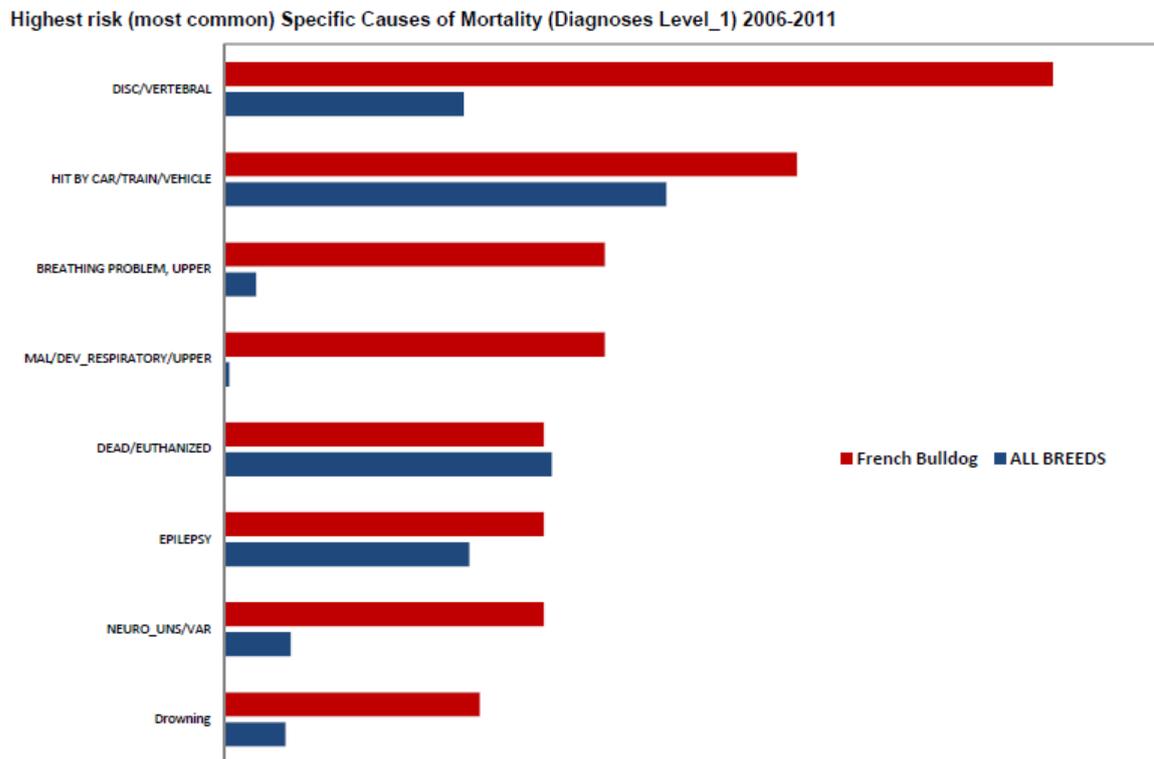


Figure 4: The most common specific causes of death for the French Bulldog compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data.

Breed-specific health surveys

No breed-specific health surveys were available.

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

As a category two breed judges' health monitoring forms are mandatory. The points of concern reported are shown below in Table 6.

Table 6: Percentage of French Bulldogs exhibited at Dog shows with points of concern for 2014 and 2015. Those with a * indicate new points of concern.

Point of concern	2014	2015	2016	2017
* Audible breathing	0.00%	0.55%	0.00%	0.00%
* Excessive wrinkle	0.55%	0.00%	0.13%	0.00%
* Eye/Eyelid abnormalities	0.23%	0.00%	0.00%	0.16%
* Lower lip over incisors (tight lip)	0.09%	0.00%	0.00%	0.21%
* Skin irritation	0.00%	0.33%	0.00%	0.00%
* Weak hind movement	0.00%	2.19%	0.69%	0.21%
Difficulty breathing	0.82%	1.59%	0.35%	0.82%
Exaggerated roach in the top line	2.20%	1.53%	2.03%	0.00%
Excessively prominent eyes	0.64%	1.09%	0.73%	0.49%
Incomplete blink	0.09%	0.16%	0.91%	2.10%
Incorrect bite	1.15%	1.81%	1.73%	0.37%
Inverted tail	0.27%	0.98%	0.30%	0.16%
Lack of tail	9.58%	7.49%	4.58%	0.00%
Overly short neck	0.73%	0.93%	0.91%	2.27%
Pinched nostrils	3.12%	2.52%	7.73%	1.36%
Screw tail	2.84%	0.82%	0.60%	5.15%
Signs of dermatitis in skin folds	0.55%	0.11%	0.13%	0.62%
Tight tail	2.75%	2.35%	1.94%	9.07%

Breed Club health activities

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.

One of the major initiatives developed and set up by the breed's parent club, The French Bulldog Club of England, is the multi-level French Bulldog Health Scheme, which is open to all owners of dogs of the breed, with no pre-requisite of membership of any club.

The initial Bronze level tests can be carried out by any local vet, making it widely accessible. The scheme covers the following:

Bronze Level: a thorough veterinary health check including a BOAS respiration test (at rest and after exercise), and grading of nostrils. The results of the health check are recorded on a three part form – one kept by the vet, one by the owner and the third sent to the breed club to form part of the Health Database.

Silver Level: in addition to the 'Bronze' health check, the next level includes a series of non-invasive tests:

- DNA test HC HSF4 to test for Hereditary Cataracts (clear result required)
- DNA test for Degenerative Myelopathy

Gold Level: to have obtained the Bronze and Silver level certificates

- Repeat BOAS test for breathing
- Cardiologist Heart Test (normal)
- Spine X-ray and evaluation

Results of all these tests are recorded by the breed club for the breed database and holders of certificates are included on the website both as recognition but also as a resource for breeders.

BHC annual report

The Breed Health Coordinators' Annual Health Report 2016 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 BOAS including nostrils, 2 spinal problems, and 3 allergies. In terms of what the breed has done in the last year to help tackle these listed health and welfare concerns, for BOAS the breed clubs have been actively supporting and involved with the research undertaken at the University of Cambridge; for spinal problems they require as part of the French Bulldog health assessment both thermal imaging and a DNA test for degenerative myelopathy at the higher certificate levels; for allergies the French Bulldog Club of England provide advice for owners on their website. The same three conditions were given in the Annual Health Report 2017.

DNA test results

There are currently DNA tests for French Bulldogs for hereditary cataract (HC-HSF4), degenerative myelopathy (DM), hyperuricosuria (HUU), canine multifocal retinopathy (CMR1), cystinuria type III and dilated cardiomyopathy (DCM). DNA test results are only recorded for Official Kennel Club DNA Testing Schemes which involve collaboration between the Kennel Club, the breed clubs and the DNA testing facilities. Currently the Kennel Club records DNA test results from approved laboratories for HC-HSF4 and DM.

Hereditary Cataracts (HC-HSF4)

The results of the French Bulldogs DNA tested for hereditary cataract (HC-HSF4) up to 11/01/2018 are shown in Table 7. No dogs have been recorded as hereditarily affected.

Table 7: HC-HSF4 DNA test results held by the Kennel Club for French Bulldogs up to 11/01/18.

Total Number of Results	CLEAR	CARRIER	HEREDITARILY CLEAR
11487	2286 (19.9%)	31 (0.3%)	9170 (79.8%)

Degenerative Myelopathy (DM)

The results of the French Bulldogs DNA tested for Degenerative Myelopathy (DM) up to 11/01/2018 are shown in Table 8. No dogs have been recorded as affected, hereditarily affected or hereditarily carrier.

Table 8: DM DNA test results held by the Kennel Club for French Bulldogs up to 11/01/18.

Total Number of Results	CLEAR	CARRIER	AFFECTED	HEREDITARILY CARRIER	HEREDITARILY CLEAR
2344	909 (38.8%)	329 (14.0%)	42 (1.8%)	34 (1.5%)	1030 (43.9%)

Canine Health Scheme results and EBVs

Under the Assured Breeder Scheme it is a recommendation for breeding stock to participate in the BVA/KC/ISDS Eye Scheme annually. However, all the British Veterinary Association (BVA)/Kennel Club (KC) Canine Health 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

In total 39 French Bulldogs have been hip scored as part of the BVA/KC Hip Dysplasia Scheme in the 15 years to 2016. The median hip score received was 12 (range 5 – 93).

ELBOWS

Just three French Bulldogs have been elbow scored as part of the BVA/KC Elbow Dysplasia Scheme since it launched in 1998. Two were scored zero and one dog received a score of one.

EYES

The French Bulldog is not currently on Schedule A or B for any condition under the BVA/KC/International Sheep Dog Society (ISDS) Eye Scheme. 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. However, the BVA still records the results of dogs of other breeds which have participated in the scheme. The results of Eye Scheme examinations of French Bulldogs which have taken place since 2010 are shown in Table 9.

Table 9: Reports on French Bulldogs which have participated in the BVA/KC/ISDS Eye Scheme since 2012.

Year	Number seen	Comments	
2012	10 adults	No sightings reported	
2013	46 adults 5 litters	Adults 1 – entropion 1 – persistent pupillary membranes 1 – other cataract 1 – choroidal hypoplasia 1 – cherry eye 1 – micropunctum	Litter 1 – multifocal retinal dysplasia
2014	30 adults 4 litters	Adults No sightings reported	Litter 1 - distichiasis
2015	46 adults 3 litters	Adults 1 – multifocal retinal dysplasia	
2016	42 adults 1 litter	Adults 2 - distichiasis	

Breed Club Recommendations

Participation in French Bulldog Health Scheme.

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 French Bulldog and the number of reported caesarean sections in the breed for the past 10 years are shown in Table 10.

Table 10: Number of litters of French Bulldogs registered per year and number of caesarean sections reported per year, 2008 to 2017.

Year	Number of Litters Registered	Number of C-sections	Percentage of C-sections
2008	245	1	0.41
2009	357	0	0
2010	531	9	1.69
2011	667	51	7.65
2012	1021	356	34.87
2013	1485	493	33.20
2014	2089	709	33.94
2015	3155	1066	33.79
2016	4620	1633	35.35
2017	5783	2192	37.90

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 132.2 was reported (estimated using the rate of inbreeding over the period 1980-2014). The rate of inbreeding has remained relatively steady and is within the level thought to be sustainable. This means that there is a suitable balance between selective breeding and inbreeding, therefore the genetic diversity is being effectively managed (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 'random mating') over the period 1980-2014 are shown in Figure 5. As with most breeds, the rate of inbreeding was at its highest in this breed in the 1980s and 1990s. This represents a 'genetic bottleneck', with genetic variation lost from the population. However, since the early 2000s the rate of inbreeding has been negative, implying moderate replenishment of genetic diversity (possibly through the use of imported animals).

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

The current annual breed average inbreeding coefficient is 2.5%. This value is calculated each June and represents the average inbreeding coefficient of all French

Bulldogs registered between January and December of the previous year i.e. in 2016.

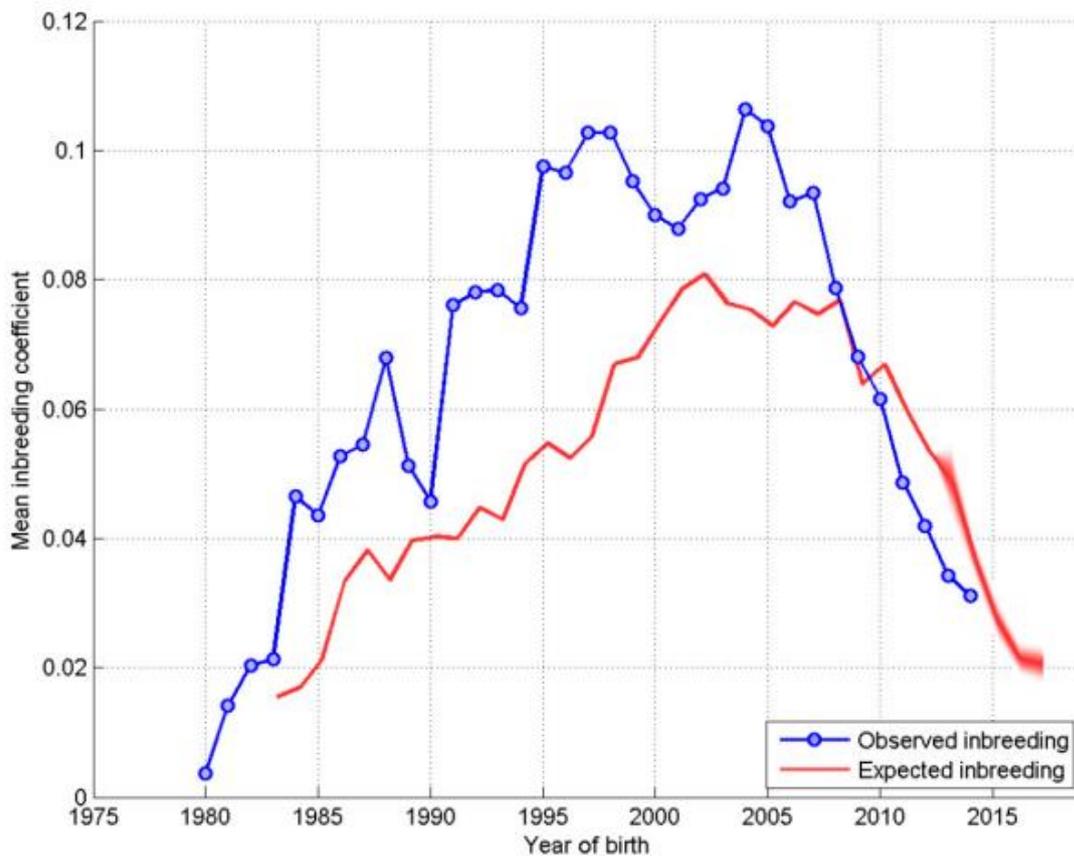


Figure 5: Annual mean observed and expected inbreeding coefficients

Below is a histogram ('tally' distribution) of number of progeny per sire and dam over each of seven 5-year blocks (Figure 6). 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 increased (the 'tail' of the blue distribution lengthening in figure 6).

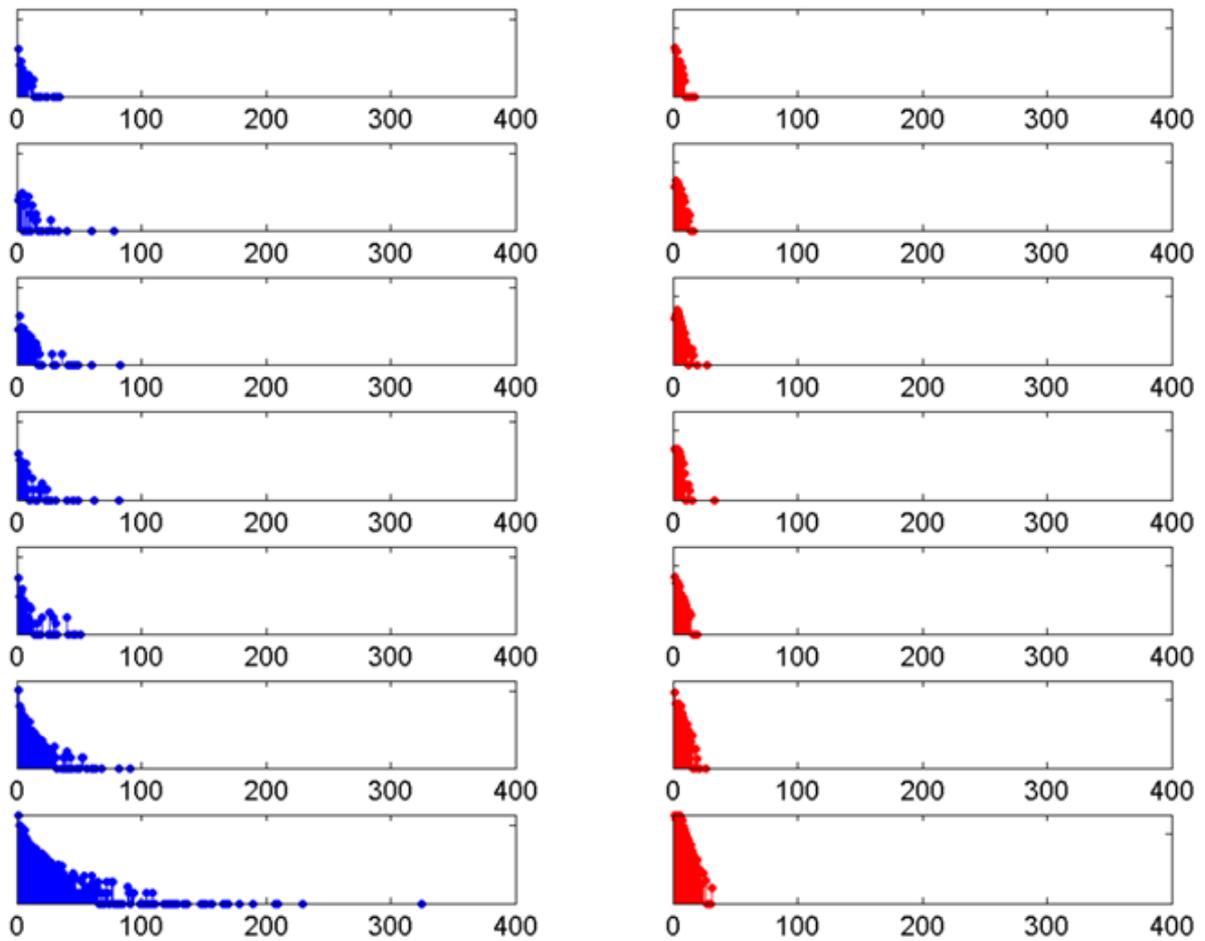


Figure 6: Distribution of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-4 top, 2010-14 bottom). Vertical axis is a logarithmic scale.

Current research projects

The French Bulldog is part of the BOAS research project underway at the University of Cambridge.

SECTION 2: PRIORITIES

A meeting was held with the French Bulldog breed club representatives on 15th February 2018 to discuss Section 1 of the BHCP and agree the priority issues for the health of the breed.

The evidence base document was reviewed, starting with registration figures. All were aware of the increase in registrations in recent years. However, due to the breed being relatively small up until recently, this may be the reason for a relative paucity of studies. However, it is likely that the body of scientific papers relating to the health of the breed will grow rapidly.

The dermatological condition found in the literature review was atopy, which the group discussed as an emerging condition in the breed. Gastrointestinal conditions; histiocytic colitis/granulomatous colitis was reported, but this had not been seen in the UK population. Persistent vomiting was agreed as an issue, anecdotally often associated with sensitive stomachs or BOAS. The haematological condition reported was haemophilia B, with no prevalence estimates. This has not been seen in the UK, but has been seen in the USA and other European countries. Discussion was had over the current increase in importation/exportation and concern with conditions seen in other populations, and awareness required by an owner when using dogs from overseas.

Musculoskeletal conditions were discussed with regard to the debate on whether the French Bulldog is chondrodystrophic, this is not clear. In terms of neoplastic conditions, the group agreed mast cell tumours as the most prevalent cancer in French Bulldogs. Neurological conditions had a number of studies raising particular conditions. Congenital deafness had been seen, most common in pied, but also seen in other colours as well. The breed standard details a wide and open opening to the ear canals. The current health scheme also does a basic hearing test with the vet, any dogs with suspected deafness are recommended to undertake BAER testing. Hemivertebrae were agreed to be a concern for the breed. Currently part of the French Bulldog Club of Great Britain Health Scheme is to undertake spinal radiography and evaluation for the gold level. The breed are currently looking into grading of the hemivertebrae taking into account the location of the hemivertebrae as well. Discussion over IVDD was had and this is hoped to be covered in the spinal radiograph. The Kennel Club is to continue to monitor the research at UC Davies and AHT involving Dachshunds, to see if this may be of relevance. Jackie Mavro-Micheallis offered to enquire whether there is any research in Germany where back scoring is occurring. There was some anecdotal evidence of necrotising leukoencephalitis (NLE), but very few cases and no prevalence estimates.

Ocular conditions; prolapse of the nictitating membrane (prolapsed gland of the third eyelid, 'cherry eye') has been seen more recently, however not thought to be a priority for the breed at the moment, and is monitored through the breed health scheme. The other conditions were from the American College of Veterinary Ophthalmologists (ACVO); it was noted that there is a different breed standard in the US to the UK, with flatter faces favoured in the USA.

Reproductive conditions found dystocia reported with 81.3% of litters requiring caesarean section in a 2010 study. The c-sections reported to the Kennel Club appear to be rising and are thought to be higher than the number reported. Discussion was had over elective and emergency c-sections and factors which may affect this, such as inexperience.

The respiratory condition noted was BOAS, agreed by the group as a concern and priority for the breed, which a lot of work has already been done on. The group were made aware of the Kennel Club exploring a BOAS scheme with the University of Cambridge, with the hope of collecting this information in a centralised database to produce Estimated Breeding Values (EBVs). EBVs are a measure of genetic risk of passing the condition onto the next generation, calculated by taking into account pedigree data and any dogs scored. These are a useful tool for complex conditions, such as BOAS. Discussion was had over this and Penny Rankine-Parsons reassured the group that respiratory grading is to stay on the bronze level of the health scheme, for all dogs. The additional grading through the BOAS scheme is to be encouraged for breeding animals. Urological conditions; cystinuria/cystine urolithiasis is a condition seen and tested for in the US population, but not currently seen in the UK population.

The Purebred and Pedigree breed health surveys supported the literature review. A VetCompass study is currently being written up and will be forwarded on from the Kennel Club to the Breed Health Coordinator once received. The Agria data again supported the literature review, with an additional point of fractured humerus, which was discussed and thought to be due to jumping off furniture or downstairs at a young age and trying to be addressed through educational material on the breed clubs' websites.

Breed Watch points were discussed, with some points thought to be under reported and may benefit from reviewing the wording in order to clarify. Very few dogs were noted to be currently going through the canine health schemes. The French Bulldog is currently not on Schedule A of the BVA/KC/ISDS Eye Scheme, but as there is a DNA test for hereditary cataracts this may change. Schedule A includes breeds with a known inherited eye condition. Of those that have been through the eye scheme relatively few sightings have been noted. Again, in the breed's health scheme, any suspected eye conditions are referred to an ophthalmologist.

Genetic diversity currently does not appear to be an issue for the breed, due to the increase in the population. The use of popular sires does seem to have increased, however this is an absolute number graph, thus the increase in the population may also have an effect on this. There was discussion on how to reduce the use of popular sires, with the associated risks of loss of genetic diversity, and how some breed clubs have a limit in their code of ethics.

The group agreed from the evidence base that the priorities for the French Bulldog were; BOAS (including nostrils), spinal problems and allergies.

SECTION 3: ACTION PLAN

- The French Bulldog Breed Clubs to propose wording for Breed watch points of concern to be taken to the Breed Standard & Conformation sub-committee
- The Kennel Club to develop a BOAS Scheme in collaboration with the University of Cambridge, with support from the breed clubs.
- The breed to continue to support and attend the Brachycephalic Working Group
- The Kennel Club to raise press release issues with the BVA
- The Kennel Club to monitor outcomes of research into spinal research and explore the possibility of including French Bulldogs if relevant
- The Kennel Club will review progress with the breed in February 2019

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