

Summary of Kennel Club Breed Records: Cavalier King Charles Spaniel 2020

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Breeding and health testing may have been impacted by the ongoing COVID-19 pandemic

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Methods

Information on Cavalier King Charles Spaniel litters registered by the Kennel Club in 2020 was retrieved from the toy group breed record supplements AX1 – AX4. This included information on the sire and dam of the litter, the date of birth of the litter, the number and colour of the registered puppies, any Caesarean section information (elective or emergency), artificial insemination information, and Kennel Club Assured Breeder (KCAB) information.

Further information was gathered from the Kennel Club database, including: the sex of the puppies, the date of birth of the sire and dam, the coefficient of inbreeding for the litter, the litter count and date of the first litter, and Episodic Falling (EF) and Curly Coat / Dry Eye (CC/DE) DNA testing, eye testing & CM/SM testing results for the parents. For tests which can be repeated, the latest test prior to the birth of the litter was recorded.

Eye testing results were recorded for parents of litters tested 0.1 years or more before the birth of the litter. Additional MRD results were added from the open register - <https://www.thekennelclub.org.uk/media/4443/mrd-open-register-cavaliers.pdf>.

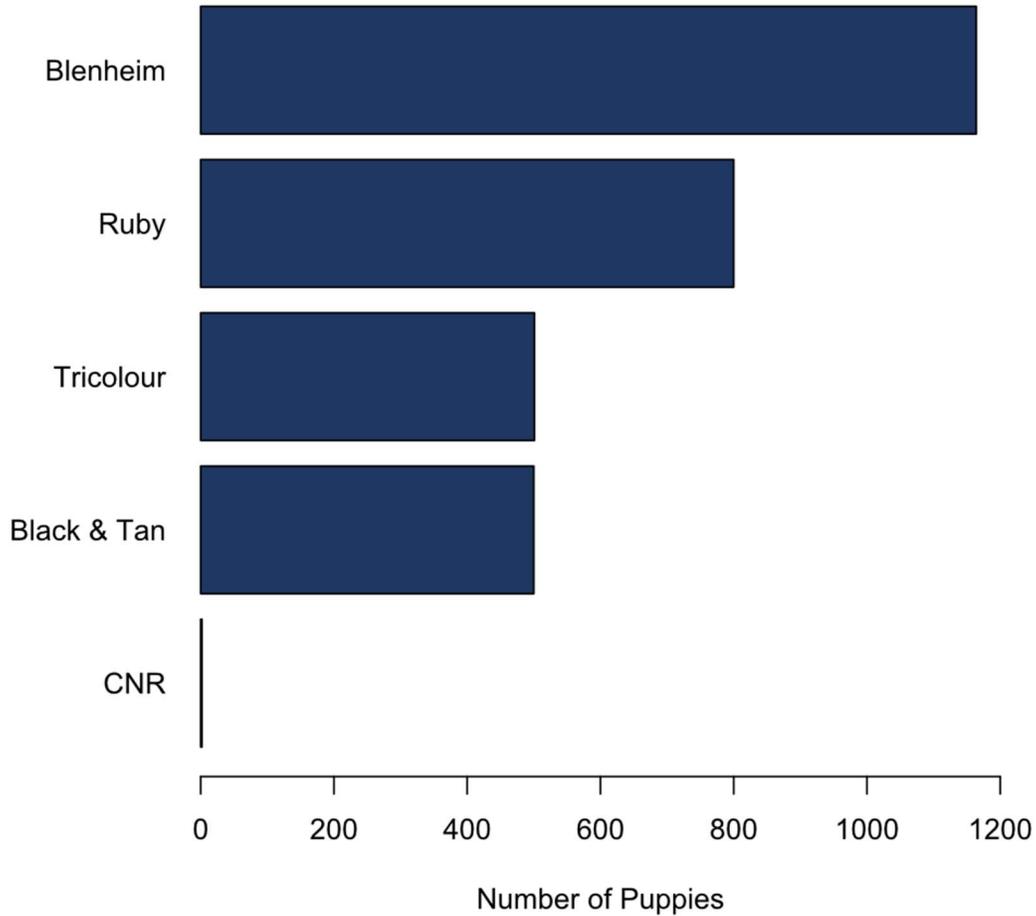
Additional health testing results were retrieved from the results of a Google search using the search phrase: “<Registered Name>” Cavalier. Four MRI results were added from personal correspondence. These are listed in Appendices I & II.

Data summarisation was carried out using Microsoft Excel and RStudio.

Litter Summary

705 Cavalier King Charles Spaniel (CKCS) litters were registered with the KC in 2020, consisting of 2,967 puppies. 45.2% (1,340) were dogs and 54.8% (1,627) were bitches.

The most common puppy coat colour was Blenheim (39.2%). *Figure 1* shows the breakdown of puppy coat colours in these litters.



*Figure 1. Coat colour of puppies from CKCS litters (n=2,967);
CNR = Colour Not Recognised by KC*

Litter Size

The mean number of puppies in CKCS litters was 4.2, whilst the median was 4. The distribution of puppy numbers per litter is shown in *Figure 2*.

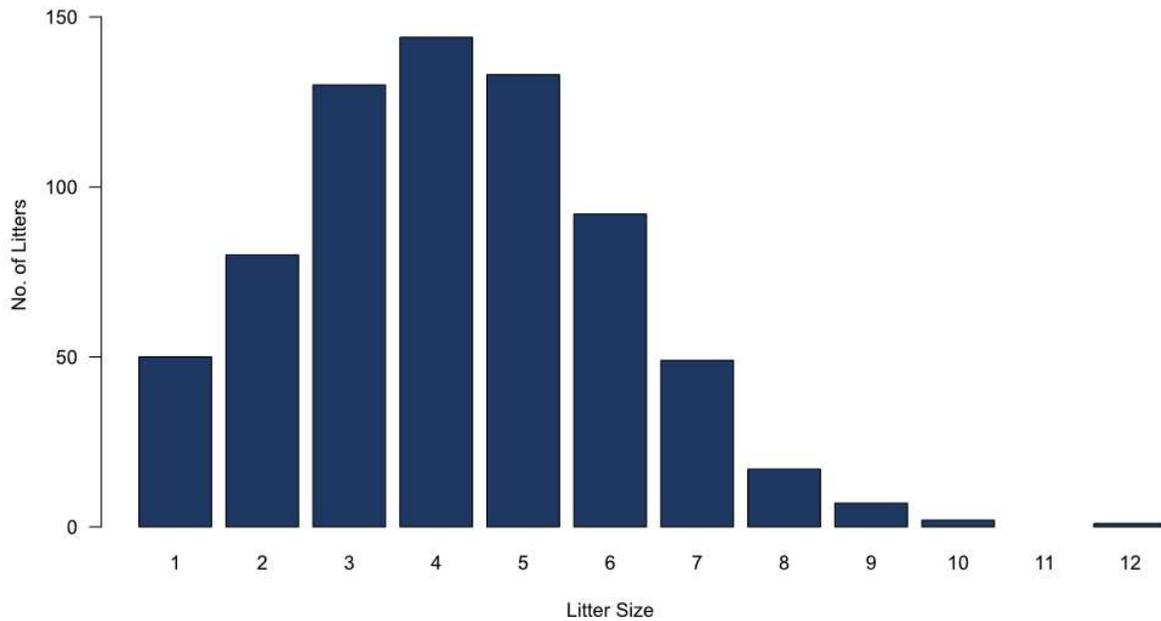


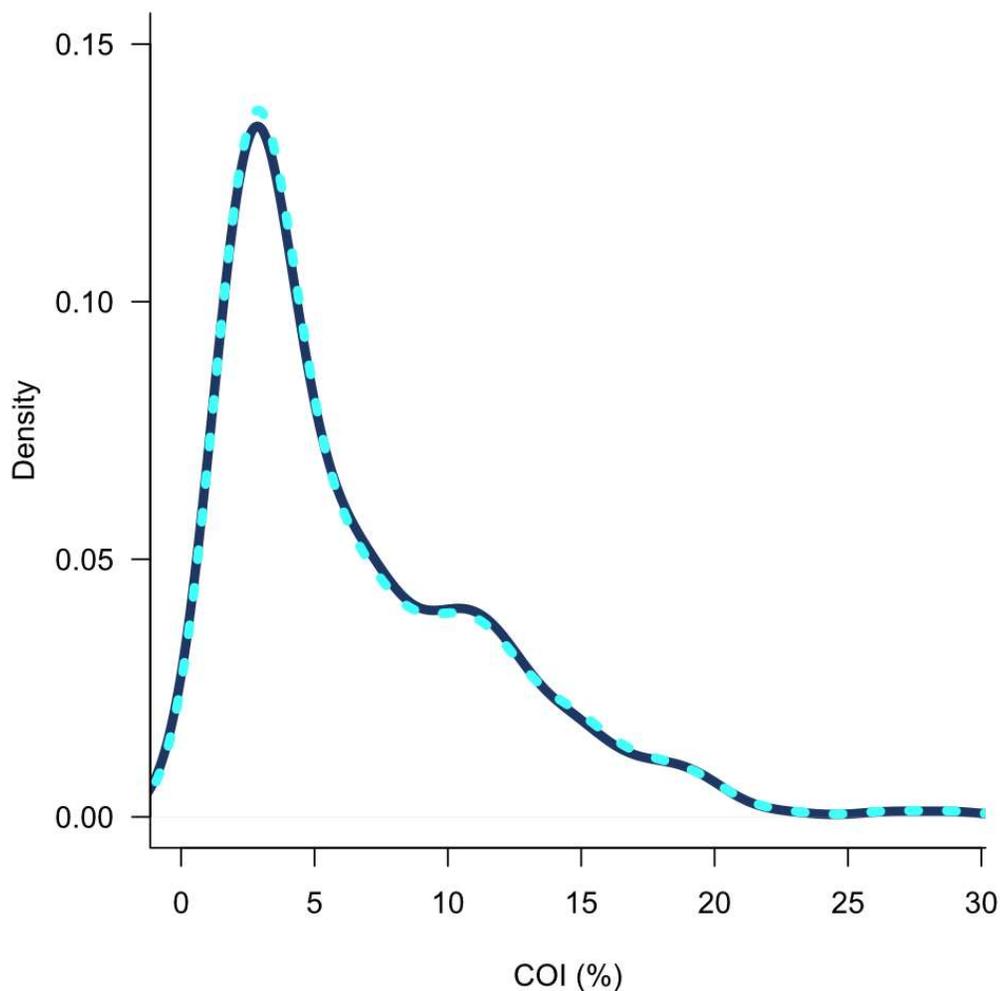
Figure 2. Litter size of CKCS litters (n=705)

Coefficient of Inbreeding

The coefficient of inbreeding (COI) is a measure of estimated inbreeding, expressed as a percentage probability of the same variation being inherited from the sire and the dam. A lower percentage indicates a lower estimated level of inbreeding.

The Kennel Club calculates the COI for each dog using all generations in their database.

The mean COI for these litters was 6.5% and the median COI was 4.6%. The median number of complete generations in this calculation was 9 (range 3 – 12), with at least part of the pedigree extending back a median of 29 generations (range 24 – 34). The solid line in *Figure 3* shows the distribution of COI percentages for these litters.



*Figure 3. Distribution of COI percentages for CKCS litters
solid line = all litters (n=705); dotted line = litters with no imported parents (n=647)*

The highest recorded COI was 29.0%, and 4 litters were recorded with a COI over 25% (the equivalent of a parent/child or brother/sister mating). 428 (60.7%) litters had a calculated COI under 6.5%.

One limitation of the COI calculation is that a reduced number of available generations in a pedigree decreases how informative the calculation may be. For imported dogs, the Kennel Club database may only contain three generations.

Removing litters with one or more imported parents, the mean COI for these litters was 6.5% and the median COI was 4.5%. The median number of complete generations in this calculation was 9 (range 5 – 12), with at least part of the pedigree extending back a median of 29 generations (range 24 – 34). The dotted line in *Figure 3* shows the distribution of COI percentages for these litters.

Caesarean Sections & AI

7.1% of these litters were delivered by a reported Caesarean section (C-section). Of those litters where natural birth is presumed to have been attempted (i.e., excluding elective C-sections), 6.3% of litters were reported to be delivered by emergency C-section.

Figure 4 shows the proportion of litters reported to have been delivered by C-sections.

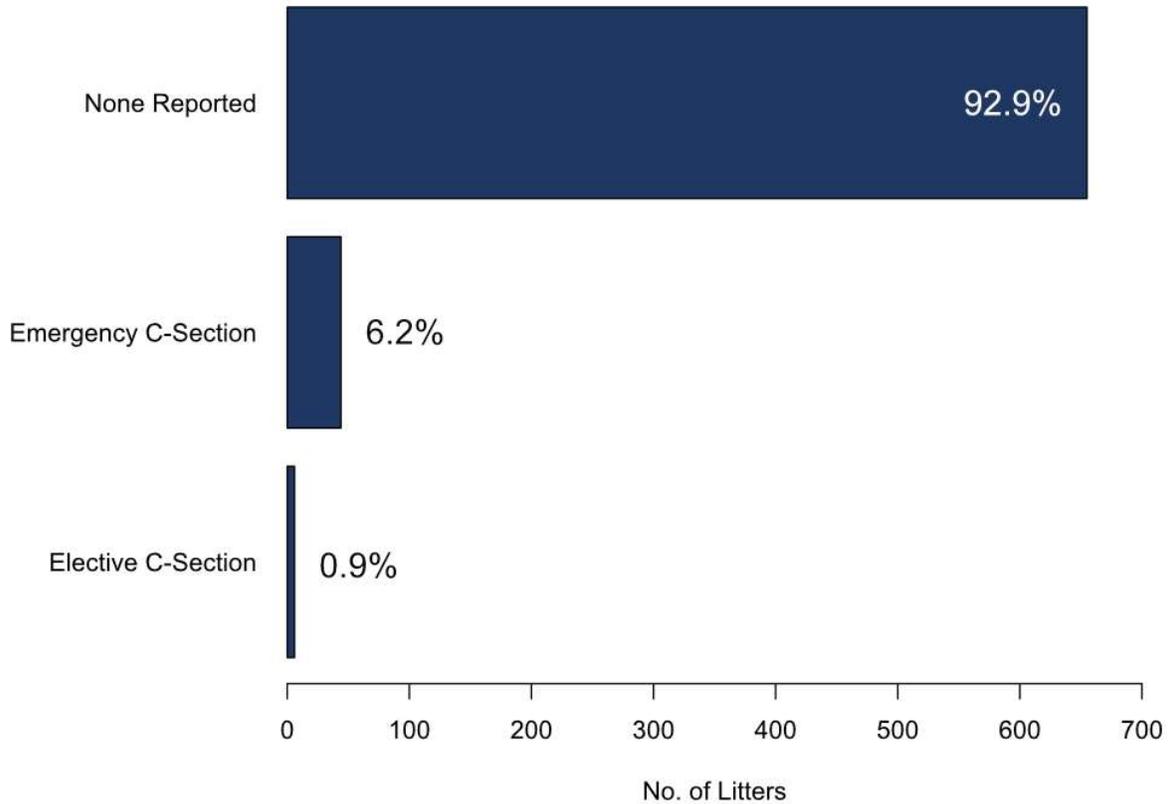


Figure 4. Reported Caesarean section information for CKCS litters (n=705)

Three litters were reported to have been conceived by artificial insemination (AI).

Parents

The 705 CKCS litters were produced by 299 different sires and 695 different dams, a ratio of 2.3 dams for every sire.

26 of the sires are imports/from other countries, whilst 12 of the dams are the same (*Table 1*).

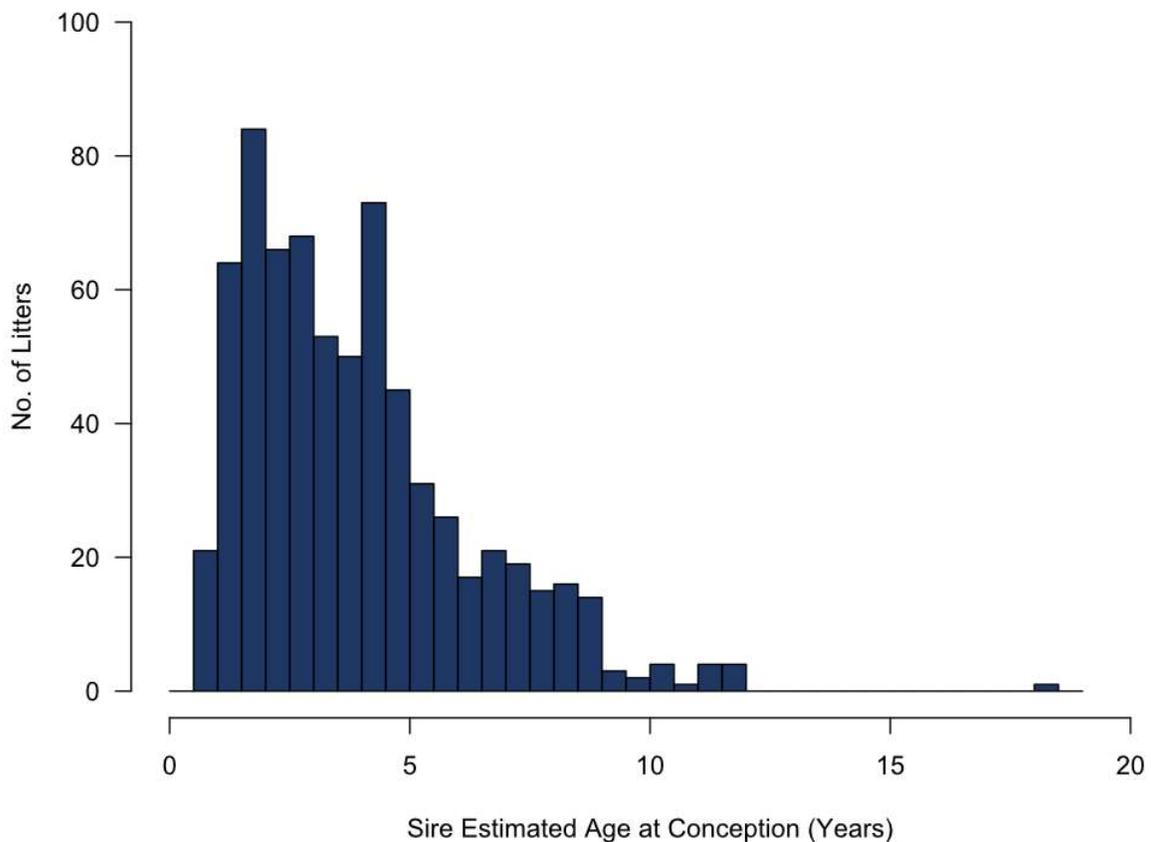
Table 1. Origin of foreign and imported parents of CKCS litters

Country of Origin	No. of Sires	No. of Dams
Belarus	0	1
Belgium	1	0
Czechia	1	1
Estonia	1	0
France	2	0
Germany	4	1
Ireland	6	3
Italy	1	1
Netherlands	4	1
Norway	0	1
Poland	1	0
Spain	1	0
Ukraine	0	3
USA	2	0
Unknown	2	0

Sire Age

The mean age of sires at the birth of these litters was 4.10 years, whilst the median age was 3.61 years. The maximum age of sire at birth of a litter was 18.40 years, whilst the minimum was 0.68 years.

Assuming a gestation time of approximately 60 days (or 0.17 years), the predicted mean age of sires at conception of the litter is 3.93 years, whilst the median age is 3.44 years. Under the same assumption, 169 litters (24.1%) are predicted to have been conceived when the sire was under 2 years of age. *Figure 5* shows the distribution of the estimated age of sires at the conception of the litters.



*Figure 5. Estimated sire age at conception of CKCS litters (n=702)
estimated age at conception = age at birth of litter – 0.17*

92 litters were registered from first-time sires, excluding foreign dogs and imports as they are more likely to have sired a litter abroad, potentially prior to any Kennel Club registered litter. Assuming a gestation time of approximately 60 days (or 0.17 years), the predicted mean age of first-time sires at conception of the litter was 2.20 years, whilst the median age was 1.48 years. The maximum age of sire at estimated conception of a litter was 11.32 years, whilst the minimum was 0.51 years.

Figure 6 shows the distribution of the estimated age of first-time sires at the conception of the litters.

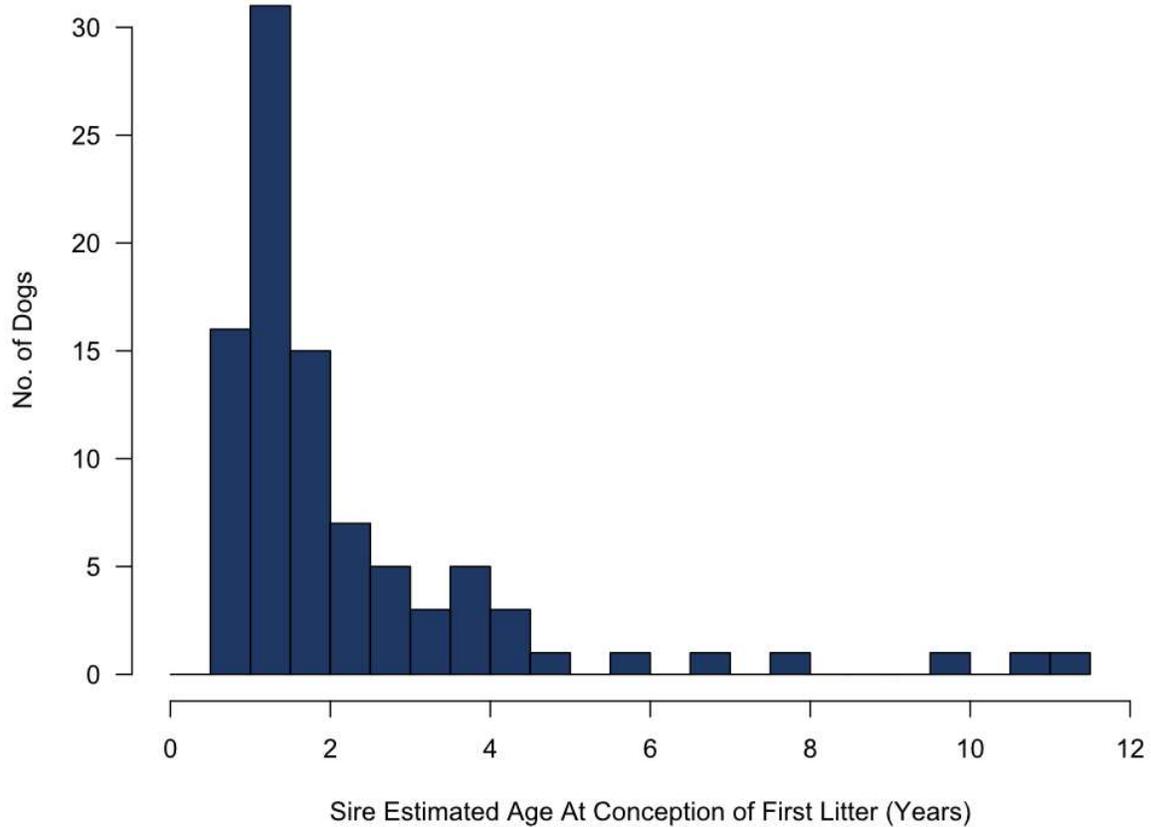
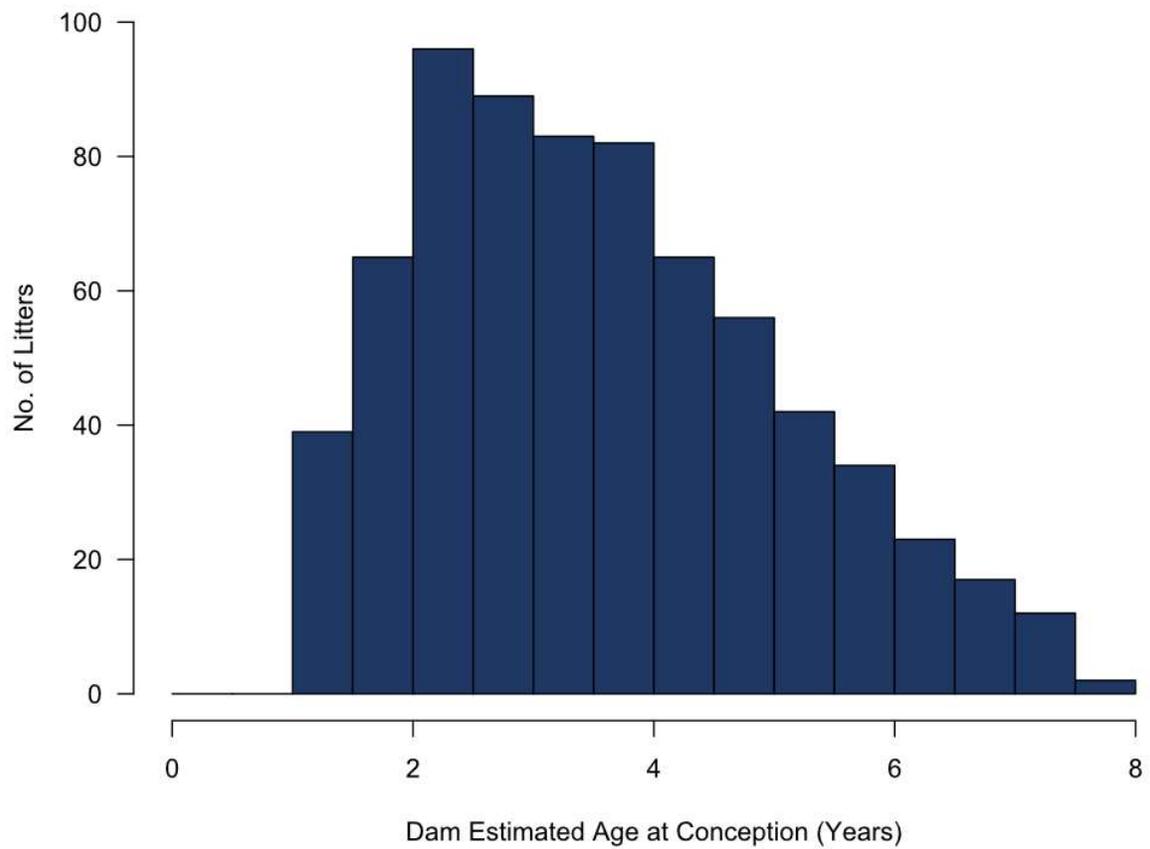


Figure 6. Estimated age at time of conception of first-time sires of CKCS litters, excluding foreign dogs (n=92); estimated age at conception = age at birth of litter – 0.17

Dam Age

The mean age of dams at the birth of these litters was 3.74 years, whilst the median age was 3.53 years. The maximum age of a dam at birth of a litter was 7.79 years, whilst the minimum was 1.22 years.

Assuming a gestation time of approximately 60 days (or 0.17 years), the predicted mean age of dams at conception of the litter is 3.57 years, whilst the median age is 3.36 years. Under the same assumption, 104 litters (14.8%) are predicted to have been conceived when the dam was under 2 years of age. *Figure 7* shows the distribution of the estimated age of dams at the conception of the litters.



*Figure 7. Estimated dam age at conception of CKCS litters (n=705)
estimated age at conception = age at birth of litter – 0.17*

358 litters were registered from first-time dams, excluding foreign dogs and imports as they are more likely to have birthed a litter abroad. Assuming a gestation time of approximately 60 days (or 0.17 years), the predicted mean age of first-time dams at conception of the litter was 2.82 years, whilst the median age was 2.56 years. The maximum age of the dams at estimated conception of a litter was 7.33 years, whilst the minimum was 1.05 years.

Figure 8 shows the distribution of the estimated age of first-time dams at the conception of the litters.

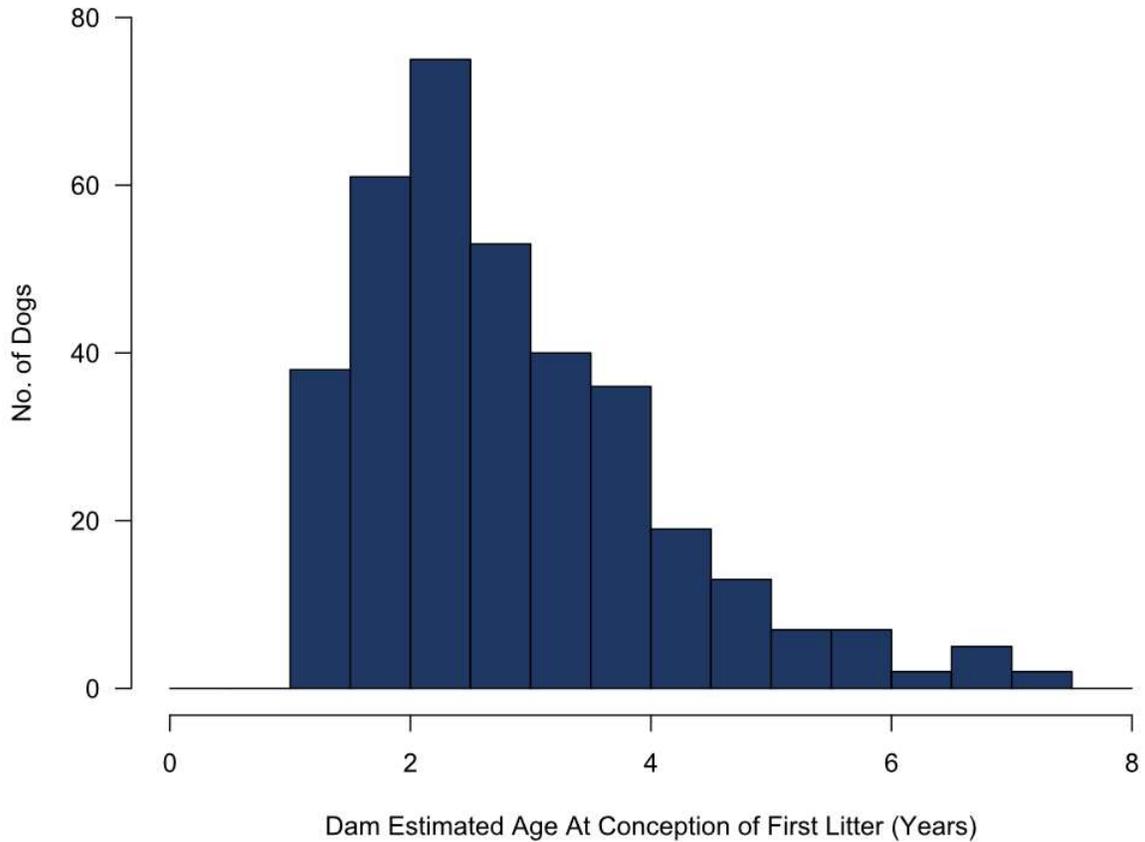


Figure 8. Estimated age at time of conception of first-time dams of CKCS litters, excluding foreign dogs (n=358); estimated age at conception = age at birth of litter – 0.17

Popular Sires

Table 2 lists sires with eight or more litters registered in 2020.

Table 2. Sires with eight or more litters registered in 2020.

Registered Name	No. 2020 Litters
Pascavale Haiden	21
Bonnafrey Red Admiral	14
Home Free At Kettreana	12
Glenbrows Dexter	10
He's A Royal Boy	10
Henbarc Milo	9
Toby's Tiny Teddy	9
Gwynmardene Tartan	8
Lutenant Of Sheffield	8
Oaky Rainbow	8
Pascavale Bijou	8

Table 3 lists the fifteen sires with at least one 2020 litter, with the highest number of total registered litters (up to the last litter registered in 2020).

Table 3. Sires with the most total litters to the end of 2020

Registered Name	Total Litters
Maibee Perfect Touch Of Charnavale	111
Rustic Rufus	60
Carolus Don Ricco	54
Home Free At Kettreana	53
Gentle Treacle Delight	47
Bevelmount Red Beaujolais	45
Casstheo Dream Of You	45
Lochbuie Cappuccino	41
Kinvaar Son Of A Gun	36
Jacob Josh At Sirahdis	36
Peeping Tom	35
Clockpelters Harvest Moon	34
Lankcombe Angus	33
Pascavale Haiden	31
Trirayne Chutney	31

Health Testing

The Kennel Club currently recommends CKCS breeders use the following schemes and tests:

Priority:

- Kennel Club's heart scheme for Cavalier King Charles Spaniels,
- Eye screening scheme (BVA/KC/ISDS),
- DNA test for episodic falling (EF),
- DNA test for curly coat/dry eye (CC/DE).

Important:

- CM/SM screening scheme (BVA/KC),
- Check COI.

62 CKCS litters were produced under the Kennel Club Assured Breeder (KCAB) scheme.

Episodic Falling DNA Testing

Episodic Falling (EF) is a neurological disorder, characterised by muscle stiffness and collapse. This is induced when an affected dog is stimulated by, for example, exercise, excitement or frustration. Symptoms usually appear before one year of age and severity can range from mild to severe.

EF in CKCS is recessively inherited, meaning if at least one parent has tested clear or is hereditary clear for the EF associated variant all puppies from that litter are safe.

Table 4 shows the available testing results for CKCS litters. Dogs classified as ‘No Result’ may be tested, but the result is not publicly available. Hereditary results are combined with their tested counterparts (e.g., hereditary clear dogs are combined with clear tested dogs).

Table 4. EF testing results for the parents of CKCS litters (n=705)

		Sire			
		Affected	Carrier	Clear	No Result
Dam	Affected	0	0	0	0
	Carrier	0	0	26	1
	Clear	0	17	387	27
	No Result	0	13	132	102

589 (83.5%) of CKCS litters had at least one parent carrying no copies of the EF variant, meaning all puppies were at minimal risk. For 102 (14.5%) litters, no public EF test results were available for either parent.

For fourteen litters, public EF testing results were only available for one parent, who was a carrier for the EF variant. These litters were potentially at risk for EF, depending on the EF status of the second parent.

Curly Coat/Dry Eye DNA Testing

Curly Coat/Dry Eye (CC/DE) affects the skin and eyes of a dog. Affected dogs cannot produce tears, leading to dry and sore eyes. Their skin is also dry and flaky, which is also painful for the dog, particularly when trying to walk and stand due to affected skin around the feet.

CC/DE in CKCS is recessively inherited, meaning if at least one parent has tested clear or is hereditary clear for the CC/DE associated variant all puppies from that litter are safe.

Table 5 shows the available testing results for CKCS litters. Dogs classified as 'No Result' may be tested, but the result is not publicly available. Hereditary results are combined with their tested counterparts (e.g., hereditary clear dogs are combined with clear tested dogs).

Table 5. CC/DE testing results for the parents of CKCS litters (n=705)

		Sire			
		Affected	Carrier	Clear	No Result
Dam	Affected	0	0	0	0
	Carrier	0	0	15	1
	Clear	0	8	410	27
	No Result	0	4	137	103

597 (84.7%) of CKCS litters had at least one parent carrying no copies of the CC/DE variant, meaning all puppies were at minimal risk. For 103 (14.6%) litters, no public CC/DE test results were available for either parent.

For five litters, public CC/DE testing results were only available for one parent, who was a carrier for the CC/DE variant. These litters were potentially at risk for CC/DE, depending on the CC/DE status of the second parent.

Eye Screening Scheme

CKCS are recommended to undergo eye testing, under the KC/BVA/ISDS eye scheme or the ECVO scheme.

Under the KC/BVA/ISDS eye scheme, CKCS have two schedule A conditions, known to be inherited in the breed: MRD (multifocal retinal dysplasia) and HC (hereditary cataracts). Additionally, prior to 2020 multi-ocular defects (MOD) was a schedule B condition, suspected of being inherited in CKCS. From 2020, schedule B conditions no longer exist and a sightings report recording evidence of different conditions and abnormalities in different breeds is now used to review addition of conditions to schedule A¹.

The ECVO scheme covers fourteen inherited eye conditions, as well as a general examination of the eye².

Affected/unaffected statuses for schedule A conditions are available for tested dogs from the Kennel Club database. Prior to 2020, results for MRD were recorded on a separate register for schedule A breeds³.

1. <https://www.thekennelclub.org.uk/media-centre/2019/december/kennel-club-and-bva-announce-changes-to-chs-eye-scheme-for-2020/>
2. <https://www.ecvo.org/hereditary-eye-diseases/ecvo-eye-examination-certificates.html>
3. <https://www.thekennelclub.org.uk/media/4443/mrd-open-register-cavaliers.pdf>

Results

Table 6 shows the numbers of CKCS litters produced from eye tested parents. At least one parent had been eye tested prior to birth of the litter in 68.5% of cases. 12.6% of litters met the highest standard of both parents tested within one year of birth of the litter.

Table 6. Eye testing for parents of 2020 CKCS litters (n=705)

	Both Parents	Only One Parent
Tested prior to litter	285 (40.4%)	198 (28.1%)
Tested within one year	89 (12.6%)	213 (30.2%)
Tested within two years	194 (27.5%)	228 (32.3%)

Most eye testing results for parents of 2020 litters were unaffected. Nineteen litters were produced from one parent assessed as affected with MRD, and none with HC, from thirteen different affected dogs, most with just one litter. One sire affected with MRD had six registered litters in 2020. For eleven these nineteen litters, the partner of the MRD affected dog had an unaffected eye testing result.

Figure 9 shows the age of eye tested parents at their last test before the birth of the litter. The mean age was 2.65 years, whilst the median age was 2.27 years. The maximum was 9.13 years, whilst the minimum was 0.24 years.

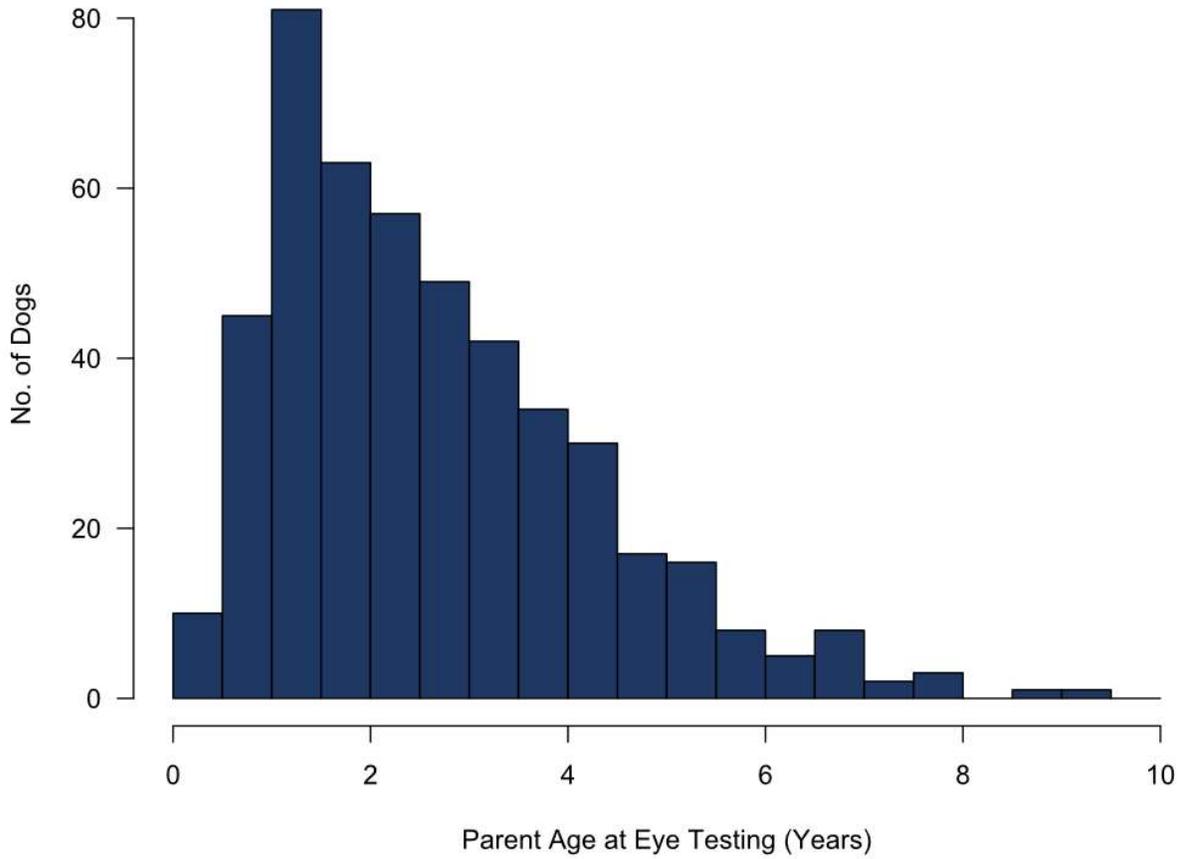


Figure 9. Age of parents at eye testing prior to birth of litter (n=472)

Figure 10 shows time in years between the last eye test of a tested parent and the birth of the litter. Eye tested parents with multiple litters will appear in this figure multiple times. The mean time was 1.35 years, whilst the median time was 0.98 years.

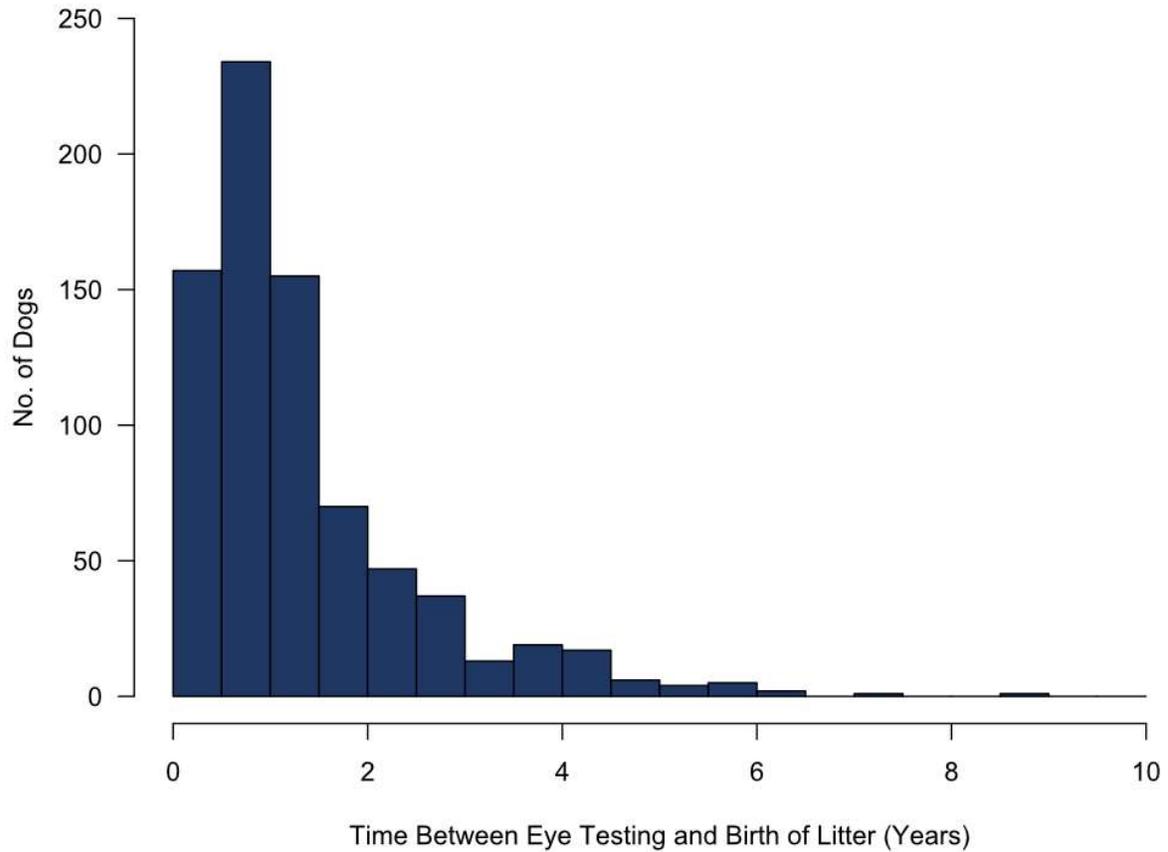


Figure 10. Time between eye testing of parent and birth of litter (n=768)

CM/SM Screening Scheme

Chiari-like malformation (CM) in dogs is produced by a brain too large for the skull, which can lead to blockage of the opening connecting the spine and the skull, changing the flow of cerebrospinal fluid (CSF). Syringomyelia (SM) develops when this causes syrinxes (fluid-filled cavities) to develop around the spinal cord, which may cause high levels of pain in affected dog. CM/SM has been shown to be inherited in the CKCS.

Dogs assessed under the BVA/KC CM/SM scheme are graded 0, 1 or 2 for the severity of CM and SM – the higher the grade, the higher the level of abnormality. A letter is then appended to the SM grade, indicating the age of the dog when tested: a = over five years, b = three to five years, c = one to three years. This is included as syringomyelia is a progressive disease and may become more severe as the dog ages.

Some dogs are also MRI screened and assessed under similar principles outside the official BVA/KC scheme, and these are included here where identified.

Information from <https://www.thekennelclub.org.uk/health-and-dog-care/health/getting-started-with-health-testing-and-screening/cmsm-screening-scheme/>

Results

Four litters have public evidence of two MRI screened parents, with an additional 75 litters having public evidence of one MRI screened parent. This leaves 626 (88.8%) litters with no public evidence of either parent being MRI screened.

There are not currently specific breeding recommendations for CM/SM from the Kennel Club. However, they do provide the breeding guidelines, with the caveat that these are recommendations and the BVA and the Kennel Club accept no liability for any breeding outcome.

Of the four litters with two MRI screened parents, there are CM/SM grades available for both parents for three. Two of these litters pass the breeding guidelines: 0a/1b and 0b/0b.

32 different dogs with litters registered in 2020 have public evidence of MRI screening, with an additional 2 added by personal correspondence. Of these, 28 have complete CM/SM results – 11 under the official BVA/KC scheme and 17 not. The remaining dogs either had only notice of MRI screening or incomplete results.

Table 7 shows the CM grading results of these MRI screened dogs. Only one dog was graded a 0 (no malformation), with the majority of dogs assessed under the BVA/KC scheme graded a 2 and the majority of dogs graded outside the official scheme graded a 1.

Table 7. Chiari malformation grading results for MRI screened CKCS with litters registered in 2020.

CM Grade	Total	BVA/KC Scheme	Other Grading
0 – No Chiari malformation	1	0	1
1 – Cerebellum indented (not rounded)	16	1	15
2 – Cerebellum impacted into, or herniated through, the opening at the rear of the skull (the foramen magnum)	11	9	2

Table 8 shows the SM grading results of these MRI screened dogs. Most dogs graded for SM were awarded a 0, both under the BVA/KC scheme and from other grading. The majority of assessments were for dogs in age category c, so screened when the dog was under the age of three. One dog assessed as grade 2 SM had three litters registered in 2020.

Table 8. Chiari malformation grading results for MRI screened CKCS with litters registered in 2020.

SM Grade	Age Category	Total	BVA/KC Scheme	Other Grading
0 – Normal (no central canal dilation, no pre-syrinx, no syrxinx)	a	1	0	1
	b	6	2	4
	c	18	6	12
1 – Central canal dilation (CCD) less than 2mm in diameter	a	1	0	1
	b	1	1	0
	c	2	2	0
2 – Syringomyelia or separate syrxinx, pre-syrinx with or without CCD	a	0	0	0
	b	0	0	0
	c	1	1	0

Two dogs had new results recorded for the official KC/BVA CM/SM screening scheme in 2020. The results were: CM2/SM0c and CM2/SM2c.

Kennel Club's Heart Scheme for CKCS

A heart testing scheme for CKCS has been developed and launched by the Kennel Club. According to Kennel Club press releases, this scheme entered a trial phase in May 2018¹, with the release of the full scheme in May 2019². This is based on a successful Danish heart scheme, which has led to 73% reduction in mitral valve murmurs in litters from tested parents.

Dogs assessed under this scheme will receive two grades:

- 1) a mitral murmur grade,
- 2) a grade assessing the degree of mitral valve prolapse.

Further information on this scheme and breeding guidelines are available at <https://www.thekennelclub.org.uk/heartscheme>.

No CKCS litters registered in 2020 had parents with public test results under this scheme in the Kennel Club database at the time of report writing. According to a post on the Cavalier Club website, results for this scheme are currently not published publicly³.

1. <https://www.thekennelclub.org.uk/press-releases/2018/may/new-heart-scheme-for-cavaliers-to-undergo-trial-phase/>
2. <https://www.thekennelclub.org.uk/press-releases/2019/may/kennel-club-launches-new-heart-scheme-for-cavalier-king-charles-spaniels-supported-by-veterinary-cardiovascular-society/>
3. <http://www.thecavalierclub.co.uk/start.html>

Appendix I: Additional DNA Health Testing Results

Registered Name	EF	CC/DE	Source
Cassie Beautiful	Clear	Clear	https://www.champdogs.co.uk/dog/67756
Easy Peasy Du Chateau Noblesse	Clear	Clear	http://www.chateau-noblesse.com/DU_CHATEAU_NOBLESSE_EASY_PEASY_HEALTH.html
Jeffs Lord Toby	Clear	Clear	https://www.pets4homes.co.uk/classifieds/3140425-stud-dog-toby-sunderland.html
Loves Young Dream Canis Satelle	Clear	Clear	https://www.glenheart.co.uk/planned-litters.html
Magic Charm's Witchy Woman To Delhaze	Clear	Clear	https://www.champdogs.co.uk/dog/55507
Pumpkin Princes	Clear	Clear	https://www.champdogs.co.uk/dog/64894
Thekop's Hugo A Go Go	Clear	Carrier	https://www.champdogs.co.uk/dog/54867
Xcellento Du Chateau Noblesse	Clear	Clear	http://www.chateau-noblesse.com/DU_CHATEAU_NOBLESSE_XCELLENTO_HEALTH.html

Appendix II: Additional CM/SM MRI Screening Results

Registered Name	CM	SM	Source
Bellflows Gentle Little Man	2	0c	https://www.champdogs.co.uk/dog/59925
Carolus Don Ricco	1	0c	https://www.champdogs.co.uk/dog/50951
Charalier Dress To The Nines For Charlesworth			https://www.angelspride.de/angelspride/de/eng_rueden_benson.html
Clockpelters Harvest Moon	1	0c	https://www.champdogs.co.uk/dog/69167
Easy Peasy Du Chateau Noblesse		0c	http://www.chateau-noblesse.com/DU_CHATEAU_NOBLESSE_EASY_PEASY_HEALTH.html
Fortunamajor Time Turner	1	0b	https://www.champdogs.co.uk/dog/62305
Hearthfriend Hocus Pocus	1	0b	https://www.champdogs.co.uk/dog/70984
Korraines Peaky Blinder At Llapsttam	1		https://www.champdogs.co.uk/dog/75434
Lochbuie Taken Advantage Korraine	1	0c	https://www.champdogs.co.uk/dog/68141
Loves Young Dream Canis Satelles			https://www.glenheart.co.uk/planned-litters.html
Millpoint Careless Whisper	1	0c	https://www.champdogs.co.uk/dog/66134
Millpoint Flower Girl	1	0c	https://www.champdogs.co.uk/dog/69534
Millpoint Star Attraction	1	0c	https://www.champdogs.co.uk/dog/72910
Promar Bruno Buio Del Notte At Donrobby			https://www.champdogs.co.uk/dog/75607
Ralph Hardy Boy			https://www.pets4homes.co.uk/classifieds/1726027-mricardiology-ophthalmologist-glossop.html
Svena Abracadabra	1	0b	https://www.pets4homes.co.uk/classifieds/1805438-health-tested-black-and-tan-llandrindod-wells.html
Svena Lightning Strike	1	0a	https://www.facebook.com/permalink.php?story_fbid=614705408728698&id=224015281131048
Svena Love Song	1	0c	http://www.thecavalierclub.co.uk/health/mri/pick_view_mri.php?s=420&np=21&sort=ond&id=1 Grades added by personal correspondence
Svena Moonlight Symphony	1	0c	http://www.thecavalierclub.co.uk/health/mri/pick_view_mri.php?s=420&np=21&sort=ond&id=1 ; Grades added by personal correspondence
Svena Summer Knight At Donrobby	2	0c	https://www.champdogs.co.uk/dog/60550
Svena Summer Lovin For Earlrae	1	0c	http://www.thecavalierclub.co.uk/health/mri/pick_view_mri.php?s=570&np=20&sort=iao&id=1 Grades added by personal correspondence
Svena Witch Hunt	1	0c	Personal correspondence
Thekop's Hugo A Go Go	0	1a	https://www.champdogs.co.uk/dog/54867
Xcellento Du Chateau Noblesse		0b	http://www.chateau-noblesse.com/DU_CHATEAU_NOBLESSE_XCELLENTO_HEALTH.html