



THE KENNEL CLUB  
DOG HEALTH

# Breed Health and Conservation Plan

## Bavarian Mountain Hound

### Evidence Base

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## 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 raise awareness of current health and welfare concerns in their breed, and support them in making balanced breeding decisions.

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 representatives where applicable. Priorities are agreed based on this data and incorporated into a list of actions between the Kennel Club and the breed to tackle these health concerns. These actions are then monitored and reviewed on a regular basis.

## DEMOGRAPHICS

The Bavarian Mountain Hound is currently on the import register, with the first dog registered in 1989. The number of Bavarian Mountain Hounds registered by year of birth between 1990 and 2019 are shown in Figure 1.

The trend of registrations over year of birth (1990-2019) was +2.91 per year (with a 95% confidence interval of +2.08 to +3.75) reflecting the overall increase in the breed's numbers during this time. However, it should be noted that the breed's population is still very small, with no more than 90 having been registered in any one year.

[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.]

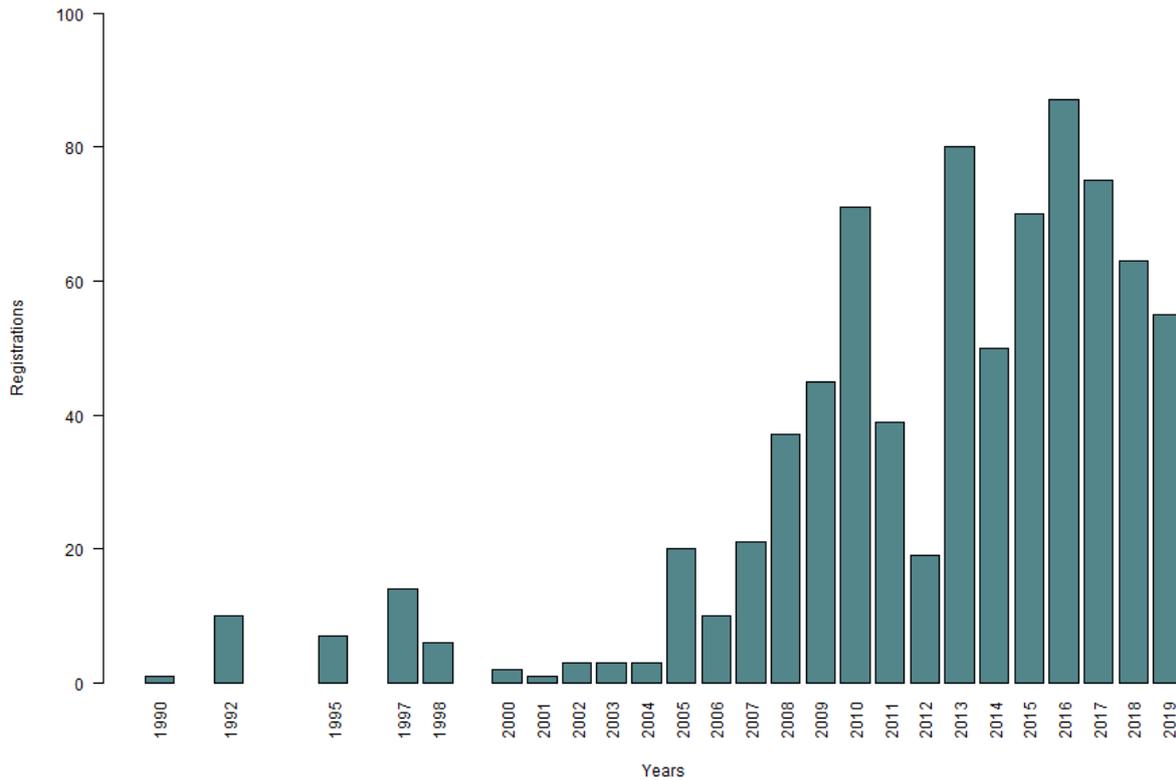


Figure 1: Number of registrations of Bavarian Mountain Hounds per year of birth, 1990 – 2019.

## 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 BHC's Annual Health Report 2019, 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. Idiopathic epilepsy
2. Hip dysplasia

In terms of what the breed has done in the last year to help tackle these listed health and welfare concerns, the breed continues to educate owners/breeders on the recommendations and requirements for hip scoring prior to breeding. The breed also sent samples to the Animal Health Trust (AHT) to contribute to their research into canine idiopathic epilepsy. It is hoped that following the trust's closure in July 2020 this research will be reinstated at the University of Cambridge.

## BREED CLUB HEALTH ACTIVITIES

The Bavarian Mountain Hound has an active Breed Health Co-ordinator (BHC) and a webpage dedicated to health on the breed club website, which can be found at:

<http://www.bmhs.org.uk/health.html>

Whilst no recent health survey results are available for the breed, the Bavarian Mountain Hound Society of Great Britain has an open reporting survey which can be found at:

<https://docs.google.com/forms/d/e/1FAIpQLSdl8PXxoQUdSvkt2jSK1ldHvDvUAig4ZtlcbHulugBeRvPS7g/viewform>

## 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 incorporated literature that was released relatively recently to try to reflect current publications and research relating to the breed. It is worth noting the very small population of the breed is reflected in the small number of papers available.

### Genetic diversity

A German paper investigated the trends in inbreeding overtime for three German breeds, including the Bavarian Mountain Hound (Voges and Distl, 2008). The reference population for the breed consisted of 3,231 individuals with pedigree information tracing back to 1912. Following pedigree analysis, the authors established an effective number of founders of 10.9 for the breed, with the top ten ancestors responsible for 54.4% of genetic contributions in the reference population. The breed had an effective population size of 72.7 and mean inbreeding coefficient of 4.5%. Whilst the mean inbreeding coefficient is low the effective population size is still within the region where there would be concern over the future of the breed and potential for rapid loss in diversity (more information on page 8).

The authors noted the history of the breed, which included the contribution of Hanovarian Hounds throughout several points in the past. The breed was found to have the largest population size of the three breeds, as well as the smallest mean inbreeding coefficient, due to the higher number of founder animals and balanced use of breeding animals. It was noted that the population size of the breed had remained stable for the past 35 years.

### Musculoskeletal conditions

*Hip Dysplasia:* Hip dysplasia is a complex inherited disorder, influenced by both genetic and environmental factors. As the hip joint deteriorates it can lead to varying degrees of pain, discomfort, stiffness and lameness, and can lead on to the development of osteoarthritis. Hip dysplasia affects a range of breeds, however some breeds have

a higher risk of developing the condition. Willmitzer et al (2016) reported a statistically significant association between Bavarian Mountain Hounds and hip dysplasia. Examination of hip joint radiographs in 272 Bavarian Mountain Hounds in Slovakia between 1995 and 2000, showed a decreased trend in prevalence for dogs of the breed affected by hip dysplasia (Ledecký et al. 2004). These findings are likely to be a result of selective breeding away from the condition.

### **Neurological conditions**

*Cerebellar cortical degeneration (CCD)*: Three unrelated dogs of the breed were documented upon presentation of a progressive degenerative neurological disorder in Germany (Flegel et al, 2007). The dogs were all aged between 18 and 20 months of age and showed clinical signs such as lack of coordination, head tremors, and collapsing, which was reported to worsen over time. One dog underwent post-mortem examination and was reported to show significant cerebellar hypoplasia (reduced cerebellar size) and increased cerebrospinal fluid (CSF) around the brain. This form of CCD was reported as unusual, with variable degrees of granule cell loss (a form of neuron residing within the brain). The authors noted that this type of CCD has been reported in other breeds and suspected to have an autosomal recessive mode of inheritance, but more research is needed to confirm this. No further papers on this condition could be found in the breed.

### **BREED WATCH**

The Bavarian Mountain Hound is a category one breed, meaning judges are not required to complete mandatory monitoring forms following an appointment as championship certificate level. To date no optional reports have been received for the breed.

### **PERMISSION TO SHOW**

As of the 1<sup>st</sup> 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, no PTS have been granted for the Bavarian Mountain Hound (not including neutering or caesarean sections).

### **ASSURED BREEDER SCHEME**

Currently within the Kennel Club (KC)'s Assured Breeder Scheme there are the following requirements for the Bavarian Mountain Hound:

- Hip scoring under the BVA/KC Hip Dysplasia Scheme

The following tests are also recommended for the breed:

- Breed club aptitude test
- Bitches under two years not to produce a litter

## **BREED CLUB BREEDING RECOMMENDATIONS**

The Kennel Club include a breed club breeding recommendation which is detailed under the Assured Breeder Scheme sub-heading above.

## **DNA TEST RESULTS**

Currently there are no recognised DNA tests for the Bavarian Mountain Hound.

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 of which involves collaboration between the breed clubs and the Kennel Club in order to validate the test's accuracy.

## **CANINE HEALTH SCHEMES**

All of the British Veterinary Association (BVA)/Kennel Club (KC) Canine Health Schemes are open to dogs of any breed with a summary given of dogs tested to date below.

### HIPS

To date (Feb 2021), 77 Bavarian Mountain Hounds have been hip scored under the BVA/KC Hip Dysplasia Scheme, with a 15-year median hip score of 10 (range 4 - 29) and 5-year of 10 (range 5 - 29).

### ELBOWS

To date (Feb 2021), four Bavarian Mountain Hounds have been elbow graded under the BVA/KC Elbow Dysplasia Scheme, all being grade 0.

### EYES

The breed is not currently on the BVA/KC/ISDS Known Inherited Ocular Disease (KIOD) list (formally Schedule A) for any condition under the BVA/KC/International Sheep Dog Society (ISDS) Eye Scheme.

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 replaced with the sightings report which lists those breeds in which the conditions are, at this stage, only suspected of being inherited. Since 2012, no Bavarian Mountain Hounds have been eye tested under the BVA/KC/ISDS Eye Scheme.

## 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)). Just one c-section has been reported to date in 2019.

## 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 2020, an estimated effective population size of **141.6** was reported (estimated using the rate of inbreeding over the period 1990-2019). This is above the threshold at which there would be concern for the future of the breed and a dramatically increased loss in genetic diversity. However, it should be noted that given the small population size this number will fluctuate overtime.

Below an effective population size of 100 (inbreeding rate of 0.50% per generation) the rate of loss of genetic diversity in a breed/population increases dramatically (Food & Agriculture Organisation of the United Nations, "Monitoring animal genetic resources and criteria for prioritization of breeds", 1992).

It should be noted that, while animals imported from overseas may appear completely unrelated, this is not always the case. Often the pedigree available to the Kennel Club is limited in the number of generations, hampering the ability to detect true, albeit distant, relationships.

For full interpretation see Lewis et al, 2015  
<https://cgejournal.biomedcentral.com/articles/10.1186/s40575-015-0027-4>.

The current breed average inbreeding coefficient for the Bavarian Mountain Hound is **1.5%**, however this will be impacted by the influence of imported dogs and potentially incomplete pedigree information.

## CURRENT RESEARCH

The Bavarian Mountain Hound Society of Great Britain currently have a health survey open, which aims to collect information on the breed's overall health and also allows participants to report a cause of death.

The Breed Club have also provided samples to the AHT to contribute to their continued research into finding a causative gene for canine idiopathic epilepsy. It is hoped that this work will be continued at the University of Cambridge following the trust's closure.

## **PRIORITIES**

Correspondence between the breed representatives and the Kennel Club was undertaken in Feb 2021 to discuss the evidence base of the BHCP and agree the priority issues for the health of the breed. The group agreed from the evidence base that the priorities for the Bavarian Mountain Hound were:

- Hip dysplasia
- Idiopathic epilepsy
- Monitoring health conditions in the breed

## **ACTION PLAN**

Following the correspondence 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 Bavarian Mountain Hound. Both partners are expected to begin to action these points prior to the next review.

### **Breed Club actions include:**

- The Breed Clubs to continue to encourage hip scoring for all breeding stock
- The Breed Clubs to continue monitoring epilepsy in the breed
- The Breed Clubs to report back any findings from their health survey to the Kennel Club
- The Breed Clubs to continue monitoring the use of popular sires and raise awareness of the importance of considering genetic diversity when breeding

### **Kennel Club actions include:**

- The Kennel Club to assist Breed Clubs with collecting data for their breed health survey through advertisement on the KC website and journal
- The Kennel Club to produce a piece on the importance of considering genetic diversity and popular sires when breeding, specifically for numerically small breeds
- The Kennel Club to keep the breed updated regarding research at the University of Cambridge

## REFERENCES

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