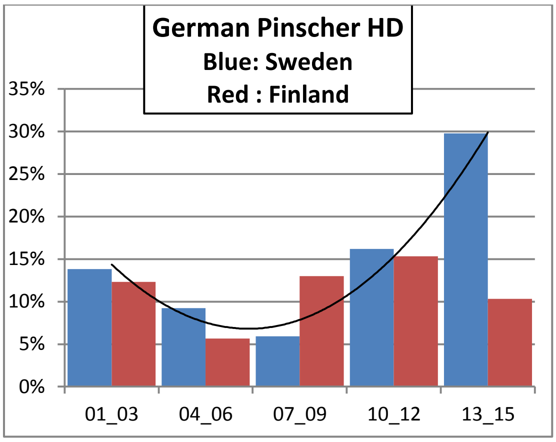
Observations regarding hip status and screening procedure in 22 dog breeds in Sweden.
Report to the Swedish Schnauzer- Pinscher Club

Summary

Expected improvements of dog hip quality in Swedish breeding programs have not materialized in spite of reasonably consequent use of HD-free parents. Either the genetic assumptions regarding inheritance or the screening procedure may be generating systematical faults. In this preliminary investigation publicly available health data is arranged to reveal possible abnormal patterns in the screening results.

Introduction

Members of the breeding clubs for the German Pinscher and Standard Schnauzer within the Swedish Schnauzer- Pinscher Club ("SSPK") have noted an alarming increase of reported cases of hip dysplasia, according to the SKK ("Swedish Kennel Club") screening procedure from the year 2000 and onwards. For comparison, a group of 20 breeds has been studied along with the Schnauzer and German Pinscher. This report is a summary of the findings so far.



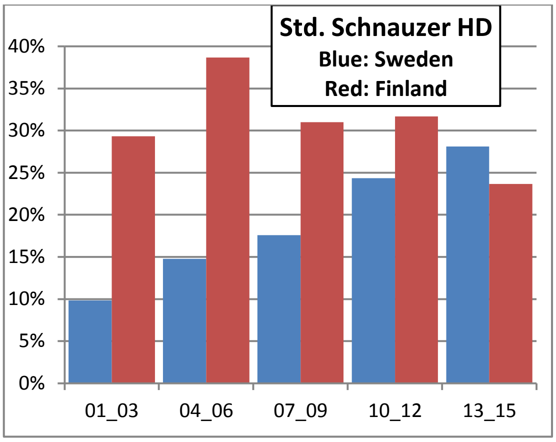
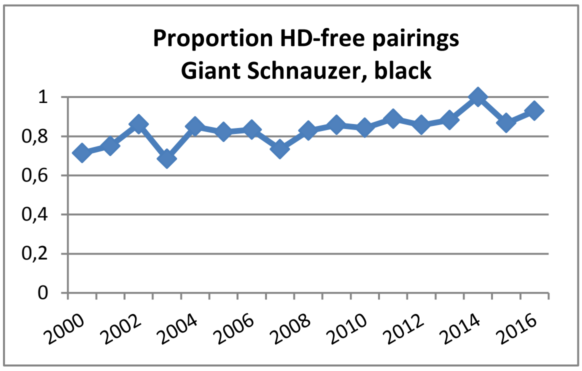


Figure 1: *Time periods are 2001-2003, 2004-2006, 2007-2009, 2010-2012, 2013-2015; and refer to birth period.*

Both breeds have had a breeding exchange with Finland over the years. For the German Pinscher the two populations are very closely related. The differences in observed hip status between Finland and Sweden cannot be explained by hereditary factors. The observed increase in dysplastic hips for the Schnauzer and the German Pinscher over the last ten years are of magnitudes that should manifest themselves in increased frequency of clinical cases and dogs with locomotion problems. The breed clubs have recently revised their s.c. "RAS-documents" (a survey on breeding and health status, revised every five years). There are no signs of increased hip problems in the insurance statistics or in the dog owner enquiries. In fact, clinical hip problems seem to be very rare in both breeds.

None of the SSPK breeds have mandatory requirements regarding hip status for breeding. The German Pinscher and the Schnauzer clubs use their whelp listing services to stimulate and enforce hip radiology. For both breeds, parents with grade A- or B-hips are recommended. Pairings with both parents HD-free cover ~80 % of the cases; the rest is A+C or A/B+"unknown". In most cases the "unknown" is an import with hips free from dysplasia, but results not registered by the SKK.

The proportion of examined dogs is slightly low; more siblings to the breeding animals should be examined in order to improve the offspring evaluation. The working dog breeds in the survey all have mandatory requirements (with different stringency) for hip radiology. In the non-working group varying requirements are applied; most with a recommendation to use HD-free parents.



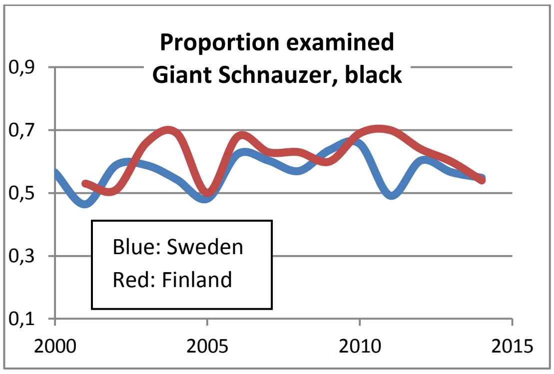


Figure 2: *Example of parental hip quality and examined proportion in the Giant Schnauzer population.*

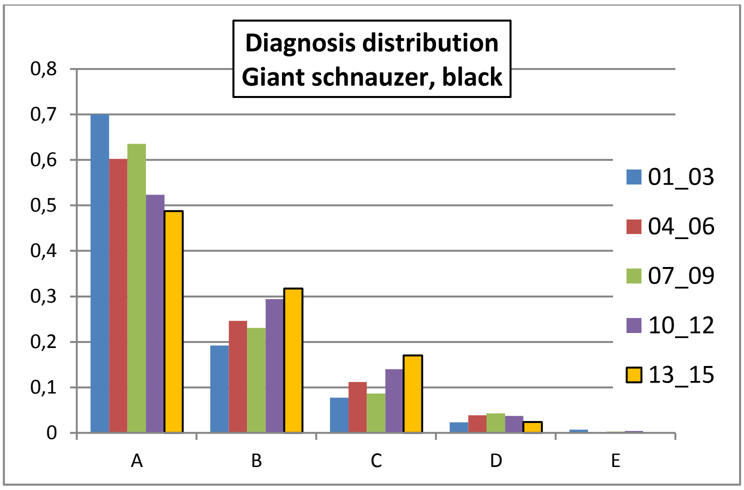


Figure 3: *Example showing observed hip quality change over time for the Giant Schnauzer. Mandatory requirement: For the registration of offspring, all parents to be A or B quality.*

Genetical contra environmental controlling factors

Available literature shows a multifactorial influence on canine hip quality; see Oberbauer et al (ref.1), Kron (ref. 2), Riser (ref. 3 and below). Recent research shows an associative relation between HD and major gene groups, but no genes directly causing the defect (see Janutta; ref.4). Interestingly, the candidate genes suggested by Distl et al (ref. 5) belong to the "*Insulin-like receptors"*, which are involved in the control of growth and metabolism.

"The hip joints of all dogs are normal at birth. The joints continue to develop normally as long as full congruity is maintained between the acetabulum and the femoral head... The acetabular rims are stimulated to grow by mild traction applied by the joint capsule and gluteal muscles attached along their dorsal borders, and from pressure by the femoral heads upon the articular surfaces... The morphologic characteristics of the complex hip structure show that biomechanical behavior is the prime influence in the growth of this joint." (Riser 1985).

Scope of work

Considering the negative outcome in Sweden from the hip screening according to the FCI-protocol, we must seek answers to the following questions:

- Are we facing significant changes in the dog environment over time (physical arrangements during growth, nutrition, physical activity et c.)?
- Have the breeders used affected animals in preference for other qualities?
- Are there unknown inconsistencies over time in the imaging or image interpretation procedures?
- Have new/different sedation substances been introduced?
- Is there a general confusion between the scope of hip screening as a "production quality control" (with a consequent rejection limit) and its use as a clinical diagnostic tool?

METHOD AND MATERIAL

Method

For this study the focus lies on the change and the rate of change of diagnostic pattern over time. Other studies have used overall average values to draw conclusions on hip screening efficiency, but that is not relevant in the search for possible systematic bias over time. If a "normal" pattern can be identified in a large population, then any abnormal deviation seen in a subpopulation can indicate both a possible cause and a remedy. Initially a graphical approach is used to find systematic trends.

Material; analyzed breeds

Since screening results disagree with observed reality, it was decided to widen the survey to an increased number of breeds for comparison. Generally, the working dog group is associated with high selection pressure regarding hip function, expressed by the requirement to use only HD-free parents. See figure 2. By using these breeds for reference, the influence of scatter in the variable "selection pressure" is reduced. This means a simplification of the preliminary search matrix.

In total 22 breeds were studied, all with a reasonably high proportion of the population having their hips examined. Information on parental hip status is included in the breed-specific calculus sheets. This survey covers over 90.000 X-rayed dogs. The following breeds are involved in the study:

Dobermann Pinscher	Standard schnauzer
Giant schnauzer, black	German Pinscher
Hovawart	Rhodesian Ridgeback
German Shepherd	Labrador Retriever
Rottweiler	Flatcoated Retriever
Boxer	Nova Scotia duck tolling retriever
Collie, long hair	Danish-Swedish farmdog
Australian Cattledog	Norwegian Elkhound
Australian Shepherd	Bernese mountain dog
Australian Kelpie	Hamilton hound
Finnish hound	Irish sc wheaten terrier

The statistical information is mainly collected from the publicly available SKK ("Swedish Kennel Club") Avelsdata ("Breeding data") webpages. Additional information was found in breed-specific data available from breed clubs. For comparison, hip scores from Finland have been included where available (source: Koira-Net). Limited, unpublished research data regarding sedation and weight is available for some working breeds, covering the period 2003 to 2013.

SSPK has requested extracts from the SKK database, including information regarding individual weight, sedation substance, clinic and image interpreter, in order to analyze the variables involved. Access was denied by the SKK; no reason stated. Consequently, the trends for weight and sedation practice are limited to the working breeds as above. The trends are, however quite clear, and should be relevant in general terms for other breeds and for a reasonable extrapolation forward in time.

<u>RESULTS</u>

<u>The attachments, their contents and how to read them.</u>

This report refers to a raw data document (HD2000_2016.xlsx), where the "Avelsdata" information is collected for the breeds involved. Limited information on sedation, weight et c. is gathered in a separate, non-public document. Since there is a wide variation in absolute level of dysplasia (defined as the sum of diagnoses C, D and E) between breeds, the focus rests on the observable <u>change in hip status over time</u> within each breed. For illustrative purposes extracts from the original raw data file are attached as appendici. Some breeds are omitted here for the sake of clarity.

In the **Appendix 1** the breed specific values have been "non-dimensionalized" by indexing all diagnoses to the base year of 2001. This manipulation allows a non-biased comparison between breeds, as well as a check on overall average values for the variation. In addition, you will find examples of breed data for a selection of breeds. In order to judge possible influences from breeding strategies, information on parental HD-status and proportion of examined dogs within breeds is shown together with HD-results as a function of time period.

Now, lumping all dysplasiae together may hide significant variations. A final sweep showing variation of all five diagnose levels over time is presented in the **Appendix 2;** "*Distribution".* The first four pages show actual percentage distribution, where the difference in total level between breeds is seen. In the last three, the individual values have been indexed to the base year 2001, making a breed-to-breed comparison possible, as well as an overall average for the complete cohort.

The **Appendix 3** shows three examples of the raw data structuring for each breed, before integration into the *Trends* and *Distribution* pages. There a collective overview may reveal eventual systematical changes in general patterns over time. The breed pages differ slightly from one another; various formats have been tested to find reasonably instructive models for the overall presentation.

Observations at first glance

- In the *Trends* page the diagram *HD relative change in Sweden* shows that, in spite of generally sufficient hip quality (i.e. A or B status) in the parents and several previous generations in their lineage, there is not a single breed in the group where this breeding strategy has been successful in terms of an observed reduction in HD frequency. The average HD increase is 49 % with a span from 1 to 165 % during the period 2001 to 2015.
- The corresponding picture in Finland is different; all breeds except Hovawart, Australian Cattledog, Australian Shepherd and Boxer, have produced improved hip quality over the fifteen-year period. The same goes for the German Shepherd in Denmark, though not included in the *Distribution* file.
- For all breeds there is a marked increase in the proportion of C-hips over time (see "Diagnose distribution over time period"). For many of the breeds, there is a steady gradient from the first period. The rest show an irregular pattern, mostly with a dip in one or two of the intermediate periods.
- The trend for dogs born in the period 2013-2015 (examined in average 18 months later) is particularly bad, generally showing a reduction in A-hips and an increase in both C- and D-hips.
- The trend changes become obvious when displayed in the "*Relative change over time*" – format. This is a direct picture of the breeding success (provided the screening procedure is correct!) in the situation where all breeds are starting their breeding efforts from different absolute levels.
- At first sight, the decrease in relative values seems to be higher for breeds entering the screening with low numbers of dysplasia (see f.i. Flatcoated retriever); this is a mathematical consequence from the distribution pattern with a great proportion of A and B-hips.
- Generally, in most breeds, the proportion of examined dogs is decreasing over time from a peak roughly during the second period; the German shepherd and the Collie being the exceptions.

DISCUSSION

The observed decrease in proportion of dogs with good hip scores can be explained either as a real reduction of hip quality (increase in number of defects), or as the result of a slow, but continuous displacement of the limits between diagnostic steps, creating a virtual "dysplasia-inflation" effect.

First scenario

Here we have the effect of heritage, combined with an ongoing change in environmental factors, influencing the maturing of the hip organs (skeleton, ligaments, muscles a.s.o.). Apart from an "urbanization" of dogs, leading to a possible loss of physical condition and muscle and ligament strength, no substantial change in dog living environment explaining the lack of breeding success has been found in the literature. An example: the average weight in kg at hip examination for the German shepherd, Giant schnauzer, Boxer and Rottweiler is shown in tabular form below:

Birth period	*G. shepherd (fem/male)*	*G. schnauzer*	*Boxer*	*Rottweiler*
2000-2003	*30.5 / 37.4*	*36.7*	*28.6*	*43.3*
2004-2006	*29.4 / 35.9*	*35.1*	*28.6*	*40.8*
2007-2009	*29.3 / 35.6*	*34.9*	*28.8*	*40.1*
2010-2012	*28.8 / 35.3*	*36.1*	*28.4*	*40.0*

There is a trend towards lower weight. This should correlate to a reduction of HD in general. On the other hand, the strength and cross section of the ligaments may be subject to a decrease as a result of lacking physical activity (see Cornwall et al; (ref. 6) and Wren et al; (ref. 7)). Fitness reduction due to "urbanization" may thus correlate to an observed increase in HD as a result of increased laxity.

Second scenario

Any hip improvement due to breeding strategy may be hidden by the cumulative effect of various changes in screening procedure over time. Here we should see the influence from changing sedation practice (including new substances and combinations), changing routines in clinics and in image quality and interpretation, as well as in the evolution of the technical equipment involved:

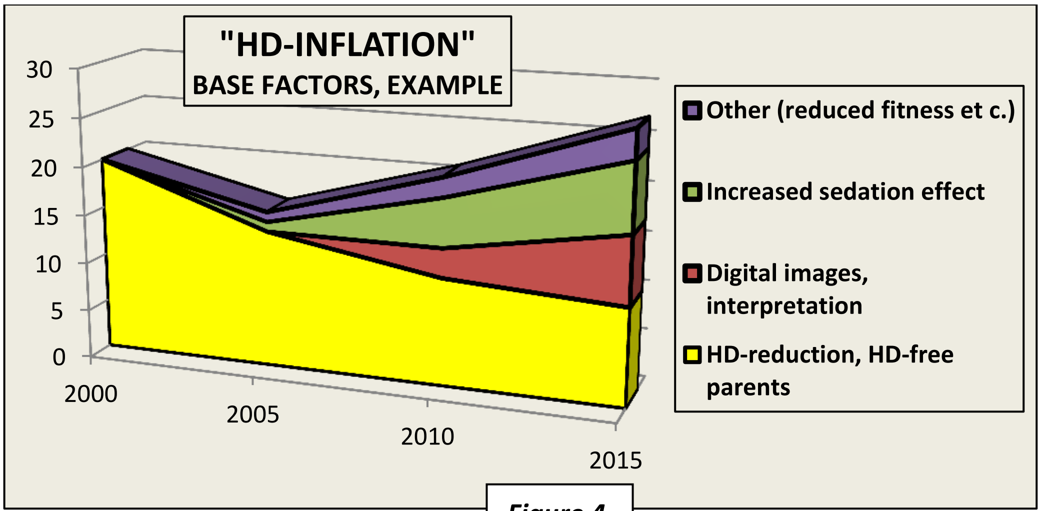
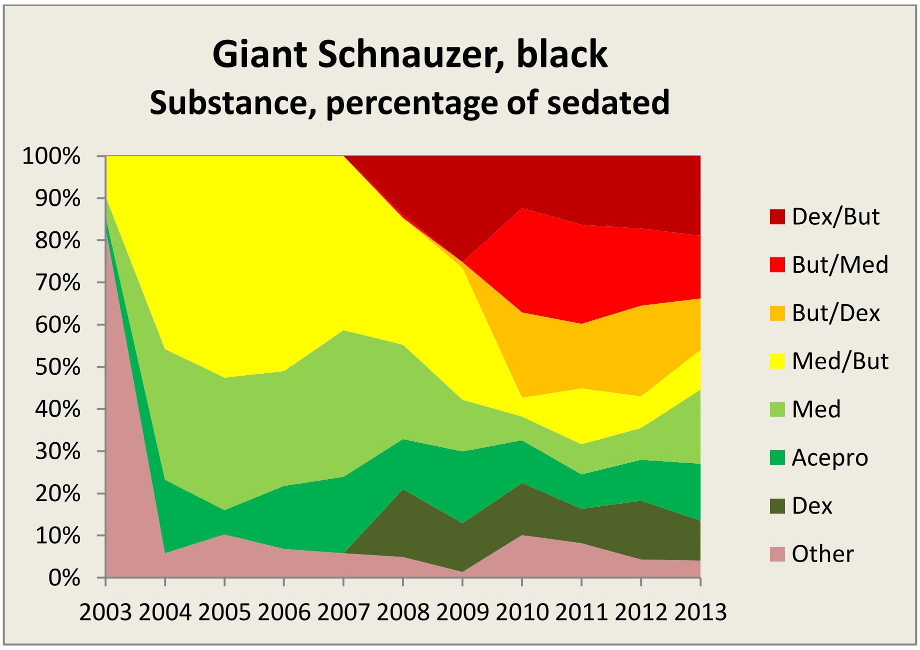


Figure 4

Of these factors, the effects of **sedation substances** and of the **transfer from analog to digital image processing** stand out. To begin with the imaging, the switch from analog to digital imaging has taken place in steps from the early 2000:s. Pictures are now routinely manipulated by advanced computing methods, producing image qualities on a detail level unheard of ten years ago (ref. 8, 9). In human radiology, as well as in industrial X-ray applications for quality control, there must be a standard ***Image Quality Indicator*** associated to each image (ref. 10, 12, 13). This is mandatory in order to avoid false diagnoses and "fake" quality defects. No references to similar image quality assessment in the veterinary screening arena have been revealed.

Regarding the effect of sedation practice, new substances have been introduced in/around 2007. Except for *Dexmedetomidine* in single application, the combinations *Butorfanol/Medetomidine* and *Dexmedetomidine/Butorfanol* are associated with elevated numbers of observed defects, compared to the pre-2007 substance selection. This change occurred between 2007 and 2010. In 2012 these substances covered 60% of the sedations in total.



***<u>Figure 5</u>**. Sedation substances used for the Giant Schnauzer*
Abbreviations:
Dex: Dexmedetomidine; But: Butorfanol; Med: Medetomidine; Acepro: Acepromazine.
Note: The order of distribution in combinations is not trivial!

The span of defect ratio between substances within a single breed is remarkable. In addition, breeds tend to react differently to different substances. For example, during the period 2003 to 2013, the variation in HD-indications for different substances span between 20-38% for the Boxer, 13-23% for the Giant schnauzer and 7-22% for the Hovawart.

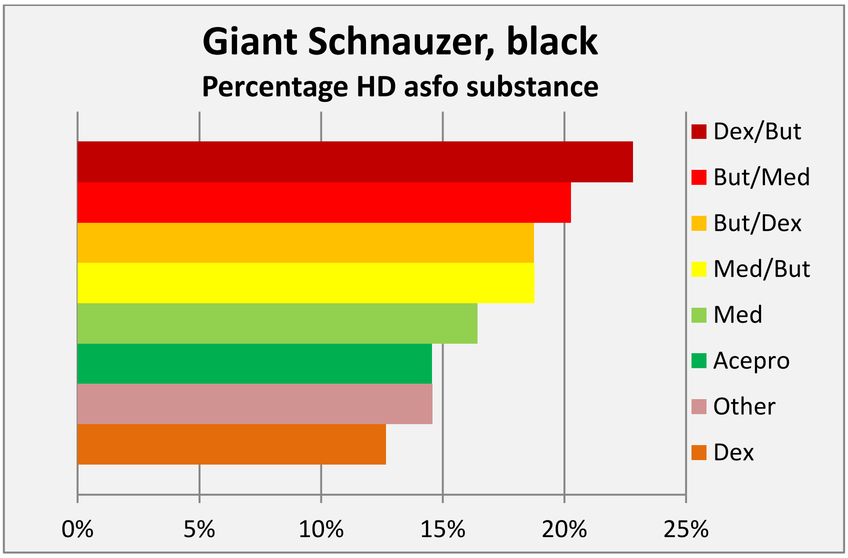
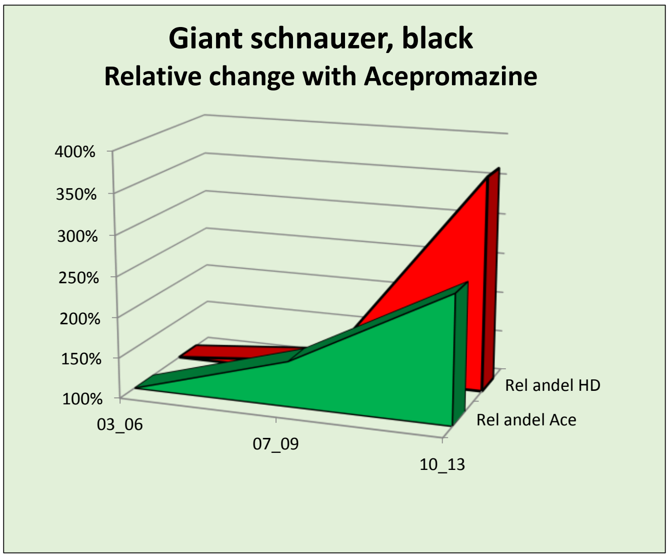


Figure 6. *Variation in diagnostic outcome depending on sedation substance.*
Note: Intensity in reaction to substances is breed specific.

How much influence from sedation and how much from image improvement?

This could easily be answered by running a factor analysis on the information on substance, breed and image variant et c.. Since this info is missing, a rough estimate can be performed from the SBK data on substances. The least variation among the "old" substances is found with the Acepromazine. If we compare the variation of the proportion of the population that is sedated with Acepro with the variation of the resulting proportion of HD in the "Acepromazine population", we may get an idea about the differences.

G. Schnauzer change asfo substance		
Period	% Acepro	% HD in Ace group
03_06	14	12
07_09	22	14
10_13	36	44



In this example, the use of Acepromazine has increased from 14 to 36 percent; i.e. with a factor 2,6. In the same period the HD in the "Acepromazine group" has increased from 12 to 44 percent, corresponding to a factor 3,7. Consequently, the observed HD frequency has increased with a factor 1,42 over the substance increase. The extra increase must be due to worse hip quality or to additional factors, like image quality or radiologists interpretation. Note the accelerated increase in HD during the mid-period, when the impact of digital imaging is coming into play. Qualitively similar trends have been found for Boxer and Australian Kelpie.

One might expect the reduced tonus to specifically increase the number of observed subluxations, but it will also increase the observed incidence of "shoal bowls" where the Norberg angle is used as a criterion. This is the result of defining the center of the femur head (the "ball") as the reference point for the estimation of the Norberg angle. If the head is subluxated to any degree due to joint laxity, its center deviates from the center of the bowl, which will cause a fictive reduction of bowl depth, as a result of an observed reduction in the Norberg angle. From a biomechanical view, this procedure is incorrect and may produce false diagnoses. The bowl shape must be deduced from a fixed reference point that does not move in space as a result of sedation.

In Sweden, the combined changes in sedation procedure and imaging technology have been introduced simultaneously, which most probably affects the diagnostic outcome. If they had been applied with a time delay, we would have seen a different pattern. This may partly explain why screening results vary from one population to another within the same breed.

To conclude, the observations in this study support the view that the combined influence of the changes in sedation and imaging practice are strong enough to hide genetical and phenotypical improvements in hip quality. This lack of consistence in the screening procedure is a violation of the golden rule for all quality assessment; ***"If the precision of a measuring device is improved, the tolerance limits must be adjusted accordingly to maintain a conservation of quality and to prevent undue reject increase."***

One consequence of the recent findings is that any hip research based on the SKK screening data must be viewed with caution. With a systematic bias in the original data set, statements regarding hip quality development may be invalid due to false fundamental assumptions.

REMEDIES

The problem can be described as a distortion of the diagnostic scale, resulting from systematic changes in imaging technology and sedation practice. If the diagnostic steps originally had a common "bandwidth", the influence from sedation and imaging has caused a "narrowing" of the A-band, and a widening of the C- and D-bands, i.e. the borders between diagnostic levels are moved, resulting in the observed increase in dysplastic hips:

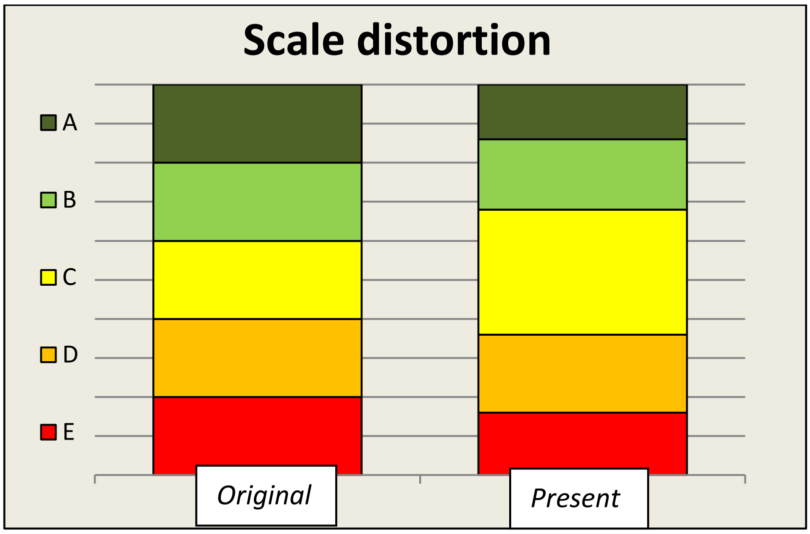


Figure 7

Imaging

In order to restore consistency in the system for breeding quality assessment, **the diagnostic classes must be redefined with respect to the minor divergences now visible with the new technology** (and previously invisible). A minor deviation from "perfect" that previously was not observed should not render a different quality score now that it can be seen. One method to achieve this would be to use a well-defined, "non-manipulated" image setting when judging the basic quality level (i.e. the diagnostic class A, B et c.), (ref. 11). That done, any image manipulation necessary for detailed clinical research may be performed with the full use of available technical capacities.

We have an analog case in ophthalmology, where the magnification for routine examination is set to a fixed limit. For example: If too high a magnification is used, a number of minor objects, "floating" in the glass body of the eye, will be detected. Normally, these residuals (from the early development of the eye) are smaller than the sight limit; they cannot be detected by the eye itself. Consequently, their existence is not a functional limitation.

Sedation

The influence of varying sedation practices must be addressed along with imaging position. A standard procedure for sedation must be introduced. A measuring procedure that results in an observed ratio of over 2:1 in the measured quantity is not satisfactory. The combination of environmental factors (tranquilization, sedation, physical fitness, position et c.) is likely to hide the effect of inherited stabilizing factors in ligaments and muscles. The importance of a measure for joint laxity is beyond discussion, but the present procedure is far too unprecise to serve as a selective guide for breeding quality.

In radiological studies of human joints, sedation is practically never used. The joint is viewed in a naturally relaxed state and hip joint laxity is estimated from the femural head position in the acetabular bowl. For dogs, a tranquilizer may be required to keep the patient in a fixed position, but this will also introduce the secondary effect of a large variation in persisting tonus in the group of muscles assisting the ligaments in stabilizing the joint. With highly sedated muscles, the joint head is merely “hanging” in the ligaments and the joint capsule when the dog’s legs are stretched to the standard imaging position. For most dogs, this position is uncomfortable and often painful, due to an overstretching of the ligaments.

Other strategy

It has been argued that C-hips should be generally accepted for breeding as an alternative strategy, leaving the screening procedure and the now distorted diagnostic scale as is. This view has been expressed by the SKK in communication with the Swedish Board for Agriculture, regarding the use of affected dogs in breeding. Three major obstacles with this attitude should be noted:

- The new, wider span of the C-class includes both “old B-hips” and “borderline D-hips”. There is no way to discriminate between “good” and “bad” C-hips with this method. It has been shown statistically that parents with C-hips have produced increased proportions of C-, D- and E-hips, which speaks against this strategy. **Parents must have better quality than the breed average; if not, the breed quality will be harmed!**
- X-ray technology is constantly advancing; within short we will probably see screening in 3D, and imaging in three-dimensions has been standard procedure in industrial applications for decades now. This means that the diagnostic class limits will continue to change with technology, making comparisons over time extremely difficult, if not impossible.
- Most breeds depend on international exchange of lineage to keep the gene pools healthy. This is particularly important for numerically small breeds (where the use of a BLUP-index is unsuitable due to the risk of increasing inbreeding). At present, many of the countries with which we have a breeding exchange, do not accept C-hips for breeding or for the earning of championship. If floating bandwidths were used in X-ray evaluation in Sweden, we would face chaos. Swedish dogs would be excluded at large from international breeding exchange.

Contacts with the SKK

Since the findings revealed in the present report are of concern for a number of breeds, the SKK was briefed in January 2017, with additional information supplied at meetings March 29 and May 18, 2017.

Additional material

During this investigation, several representatives from other breed clubs have expressed concern about the screening procedure. A survey on the screening results for 45 breeds over the period 2011 to 2016, presented by Prof. Hilde Nybom, is adding useful value, see **Appendix 4.**

Conclusions

It has been shown that the present routines for radiological hip screening according to the FCI procedure is unreliable for the group of breeds studied. In particular, the changes in technology and sedation practice that were introduced simultaneously around 2007 have overshadowed the breeding progress and led to an increase in observed number of dysplastic hips. In order to restore faith in the procedure, it has to be revised thoroughly. Even small and seemingly negligible inconsistencies become important for the quality outcome, when accumulated and added over time.

Future work needed

To gain better understanding of the problem, two additional investigations, one urgent and one obvious, should be performed. The first is a review of correlations between observed diagnoses and clinical, “matter of fact” incidents. This is necessary in order to redefine realistic diagnose class limits for breeding, considering the findings in this report. The obvious task is, of course to perform a basic factor analysis involving the possible influential factors. As noticed earlier, all information needed for this is hiding in the SKK database.

Statement of independence

The present investigation is undertaken on behalf of the Swedish Schnauzer- Pinscher Club. There are no financial, political or emotional relations involved, that have influenced my work.

Special thanks

Although this is not a scientific report in the academic sense; it is rather an “Engineering Trouble-shooting Report”, I enjoyed the privilege of a personal panel of qualified peers, representing the disciplines of genetics, biology, zoology and “data tweaking”. So, thank you Ingrid Tapper, Hilde Nybom, Irene Berglund, Staffan Thorman and David Lundgren for your stimulating input!

Styrsö 2017-06-28
/Bodo Bäckmo/

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APPENDIX 1, p1

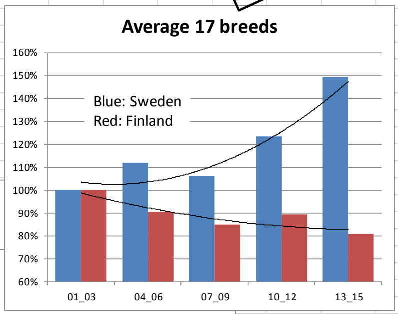
HD relative change compared to start values during the period 2001-2003

Period	Schnauzer	Pinscher	Flatcoat	Riesen B	Aussie	Tollare	Kelpie	Doberm	DS Fdog	Boxer	Cattledog	Labrador	Ridgeb	Rottweil	Collie lh	Hovawart	Schäfer	Aver
01_03	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
04_06	150%	67%	121%	140%	112%	107%	101%	144%	122%	105%	122%	109%	126%	96%	111%	75%	97%	112%
07_09	179%	43%	147%	125%	150%	99%	97%	137%	125%	104%	44%	98%	98%	102%	109%	56%	90%	106%
10_12	248%	117%	171%	174%	137%	104%	132%	131%	121%	96%	103%	91%	98%	105%	89%	90%	90%	123%
13_15	265%	228%	188%	186%	165%	160%	149%	144%	142%	141%	126%	112%	111%	107%	107%	104%	101%	149%
Andel rtg	28%	25%	60%	57%	71%		70%	51%	36%	57%	53%	63%	60%	67%	52%	74%	63%	
Antal rtg	896	471		1594	2649		1393	1784	2927	4726	220	23094	3464	11285	3917	1707	23694	

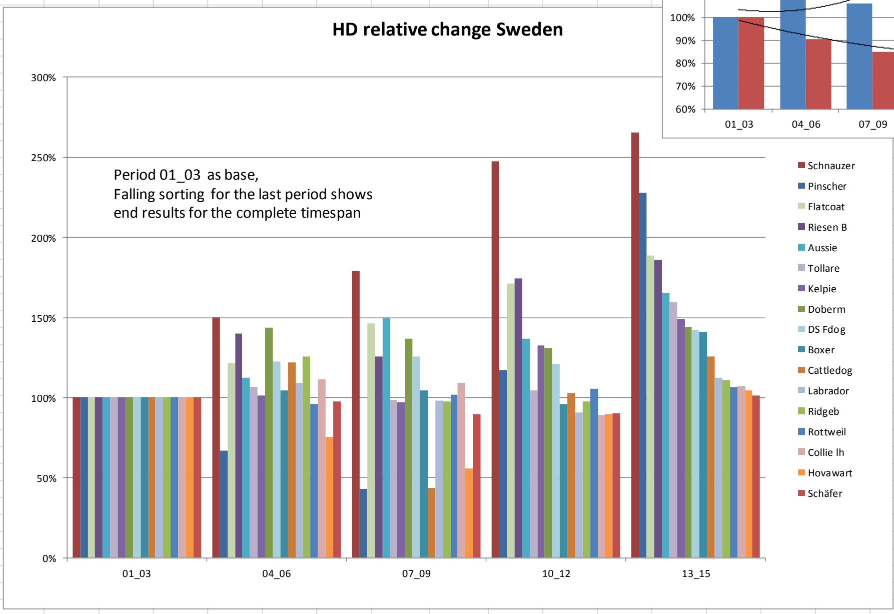
Finland

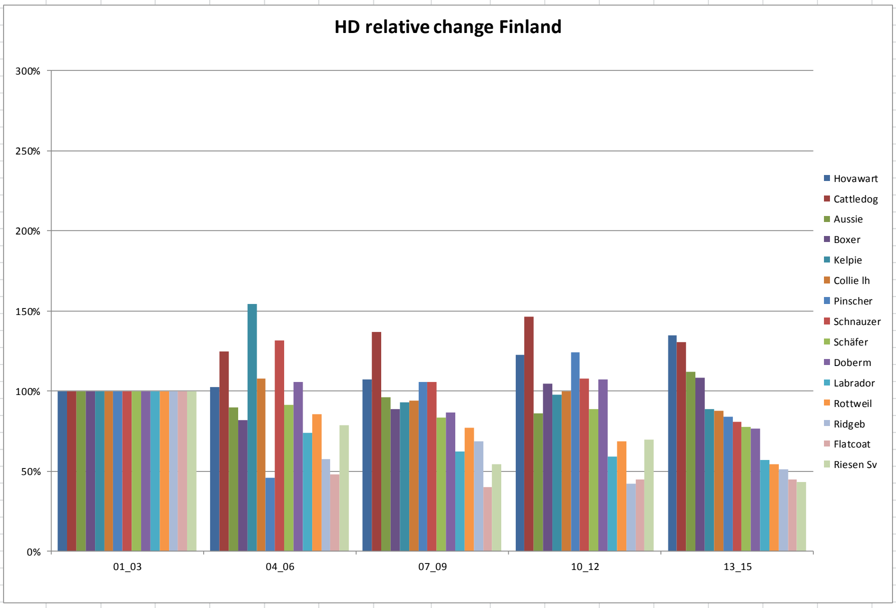
Period	Hovawart	Cattledog	Aussie	Boxer	Kelpie	Tollare	Collie lh	Pinscher	DS Fdog	Schnauzer	Schäfer	Doberm	Labrador	Rottweil	Ridgeb	Flatcoat	Riesen Sv	Aver
01_03	100%	100%	100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%
04_06	103%	125%	90%	82%	155%	71%	108%	46%		132%	91%	106%	74%	86%	58%	48%	79%	91%
07_09	108%	137%	96%	89%	93%	59%	94%	105%		106%	83%	87%	62%	77%	69%	40%	54%	85%
10_12	123%	146%	86%	104%	98%	60%	100%	124%		108%	89%	107%	59%	69%	42%	45%	70%	89%
13_15	135%	131%	112%	108%	89%	61%	88%	84%		81%	78%	76%	57%	54%	51%	45%	43%	81%

Schnauzer = Standard schnauzer
Pinscher = German pinscher
Riesen B = Giant schnauzer, black
DS Fdog = Danish-Swedish farmdog
Schäfer = German shepherd



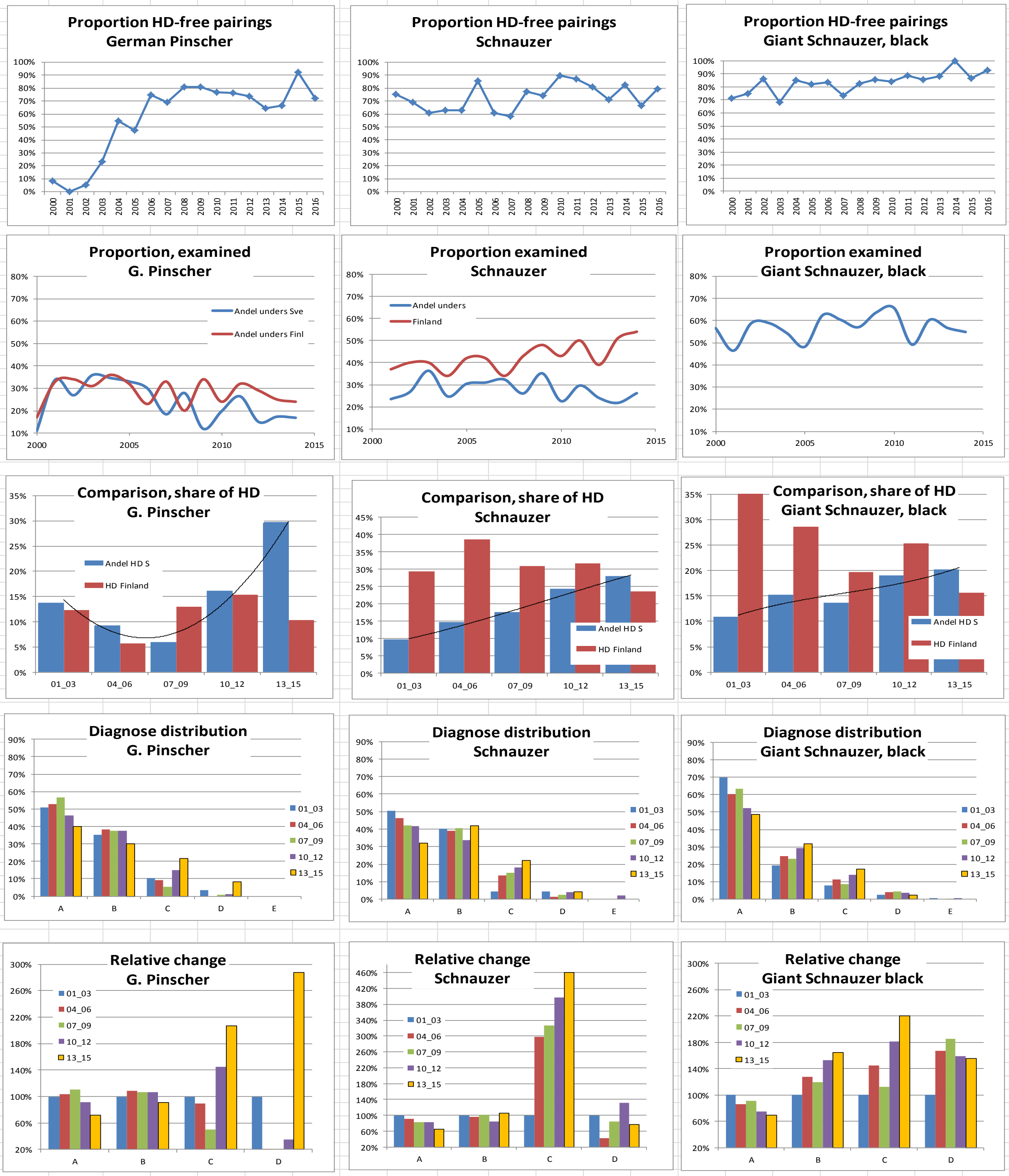
NOTE! Colour coding differs between the diagrams!



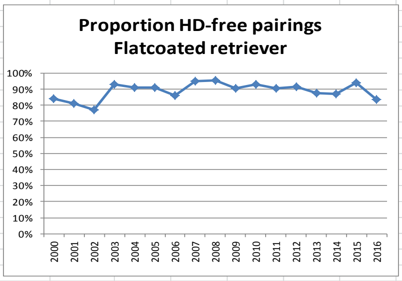


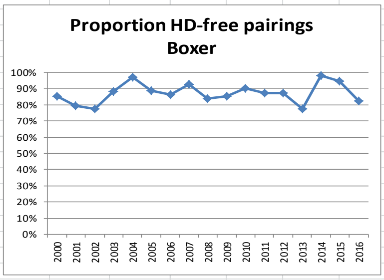
APPENDIX 1, p2

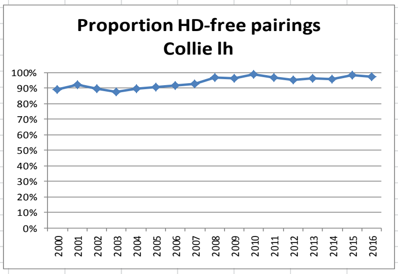
NOTE: The proportion of HD-free pairings do not include imports registered as "unknown" regarding HD.
The real percentage of "free" is thus slightly greater for all breeds in the diagrams below

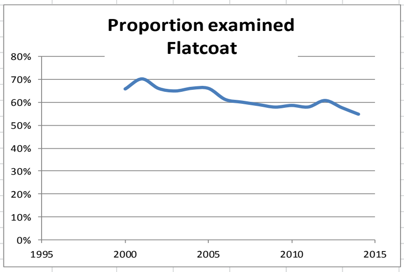


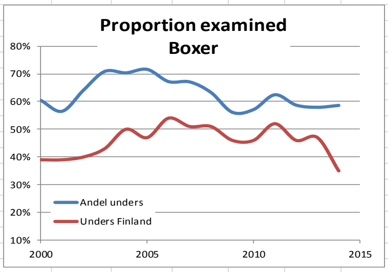
APPENDIX 1, p3

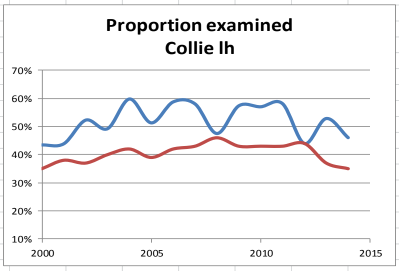


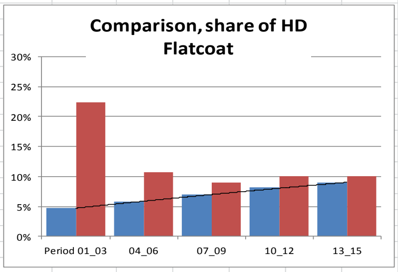


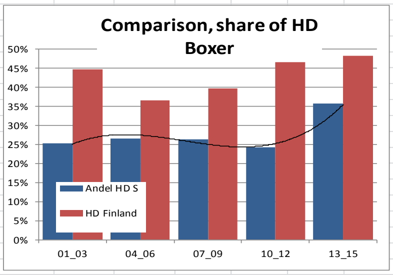


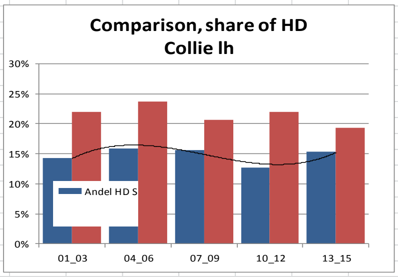


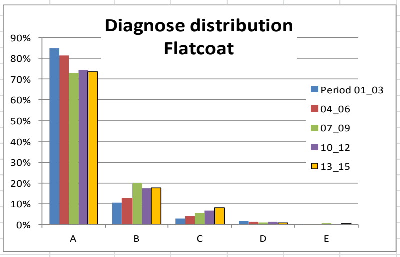


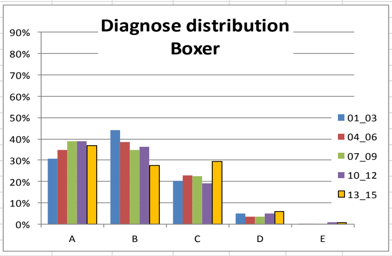


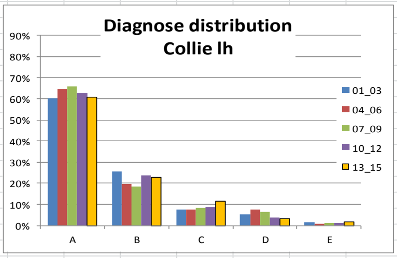


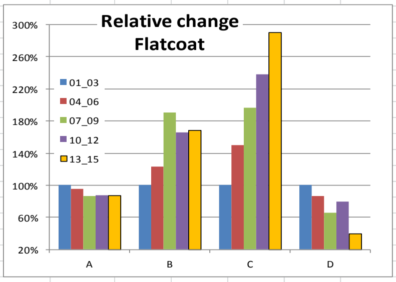


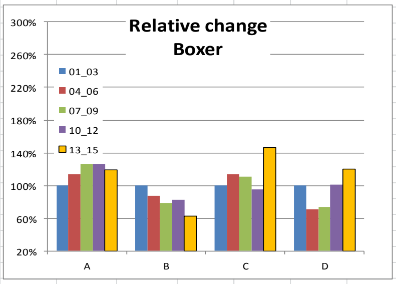


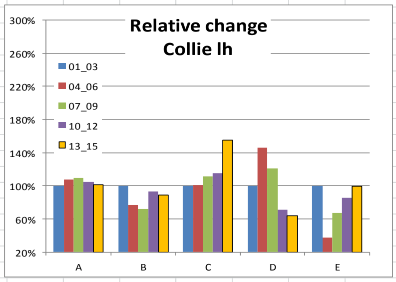






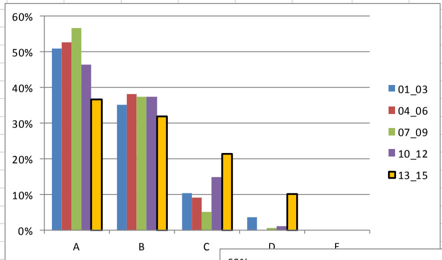


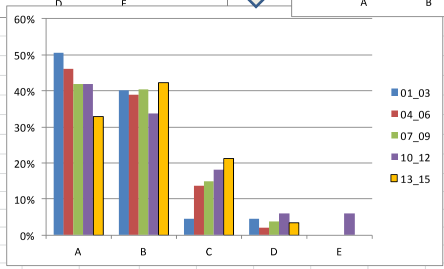


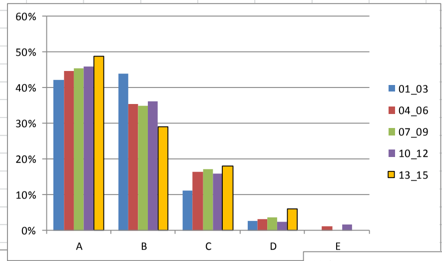


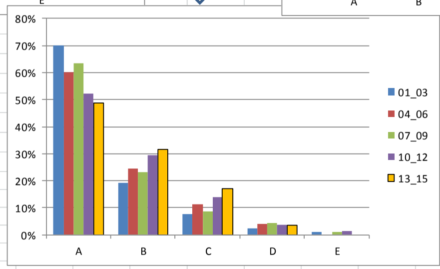
Diagnose distribution per period

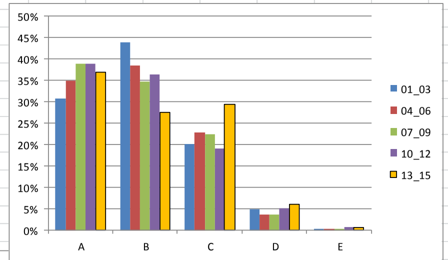
	German Pinscher					Schnauzer					Doberm.					Giant schnauzer black					Boxer				
Period	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
01_03	51%	35%	10%	4%	0%	51%	40%	5%	5%	0%	42%	44%	11%	3%	0%	70%	19%	8%	2%	1%	31%	44%	20%	5%	0%
04_06	53%	38%	9%	0%	0%	46%	39%	14%	2%	0%	45%	35%	16%	3%	1%	60%	25%	11%	4%	0%	35%	39%	23%	4%	0%
07_09	57%	37%	5%	1%	0%	42%	40%	15%	4%	0%	46%	35%	17%	4%	0%	64%	23%	9%	4%	1%	39%	35%	22%	4%	0%
10_12	46%	37%	15%	1%	0%	42%	34%	18%	6%	6%	46%	36%	16%	2%	2%	52%	29%	14%	4%	1%	39%	37%	19%	5%	1%
13_15	37%	32%	21%	10%	0%	33%	42%	21%	4%	0%	49%	29%	18%	6%	0%	49%	32%	17%	4%	0%	37%	27%	29%	6%	1%





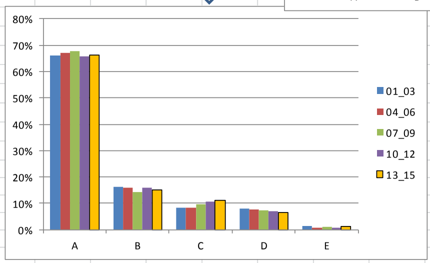


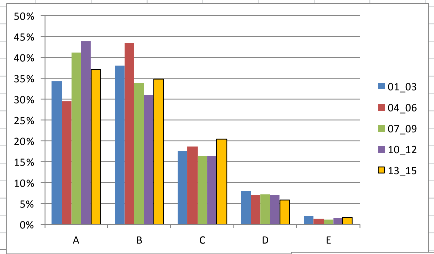


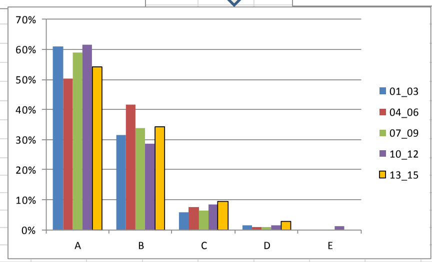


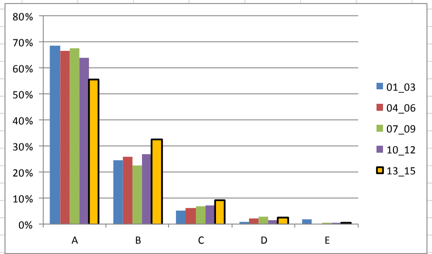
APPENDIX 2, p2

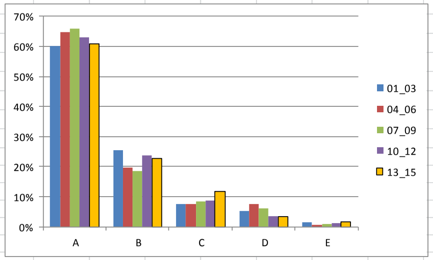
Period	Rottweiler A	Rottweiler B	Rottweiler C	Rottweiler D	Rottweiler E	German Shepherd A	German Shepherd B	German Shepherd C	German Shepherd D	German Shepherd E	Kelpie A	Kelpie B	Kelpie C	Kelpie D	Kelpie E	Austr. Shepherd A	Austr. Shepherd B	Austr. Shepherd C	Austr. Shepherd D	Austr. Shepherd E	Collie lh A	Collie lh B	Collie lh C	Collie lh D	Collie lh E
01_03	66%	16%	8%	8%	1%	34%	38%	18%	8%	2%	61%	32%	6%	2%	0%	69%	25%	5%	1%	2%	60%	26%	7%	5%	2%
04_06	67%	16%	8%	8%	1%	29%	44%	19%	7%	1%	50%	42%	8%	1%	0%	67%	26%	6%	2%	0%	65%	20%	8%	8%	1%
07_09	68%	14%	10%	7%	1%	41%	34%	16%	7%	1%	59%	34%	6%	1%	0%	67%	22%	7%	3%	1%	66%	18%	8%	6%	1%
10_12	66%	16%	11%	7%	1%	44%	31%	16%	7%	2%	62%	29%	8%	2%	1%	64%	27%	7%	2%	1%	63%	24%	9%	4%	1%
13_15	66%	15%	11%	7%	1%	37%	35%	20%	6%	2%	54%	34%	10%	3%	0%	56%	33%	9%	2%	1%	61%	23%	12%	3%	2%





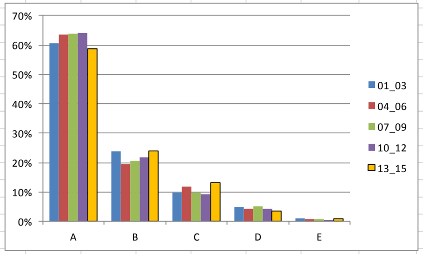


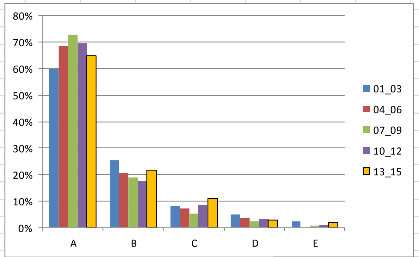


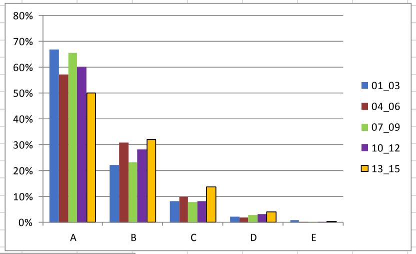


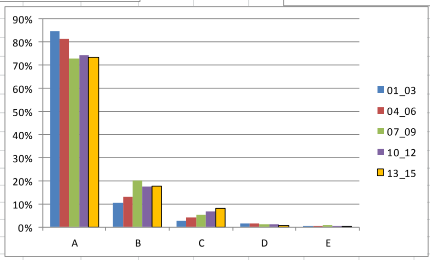
APPENDIX 2, p3

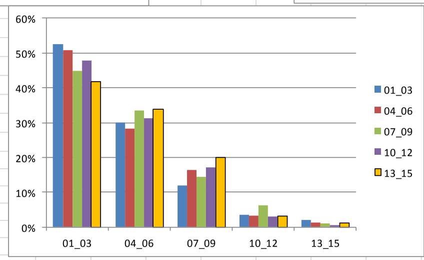
	Labrador retr.					Flatcoat retr.					Hovawart					Danish-Swedish farmdog					NS duck tolling retriever				
Period	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
01_03	61%	24%	10%	5%	1%	85%	11%	3%	2%	0%	60%	25%	8%	5%	2%	53%	30%	12%	3%	2%	66,8%	22,1%	8,3%	2,1%	0,8%
04_06	64%	19%	12%	4%	1%	81%	13%	4%	1%	0%	68%	21%	7%	4%	0%	51%	28%	17%	3%	1%	57,2%	30,9%	9,9%	1,8%	0,3%
07_09	64%	21%	10%	5%	1%	73%	20%	5%	1%	1%	73%	19%	5%	2%	1%	45%	33%	14%	6%	1%	65,7%	23,3%	8,0%	2,8%	0,2%
10_12	64%	22%	9%	4%	1%	74%	17%	7%	1%	0%	70%	18%	9%	3%	1%	48%	31%	17%	3%	1%	60,1%	28,2%	8,3%	3,1%	0,3%
13_15	59%	24%	13%	3%	1%	73%	18%	8%	1%	0%	65%	22%	11%	3%	2%	42%	34%	20%	3%	1%	50,1%	32,1%	13,6%	4,0%	0,1%











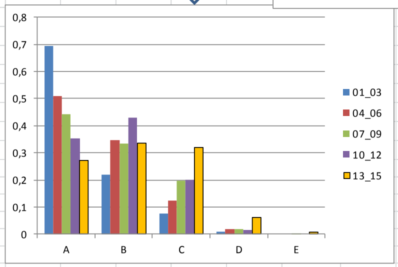
APPENDIX 2, p4

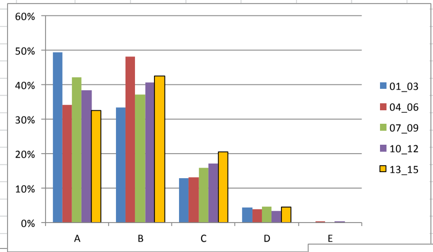
Period	Hamilton hound A	B	C	D	E	Irish s.c. wheaten terrier A	B	C	D	E	Norwegian elkhound grey A	B	C	D	E
01_03	69%	22%	8%	1%	0%	49%	33%	13%	4%	0%	58%	30%	9%	4%	1%
04_06	51%	35%	12%	2%	0%	34%	48%	13%	4%	0%	54%	29%	13%	3%	0%
07_09	44%	33%	20%	2%	0%	42%	37%	16%	5%	0%	62%	24%	10%	3%	0%
10_12	35%	43%	20%	2%	0%	38%	41%	17%	3%	0%	58%	27%	14%	1%	0%
13_15	27%	34%	32%	6%	1%	33%	43%	20%	4%	0%	57%	26%	15%	2%	0%

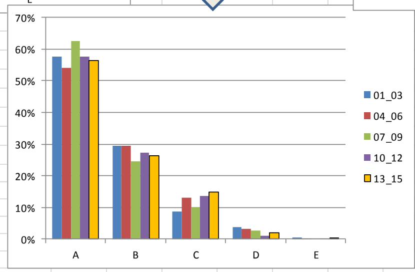
Average 18 breeds

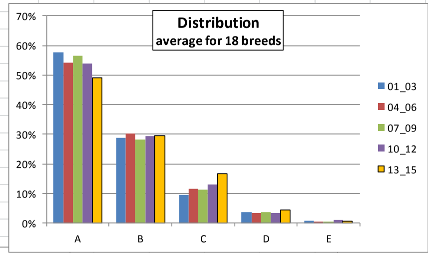
Period	A	B	C	D	E	HD
01_03	58%	29%	9%	3,8%	0,9%	14%
04_06	54%	30%	12%	3,4%	0,4%	16%
07_09	56%	28%	11%	3,8%	0,5%	16%
10_12	54%	29%	13%	3,4%	1,0%	17%
13_15	49%	30%	17%	4,3%	0,6%	22%

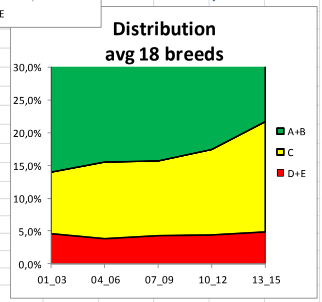
A+B	C	D+E
86%	9%	4,6%
85%	12%	3,8%
85%	11%	4,3%
83%	13%	4,4%
79%	17%	4,9%







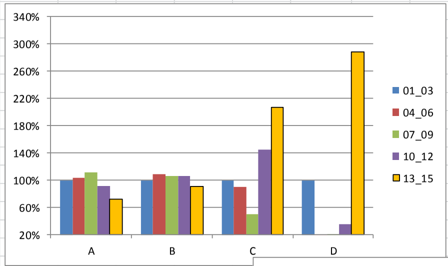


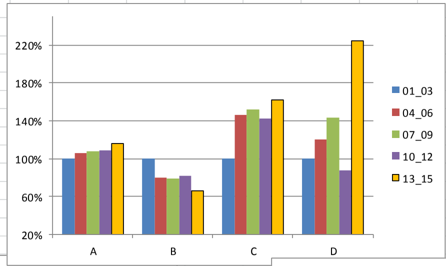


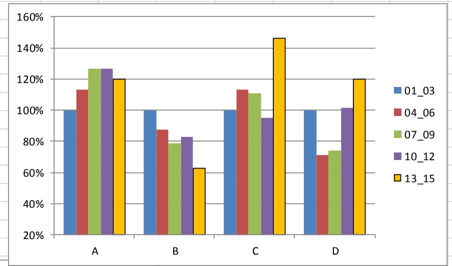
APPENDIX 2, p5

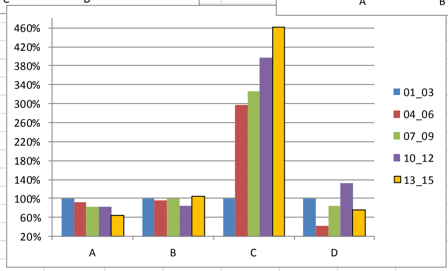
Relative change

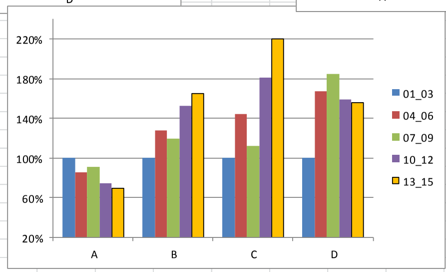
Period	German Pinscher				Schnauzer				Doberm.				Riesen black				Boxer			
01_03	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
04_06	103%	108%	90%	0%	91%	97%	297%	42%	106%	80%	146%	120%	86%	128%	145%	167%	113%	88%	113%	71%
07_09	111%	107%	51%	20%	83%	100%	327%	85%	108%	79%	152%	143%	91%	120%	112%	185%	127%	79%	111%	74%
10_12	91%	106%	145%	35%	83%	84%	397%	132%	109%	82%	143%	88%	75%	153%	181%	159%	127%	83%	95%	101%
13_15	72%	91%	207%	288%	65%	105%	461%	77%	116%	66%	162%	224%	70%	165%	220%	156%	120%	62%	146%	120%





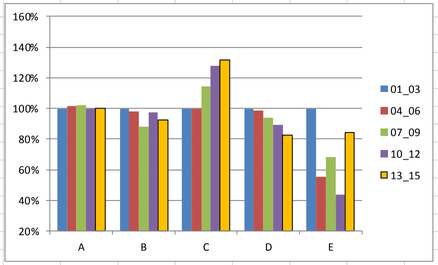


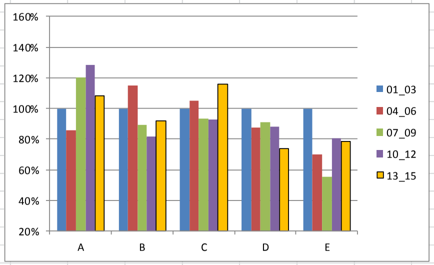


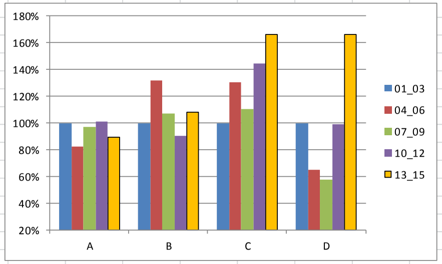


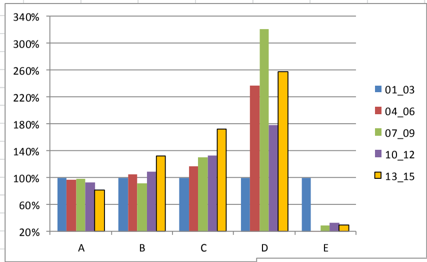
APPENDIX 2, p6

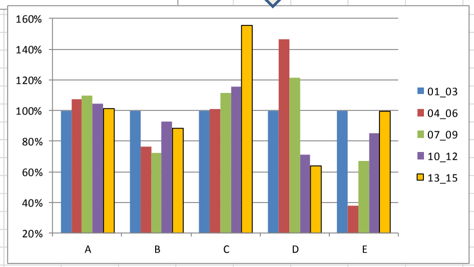
Period	Rottweiler					German Shepherd					Kelpie					Austr. Shepherd					Collie lh				
01_03	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
04_06	102%	98%	100%	98%	55%	86%	115%	105%	88%	70%	83%	132%	130%	65%		97%	104%	116%	238%	0%	107%	77%	101%	146%	38%
07_09	102%	88%	115%	94%	68%	120%	89%	93%	91%	55%	97%	107%	110%	58%		98%	91%	130%	321%	28%	109%	72%	111%	121%	67%
10_12	99%	97%	128%	90%	44%	128%	82%	93%	88%	81%	101%	90%	145%	99%		93%	109%	133%	178%	33%	105%	93%	116%	71%	85%
13_15	100%	93%	132%	82%	84%	108%	92%	116%	74%	78%	89%	108%	166%	166%		81%	132%	172%	258%	30%	101%	88%	155%	64%	99%





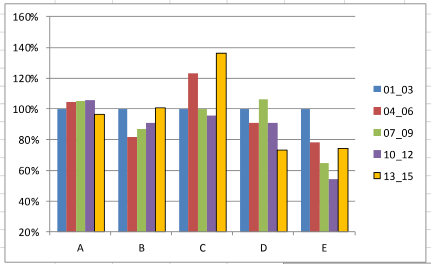


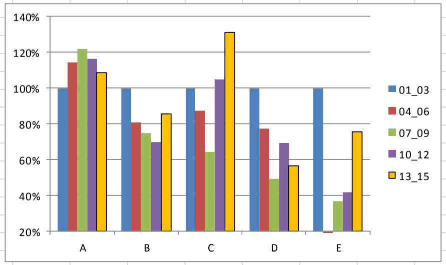


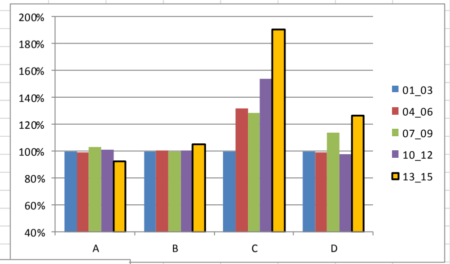


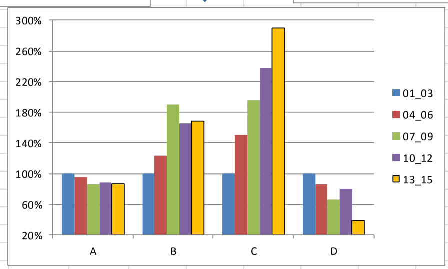
Period	Labrador retr.					Flatcoat retr.					Hovawart					Danish-swedish farmdog				
01_03	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
04_06	105%	82%	123%	91%	78%	96%	123%	150%	86%		115%	81%	87%	77%	0%	96%	94%	140%	97%	63%
07_09	105%	87%	100%	106%	65%	86%	190%	196%	66%		122%	75%	64%	49%	37%	85%	111%	122%	177%	54%
10_12	106%	91%	95%	91%	54%	88%	166%	238%	80%		116%	70%	105%	69%	42%	91%	104%	145%	88%	33%
13_15	97%	101%	136%	73%	74%	87%	168%	290%	39%		108%	86%	131%	57%	75%	79%	112%	170%	93%	63%

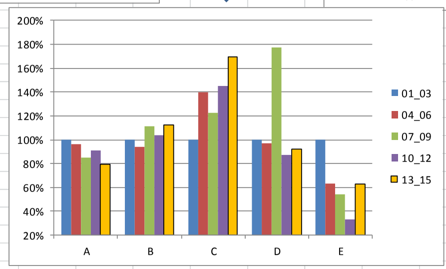
Average 17 breeds, related to period 01-03					
Period	A	B	C	D	E
01_03	100%	100%	100%	100%	
04_06	99%	100%	132%	99%	
07_09	103%	100%	128%	114%	
10_12	101%	101%	154%	98%	
13_15	92%	105%	190%	126%	











APPENDIX 3, p1

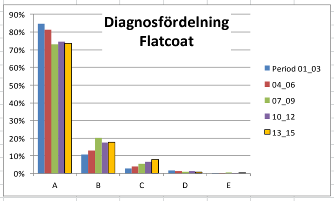
Flatcoat

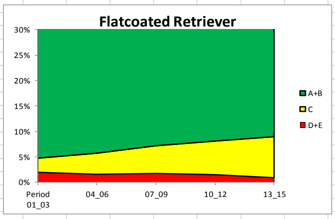
Diagnos	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
HD grad A	397	582	520	605	725	642	528	512	417	356	404	324	352	340	240	221		
HD grad B	52	73	72	68	86	107	110	112	125	117	95	77	82	87	64	43		
HD grad C	24	18	19	19	25	40	32	35	34	27	35	29	32	35	24	29		
HD grad D	15	19	9	5	14	13	6	6	9	4	7	7	5	2	3	2		
HD grad E	8	4	1	2	1	2	1	5		3	1	1	1		1			
Totalt antal unde	496	696	621	699	851	804	677	670	585	507	542	438	472	464	332	295		9149
Snittålder för und	17	17	17	17	17	17	17	18	18	18	18	18	17	17	17	15		
Antal födda	754	992	941	1 077	1 288	1 218	1 106	1 116	992	876	925	756	777	805	606	778		15007
* Se även gamla avläsningssystemet																		
Andel unders	66%	70%	66%	65%	66%	66%	61%	60%	59%	58%	59%	58%	61%	58%	55%	38%		60%
Andel HD	9%	6%	5%	4%	5%	7%	6%	7%	7%	7%	8%	8%	8%	8%	8%	11%		
Kvalitetstal	4,64	4,74	4,77	4,82	4,79	4,71	4,71	4,67	4,62	4,62	4,65	4,63	4,65	4,65	4,62	4,64		
Kvaliitetsindex	0,98	1,00	1,01	1,02	1,01	0,99	0,99	0,99	0,98	0,97	0,98	0,98	0,98	0,98	0,98	0,98		

	HD	Rel Per 1	K-tal	K-index	Unders	A	B	C	D	E
Period 01_03	5%	100%	4,78	100%	672	85%	11%	3%	2%	0%
04_06	6%	121%	4,74	99%	777	81%	13%	4%	1%	0%
07_09	7%	147%	4,64	97%	587	73%	20%	5%	1%	1%
10_12	8%	171%	4,64	97%	484	74%	17%	7%	1%	0%
13_15	9%	188%	4,64	97%	364	73%	18%	8%	1%	0%

A+B	C	D+E
95%	3%	2%
94%	4%	2%
93%	5%	2%
92%	7%	2%
91%	8%	1%

01_05	5%
06_10	7%
11_15	9%





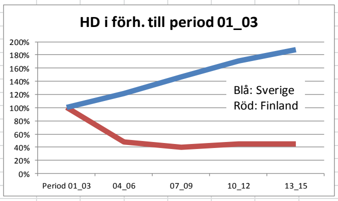
Föräldradjur

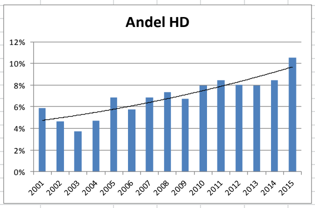
Kombinationer		Kullar födda 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
HD grad A	HD grad A		2	7	29	64	84	82	98	85	79	90	62	51	48	53	50	47
HD grad A	HD grad B			1	8	12	14	23	33	31	21	27	28	44	35	16	43	22
HD grad A	HD ua	5	19	37	58	55	35	12	4	4	3	1	1		1			
HD ua	HD ua	83	83	49	34	13	2	1										
HD grad B	HD grad B							1		3	2		4	4	8	3		8
HD grad B	HD ua		2	3	5	5	5	2	2				1			1		
HD grad C	HD ua						1											
HD grad D	HD ua				1													
HD grad A	HD grad C					1					1							
okänt	HD grad A		5	7	3	7	10	16	7	6	8	8	10	6	8	6	5	14
okänt	HD grad B			1		2		2			2	1		3	4	5	1	1
okänt	HD ua	16	18	21	6	4	2											
okänt	okänt	1	2			1	1	2							1			
	Totalt antal	105	131	126	144	164	154	141	144	129	116	127	106	108	105	84	99	92
	Andel fria	84%	81%	77%	93%	91%	91%	86%	95%	95%	91%	93%	91%	92%	88%	87%	94%	84%

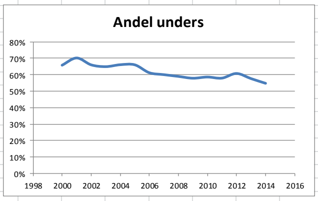
OBS! Utländska röntgenresultat ligger i många fall under "okänt", vilket innebär att andelen HD-fria parningar är högre än vad som framgår av tabellen

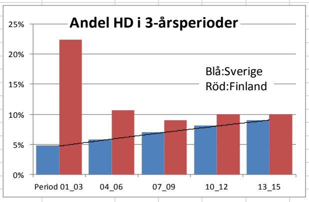
År	Examinerad	A	B	C	D	E	HD
2000	63%	46%	37%	13%	4%	0%	17%
2001	79%	54%	24%	16%	5%	0%	21%
2002	73%	45%	27%	22%	6%	0%	28%
2003	76%	50%	32%	15%	3%	0%	18%
2004	70%	60%	25%	11%	4%	0%	15%
2005	75%	60%	33%	6%	1%	0%	7%
2006	74%	60%	30%	7%	3%	0%	10%
2007	68%	59%	29%	9%	3%	0%	12%
2008	75%	72%	21%	6%	1%	0%	7%
2009	70%	76%	16%	6%	2%	0%	8%
2010	70%	58%	29%	11%	2%	0%	13%
2011	66%	67%	25%	7%	1%	0%	8%
2012	69%	66%	25%	8%	1%	0%	9%
2013	73%	72%	22%	3%	2%	1%	6%
2014	62%	63%	30%	5%	2%	0%	7%
2015	42%	47%	36%	13%	4%	0%	17%
Sammanlagt	69%	61%	27%	9%	3%	0%	12%

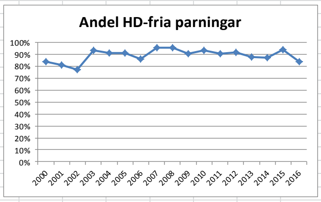
Period		Re per 1
01_03	22%	100%
04_06	11%	48%
07_09	9%	40%
10_12	10%	45%
13_15	10%	45%







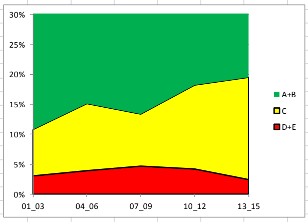


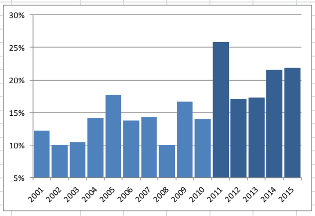


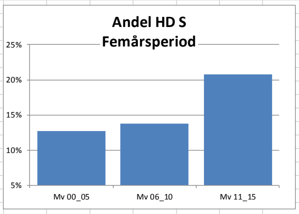
APPENDIX 3, p2

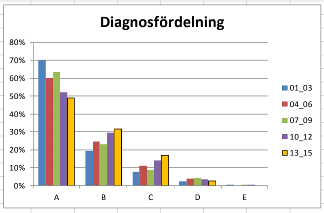
Riesen S	Diagnos	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Sum	Mv 01_14
	HD grad A	94	85	112	101	81	61	73	71	71	48	48	30	34	40	26	14		
	HD grad B	24	23	23	36	28	27	33	19	28	22	26	13	24	27	14	11		
	HD grad C	11	8	11	14	14	13	13	11	8	7	10	11	9	12	9	7		
	HD grad D	4	5	3	2	4	6	4	4	3	6	2	3	3	2	2			
	HD grad E	1	2	1							1		1						
	Totalt antal unde	134	123	150	153	127	107	123	105	110	84	86	58	70	81	51	32	1594	
	Snittålder för un	21	19	22	21	22	20	20	20	20	20	21	22	19	20	18	15		
	Antal födda	237	265	255	260	234	222	197	174	193	132	131	118	116	143	93	124		
	Andel unders	57%	46%	59%	59%	54%	48%	62%	60%	57%	64%	66%	49%	60%	57%	55%	26%		57%
	Andel HD	12%	12%	10%	10%	14%	18%	14%	14%	10%	17%	14%	26%	17%	17%	22%	22%		
	Andel HD	12%	12%	10%	10%	14%	18%	14%	14%	10%	17%	14%							
	Kvalitetstal	4,54	4,50	4,61	4,54	4,46	4,34	4,42	4,50	4,52	4,31	4,40							
													26%	17%	17%	22%	22%		
													4,17	4,27	4,30	4,25	4,22		
	Kvalitetsindex	1,01	1,00	1,03	1,01	0,99	0,96	0,98	1,00	1,00	0,96	0,98	0,93	0,95	0,96	0,95	0,94		

Andel HD	Mv 01_10	13%													
Andel HD S	Mv 11_15	21%													
	Mv 00_05	13%													
	Mv 06_10	14%													
	Mv 11_15	21%													
		HD	Rel per 1	Unders	A	B	C	D	E			A+B	C	D+E	
Period 1	01_03	11%	100%	426	70%	19%	8%	2%	1%	100%		89%	8%	3%	
	04_06	15%	140%	357	60%	25%	11%	4%	0%	100%		85%	11%	4%	
	07_09	14%	125%	299	64%	23%	9%	4%	0%	100%		87%	9%	5%	
	10_12	19%	174%	214	52%	29%	14%	4%	0%	100%		82%	14%	4%	
	13_15	20%	186%	164	49%	32%	17%	2%	0%	100%		80%	17%	2%	
Kvalitetstal	Mv 01_10	4,46													
Kvalitetstal	Mv 11_15	4,24													







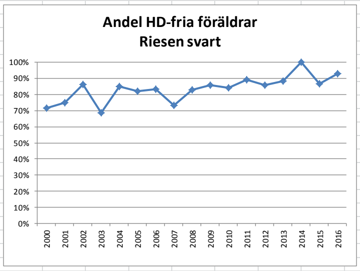


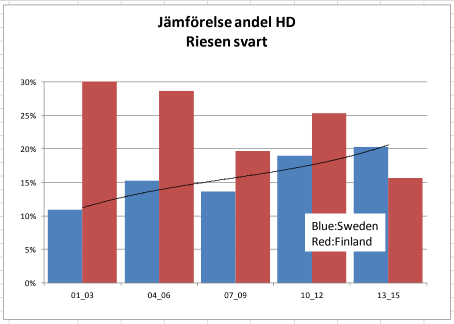
Föräldradjur		Kullar födda																
Kombinationer		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
HD grad A	HD grad A			7	6	5	10	12	10	10	8	11	4	5	6	8	5	5
HD grad A	HD grad B		2	1	1	5	9	9	10	11	9	4	10	4	6	4	7	6
HD grad A	HD ua	3	7	11	14	14	2	1	2									1
HD grad B	HD grad B				1	1		1		3	1	1	2	3	3	1	1	1
HD ua	HD ua	21	21	9	3	2	2											
HD grad B	HD ua	1		3	1	1		2										
HD grad C	HD ua	1																
okänt	HD grad A		3	2	6	4	3	2	5	4	3	3	1	1	1			1
okänt	HD grad B						1	2	2	1			1	1			1	
okänt	HD grad C														1			
okänt	HD ua	8	6	3	5	1	1		1									
okänt	okänt	1	1		1			1										
HD grad B	HD grad C																1	
Antal parn		35	40	36	38	33	28	30	30	29	21	19	18	14	17	13	15	14
Andel fria		71%	75%	86%	68%	85%	82%	83%	73%	83%	86%	84%	89%	86%	88%	100%	87%	93%

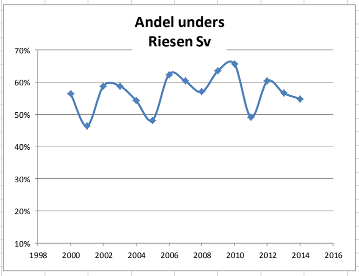
OBS! Utländska röntgenresultat ligger i många fall under "okänt", vilket innebär att andelen HD-fria parningar är högre än vad som framgår av tabellen

Data: KoiraNet

År	Examinerad	A	B	C	D	E	HD	Period	Mv	Re per 1
2000	55%	34%	30%	24%	12%	0%	36%	01_03	36%	100%
2001	53%	38%	25%	23%	14%	0%	37%	04_06	29%	79%
2002	51%	28%	35%	28%	9%	0%	37%	07_09	20%	54%
2003	66%	36%	29%	30%	5%	0%	35%	10_12	25%	70%
2004	69%	43%	32%	18%	7%	0%	25%	13_15	16%	43%
2005	50%	51%	24%	18%	7%	0%	25%			
2006	68%	32%	32%	30%	6%	0%	36%			
2007	63%	51%	29%	17%	3%	0%	20%			
2008	63%	46%	34%	16%	4%	0%	20%			
2009	60%	54%	28%	14%	5%	0%	19%			
2010	69%	46%	31%	17%	6%	0%	23%			
2011	70%	46%	28%	24%	3%	0%	27%			
2012	64%	37%	37%	20%	5%	1%	26%			
2013	60%	42%	35%	15%	8%	0%	23%			
2014	54%	45%	37%	13%	5%	0%	18%			
2015	29%	56%	38%	6%	0%	0%	6%			
Sammanlagt	59%	43%	31%	20%	6%	0%	26%			





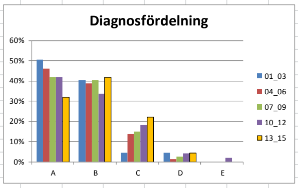


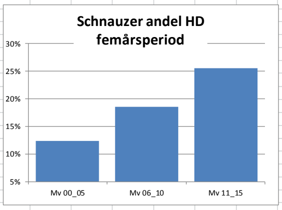
APPENDIX 3, p3

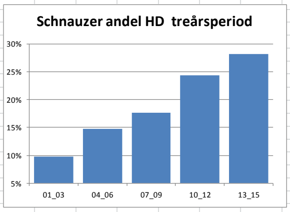
Schnauzer	Diagnos	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Sum	Mv 01_14
	HD grad A	35	18	23	47	31	36	41	32	31	18	23	24	15	12	13	4		
	HD grad B	17	21	20	29	27	31	33	25	21	32	9	23	18	17	14	7		
	HD grad C	9	3	3	2	8	11	13	8	9	12	7	9	11	4	11	5		
	HD grad D	1	1	4	3		2	1	3		2	3	3		1	1	2		
	HD grad E												3						
	Totalt antal und	62	43	50	81	66	80	88	68	61	64	42	62	44	34	39	18	902	
	Snittålder för ur	21	25	20	18	23	19	20	20	22	23	22	23	22	18	19	15		
	Antal födda	253	183	187	223	267	263	284	210	234	182	186	209	183	156	149	142	3311	
	* Se även gamla avläsningssystemet																		
	Andel unders	25%	23%	27%	36%	25%	30%	31%	32%	26%	35%	23%	30%	24%	22%	26%	13%		28%
	Andel HD	16%	9%	14%	6%	12%	16%	16%	16%	15%	22%	24%	24%	25%	15%	30%	33%		
	Andel HD	16%	9%	14%	6%	12%	16%	16%	16%	15%	22%								
	Kvalitetstal	4,39	4,30	4,24	4,48	4,35	4,26	4,30	4,26	4,36	4,03								
												24%	24%	25%	15%	31%	39%		
												4,24	4,00	4,09	4,18	4,00	3,72		
	Kvalitetsindex	1,02	1,00	0,99	1,04	1,01	0,99	1,00	0,99	1,01	0,94	0,99	0,93	0,95	0,97	0,93	0,87		

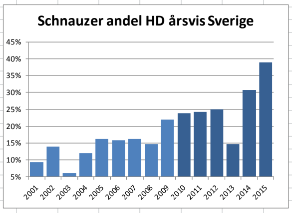
Andel HD	Mv 01_10	14%			
Andel HD S	Mv 11_15	27%			
	Mv 00_05	12%			
	Mv 06_10	19%			
	Mv 11_15	25%			
			Rel per 1	K-tal	K-index
Period 1	01_03	10%	100%	4,34	100%
	04_06	15%	150%	4,30	99%
	07_09	18%	179%	4,22	97%
	10_12	24%	248%	4,11	95%
	13_15	28%	286%	3,97	91%
Kvalitetstal	Mv 01_10	4,29			
	Mv 11_15	4,00			

Period	A	B	C	D	E
01_03	51%	40%	5%	5%	0%
04_06	46%	39%	14%	1%	0%
07_09	42%	40%	15%	3%	0%
10_12	42%	34%	18%	4%	2%
13_15	32%	42%	22%	4%	0%









Föräldradjur		Kullar födda																
Kombinationer		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
HD grad A	HD grad A		3	3	6	5	6	6	6	12	7	9	7	5	6	7		5
HD grad A	HD grad B		2	1	5	13	20	12	7	10	9	11	14	10	6	9	11	8
HD ua	HD ua	27	6	7	1													
HD grad A	HD ua	2	4	2	5	3		1										
HD grad B	HD grad B	1		2	2	6	9	6	5	5	4	6	6	6	5	3	3	6
HD grad B	HD ua		5	2	3		1											
HD grad A	HD grad C		1									1						
HD grad D	HD grad D																	1
okänt	HD grad A	2	2	2	7	5	3	8	4	1	5		2	3		2	4	2
okänt	HD grad B		1	2		6	1	5	7	6	2	2	2	2	7	2	2	2
okänt	HD grad C	1			1			1	1								1	
okänt	HD ua	6	4	4	4	3	2											
okänt	okänt	1	1	3	1	2		2	1	1								
Antal parn		40	29	28	35	43	42	41	31	35	27	29	31	26	24	23	21	24
Andel fria		75%	69%	61%	63%	63%	86%	61%	58%	77%	74%	90%	87%	81%	71%	83%	67%	79%

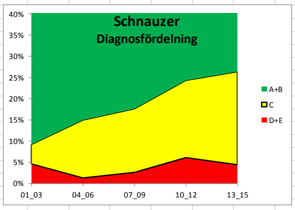
01_03	04_06	07_09	10_12	13_15
64%	70%	70%	86%	74%
36%	30%	30%	14%	26%

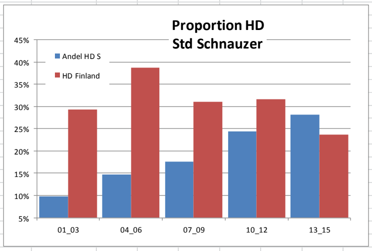
OBS! Utländska röntgenresultat ligger i många fall under "okänt", vilket innebär att andelen HD-fria parningar är högre än vad som framgår av tabellen

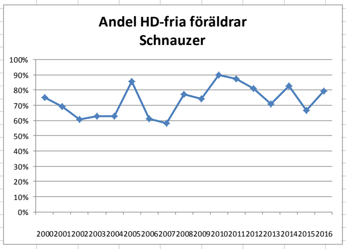
Data KoiraNet

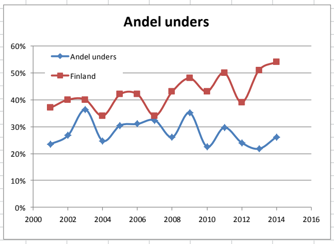
År	Examinerad	A	B	C	D	E	HD	Period	Mv	Re per 1
2000	34%	27%	45%	14%	14%	0%	28%	01_03	29%	100%
2001	37%	36%	30%	28%	6%	0%	34%	04_06	39%	132%
2002	40%	43%	38%	19%	0%	0%	19%	07_09	31%	106%
2003	40%	34%	30%	26%	9%	0%	35%	10_12	32%	108%
2004	34%	35%	33%	31%	2%	0%	33%	13_15	24%	81%
2005	42%	20%	36%	30%	14%	0%	44%			
2006	42%	28%	32%	30%	5%	4%	39%			
2007	34%	22%	53%	20%	6%	0%	26%			
2008	43%	40%	30%	23%	5%	1%	29%			
2009	48%	44%	18%	33%	3%	2%	38%			
2010	43%	43%	30%	23%	4%	0%	27%			
2011	50%	24%	35%	29%	12%	0%	41%			
2012	39%	21%	52%	27%	0%	0%	27%			
2013	51%	32%	50%	18%	0%	0%	18%			
2014	54%	31%	33%	27%	9%	0%	36%			
2015	9%	42%	42%	17%	0%	0%	17%			
Sammanlagt	40%	32%	36%	25%	6%	0%	31%			

Period	A+B	C	D+E
01_03	91%	5%	5%
04_06	85%	14%	1%
07_09	82%	15%	3%
10_12	76%	18%	6%
13_15	74%	22%	4%









APPENDIX 4.

	Andel hundar med A eller B av totalantalet röntgade							Skillnad
Ras	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	*2017*	**2016-2013**
norsk älghund grå	0,88	0,86	0,82	0,78	0,79	0,75	*0,78*	**-0,07**
irish softcoated wheaten terrier	0,81	0,73	0,78	0,68	0,71	0,61	*0,94*	**-0,17**
bearded collie	0,88	0,90	0,83	0,78	0,82	0,77	*0,88*	**-0,06**
australian shepherd	0,91	0,90	0,90	0,89	0,85	0,83	*0,92*	**-0,07**
riesenschnauzer	0,84	0,79	0,82	0,73	0,82	0,70	*0,61*	**-0,12**
nova scotia duck tolling retriever	0,88	0,89	0,88	0,83	0,83	0,78	*0,79*	**-0,10**
portugisisk vattenhund	0,82	0,73	0,83	0,83	0,81	0,68	*0,78*	**-0,15**
shetland sheepdog	0,83	0,78	0,87	0,84	0,78	0,70	*0,76*	**-0,17**
alaskan malamute	0,84	0,81	0,86	0,82	0,82	0,73	*1,00*	**-0,13**
cocker spaniel	0,84	0,83	0,91	0,79	0,84	0,74	*0,73*	**-0,17**
hamiltonstövare	0,73	0,84	0,77	0,77	0,65	0,56	*0,61*	**-0,21**
leonberger	0,81	0,76	0,77	0,82	0,71	0,70	*0,79*	**-0,07**
doberman	0,75	0,81	0,82	0,80	0,72	0,63	*0,69*	**-0,19**
pudel mellan, dvärg, toy	0,70	0,67	0,67	0,65	0,63	0,58	*0,70*	**-0,09**
finsk stövare	0,82	0,78	0,80	0,76	0,82	0,75	*0,72*	**-0,05**
finsk lapphund	0,71	0,70	0,69	0,69	0,62	0,60	*0,66*	**-0,09**
hovawart	0,86	0,80	0,91	0,86	0,86	0,81	*0,68*	**-0,10**
labrador	0,83	0,86	0,84	0,82	0,82	0,77	*0,77*	**-0,07**
boxer	0,69	0,73	0,71	0,68	0,59	0,59	*0,63*	**-0,12**
border collie	0,83	0,84	0,87	0,84	0,83	0,78	*0,84*	**-0,09**
welsh springer spaniel	0,82	0,79	0,77	0,81	0,76	0,77	*0,62*	**0,00**
tysk schäferhund	0,73	0,73	0,77	0,72	0,71	0,66	*0,65*	**-0,11**
korthårig vorsteh	0,92	0,96	0,97	0,98	0,92	0,90	*0,97*	**-0,07**
perro de agua espagnol	0,75	0,80	0,78	0,82	0,68	0,69	*0,61*	**-0,09**
samojedhund	0,76	0,81	0,77	0,73	0,69	0,71	*0,71*	**-0,06**
belgisk vallhund, malinois	0,85	0,90	0,94	0,91	0,87	0,82	*0,91*	**-0,12**
flatcoated retriever	0,90	0,94	0,91	0,90	0,90	0,88	*0,85*	**-0,03**
jämthund	0,90	0,91	0,88	0,91	0,91	0,88	*0,87*	**0,00**
collie långhårig	0,83	0,87	0,84	0,83	0,81	0,80	*0,91*	**-0,04**
rhodesian ridgeback	0,89	0,93	0,92	0,90	0,90	0,87	*0,87*	**-0,05**
dansksvensk gårdshund	0,71	0,78	0,80	0,74	0,80	0,67	*0,74*	**-0,13**
berner sennen	0,76	0,79	0,81	0,75	0,77	0,73	*0,75*	**-0,08**
golden retriever	0,72	0,75	0,75	0,74	0,73	0,69	*0,73*	**-0,06**
american staffordshire terrier	0,35	0,35	0,33	0,35	0,26	0,29	*0,26*	**-0,04**
engelsk springer spaniel	0,85	0,82	0,84	0,86	0,88	0,84	*0,87*	**0,00**
eurasier	0,85	0,93	0,89	0,86	0,84	0,84	*0,81*	**-0,05**
rottweiler	0,79	0,80	0,82	0,82	0,78	0,78	*0,67*	**-0,04**
cane corso	0,62	0,64	0,57	0,53	0,58	0,61	*0,52*	**0,04**
lagotto	0,66	0,69	0,69	0,71	0,67	0,66	*0,74*	**-0,03**
wachtelhund	0,85	0,84	0,87	0,85	0,88	0,85	*0,88*	**-0,02**
östsibirisk lajka	0,96	0,96	0,97	0,98	0,99	0,96	*1,00*	**-0,01**
pudel stor	0,84	0,85	0,86	0,82	0,87	0,86	*1,00*	**0,00**
staffordshire bullterrier	0,51	0,62	0,58	0,58	0,50	0,57	*0,60*	**-0,01**
strävhårig vorsteh	0,80	0,86	0,88	0,83	0,87	0,84	*0,72*	**-0,04**
irländsk röd setter	0,66	0,69	0,74	0,73	0,73	0,75	*0,72*	**0,01**
Genomsnitt per år	**0,79**	**0,80**	**0,81**	**0,78**	**0,77**	**0,73**	**0,76**	-0,07
Förändring sedan föregående år		+0,01	+0,01	-0,03	-0,02	-0,03	*+0,03 OBS få värden/ras*	

Urvalskriterium: Minst ca 65 röntgade per år. Tidsreferens: Undersökningsår.

En förväntad (?) uppgång (0,01 per år) i början av perioden, men vad händer sedan?
Efter 2013 går det utför; 39 av de 45 raserna har färre A+B hundar 2016 jämfört med 2013!
Endast två raser har gått framåt 2013–2016; cane corso (+0,04) och irländsk röd setter (+0,01)
I genomsnitt har andelen A+B hundar sjunkit med 0,08 (från 81% till 73%) från 2013 till 2016!
Hur mycket av detta beror på genetik och hur mycket beror på datainsamling?