

EVALUATING THE IMPORTANCE OF THE STALLION SCYRIS IN THE BREEDING OF THE CZECH WARMBLOOD

ZUZANA KUBIKOVA, IVA JISKROVA

Department of Animal Breeding

Mendel University in Brno

Zemedelska 1, 613 00 Brno

CZECH REPUBLIC

x.kubiko6@mendelu.cz

Abstract: The aim of this thesis was to evaluate the importance of the stud stallion Scyris in the breeding of the Czech Warmblood. To evaluate the stud horse we used his offspring born in the years 2011–2016. Two underlying databases were then created in the programme Microsoft Office Excel 2007. The first was used to assess linear regression and the second to assess correlation using the Pearson correlation coefficient. On the basis of aggregate statistics from these measurements, it can be stated that the dams are unbalanced in exterior terms, and stallion 606 Scyris (POL) did not completely succeed in balancing out this variability in his daughters. In the next step, the correlation dependence of individual body measurements was assessed in daughters and dams. It was determined that there is medium correlation dependence between the attributes TWH (tape withers height), SWH (stick withers height) and CBC (cannon bone circumference), so it can be said that the influence of dams on the bone mass and withers height of daughters is probable but is not conclusive. With the attribute ChC (chest circumference) low correlation dependence between dams and daughters was recorded. This suggests that the dams have a lesser influence on the bulkiness of daughters. When assessing the linear regression, we recorded a decreasing tendency of the regression coefficient with regard to offspring class which exhibits 16% reliability and according to our test emerges as statistically conclusive. So the assessed class of daughters of the sire 6062 Scyris (POL) does not improve – on the contrary, it decreases slightly. A high value for the downward trend was recorded with the jump index of the dams and is documented by 21.66% reliability. Our test emerged as highly statistically conclusive and we can conclude that the mares mated with stallion 6062 Scyris (POL) stallions are, in the course of years, breeders selected for lesser quality mares.

Key words: Czech Warmblood, Thoroughbred, stallion, offspring

INTRODUCTION

The main aim of this thesis was to evaluate the importance of the stud horse 6062 Scyris (POL), which belongs to the English Thoroughbred breed, in the breeding of the Czech Warmblood.

His importance in breeding was evaluated by performing a comparison of his 48 descendants, where we assessed and compared their exterior variability and the variability of the mated dams. The next step in evaluating the offspring was to carry out linear regression, correlation between the dams and daughters, and comparison of offspring colour with the aim of determining whether stallion 6062 Scyris (POL) carries a certain gene that influences colouring.

At present, the main point of breeding horses is to create a high-quality partner for sporting and recreational purposes. Sporting performance has become one of the main assessment criteria in the breeding of horses. The aim of improving individual breeds is to create the best possible athlete for the type of competition for which the breed is destined. This makes the correct choice of horses for breeding very important.

Horse breeding very often involves crossing different breeds, which serves to mate individuals with a different genotype with the aim of creating new breeds (known as “an infusion of blood”) and is used mainly with warmbloods to improve or refine their build.

Characteristics of the Czech Warmblood breed

Dušek (2011) states that the rather variable conformation and the existence of quite a diverse range of colours are due to the relatively short period of improvement and the number of breeds used.

The Association of Czech Warmblood Breeders, which is in charge of the breed registry in the Czech Republic, defines the breeding objective in its breeding programme and rules thus: The aim of improving the Czech Warmblood is to produce a noble, sound and easy-to-ride horse whose temperament, character, spacious and elastic mechanics of movement, and sound health make it suitable for all types of performance-related equestrian sport within the FEI disciplines as well as for leisure activities.

The adult horse has a medium body frame with good lines, a solid foundation and no obvious or genetically determined faults or diseases (SCHČT 2017).

Table 1 Body measurements according to the standard for the Czech Warmblood

Body measurements	Mares	Stallions
Stick withers height (cm)	161–167	162–170
Cannon bone circumference (cm)	19.5–22	21–22.5

(SCHČT 2017)

Characteristics of the English Thoroughbred breed

As Koubek et al. (1957) state, the forms of the English Thoroughbred are sometimes quite divergent.

According to Hermsen (2002), the Thoroughbred is a generally noble and elegantly built horse.

Schmiedová (2012) then states that the English Thoroughbred is now very different in outward appearance from the horses from which it originated. It has a medium to large, rectangular frame. This was achieved through selecting the fastest individuals for breeding purposes. The average height of the English Thoroughbred is now around 160 cm measured by stick.

Edwards (1992) writes that the head of the English Thoroughbred is noble, dry and very fine and the profile is straight. The cheeks must not be fleshy or the jaw coarse. The ears are fairly long and very mobile.

According to Hermsen (2002), the neck is long and slightly arched and passes into pronounced withers.

Schmiedová (2012) states that the chest must be capacious in order to allow for sufficient development of the heart and lungs.

According to Dušek (2011), the top line is relatively long, straight and well linked. The hindquarters are long, sloping and muscular; according to Edwards (1998), they must be strong, because they provide the strength required for speed.

Edwards (1998) describes the shoulder blade of the English Thoroughbred as long and angled. In combination with the pronounced withers, it determines the long, low and economical movement.

The cannon bone of the English Thoroughbred is relatively short and strong enough to support the body at high speeds. The strength of the cannon bone is genetically determined, but its firmness is influenced by the conditions of rearing and training. The pastern is relatively long and should be sufficiently firm and flexible with the correct bend. The hooves should, of course, be regular (Schmiedová 2012).

The colouring of the English Thoroughbred is also very variable. The most frequent colours are bay, brown, chestnut, black and grey. It can very often be found with markings, both on the head and on the limbs (Stead 2015).

Berns (2001) writes that the English Thoroughbred is a horse born for speed.

Zuda (1969) cited in Byrtusová (2007), states that a constant property acquired through the environment is early maturity. It is the earliest maturing breed. The most characteristic property is its hard constitution, expressed by its respiratory system, disproportionately spirited temperament and

generally high responsiveness of the nervous system, which mainly comes into play during performance.

Importance of the English Thoroughbred in breeding warmblood sporting breeds

Kopecký et al. (1977) state that because of its outstanding qualities the English Thoroughbred was used to improve other breeds of horses or directly contributed to their creation. Due to the spacious mechanics of movement of the hard constitution and exterior, the English Thoroughbred became the corrector of the properties of a large proportion of other warmblood utility types and breeds.

Hanušová (2007) cited in Müllerová (2010), claims that even today warmblood breeding still needs to be improved; otherwise, as a result of the stronger influence of the dam's genetic potential, it will gradually revert to the original heavier working type. The negative aspects which the Thoroughbred often brings to breeding are: poor foundation; insufficient mechanics of movement in walk and trot; small, undistinguished joints; excessive sensitivity, nervousness, etc.

Specific aspects of selecting an English Thoroughbred suitable for improving the Czech Warmblood

Zelník et al. (1958) write that breeding stallions are correctors of breeding material in local breeding, which is why they must always have more perfect conformation than mares. The chosen stallion must above all be suitable for the relevant area in which he is to be used for breeding. His origins should be such as to improve the quality of breeding in this area. A newly classified breeding stallion intended for improvement should not have exterior or character flaws which are already present in the breed.

An important aspect which needs to be taken into account is that the English Thoroughbred's influence on offspring in warmblood breeding is very individual. This is particularly true with regard to individual heredity from the stallion. With a certain type of mare or even just with a certain breed, only some stud horses will assert their influence.

MATERIAL AND METHODOLOGY

Selection of offspring by the stud horse in question

The underlying database was created using data published on the internet site of the Association of Czech Warmblood Breeders. On this website we determined that in the years 2011–2016 a total of 48 foals born by the breeding stallion 6062 Scyris (POL) were recorded in the breed registry for the Czech Warmblood. All the data available there were then used to create the database and statistics. For ease of reference we created tables and graphs expressing the number and percentage of foals by sex in the given years and the distribution of offspring by sex.

Database creation and selection of a suitable statistical processing method

The database of offspring was created in the programme Microsoft Office Excel 2007. The data acquired were then processed using the Pearson correlation coefficient and the linear regression function in the programme UNISTAT 6.5.

Selection of characteristics for evaluating the offspring of stallion 6062 Scyris (POL)

The underlying database for evaluating linear regression includes the following data for each horse: name, sex, year of birth, colour, class, jump index, dam's name, dam's colour, dam's class, dam's breed, year of birth, jump index, damsire's name, damsire's colour, damsire's class, damsire's breed, damsire's year of birth, damsire's jump index.

We observed how the class of all 48 descendants changes dependent on their year of birth. We also observed a change in the dependence of the class of the 14 assessed daughters on their year of birth. We then evaluated how the dependence of the jump index of the 48 descendants' dams on their year of birth changes. And finally we evaluated the change in the dependence of the class of the 48 descendants' dams on their year of birth.

We evaluated the Scyris stallion on the basis of 48 offspring who are enrolled in the breed book of the Czech warmblood. In a linear regression, we evaluated Scyris's offspring according to their year

of birth in order to take into account the external environmental influences that did not affect the genotype acquired by the father, however, it would affect the phenotypic expression of the sign.

The underlying database for evaluating the Pearson correlation coefficient includes the following data for each horse: descendant's name, descendant's SWH, descendant's TWH, descendant's ChC, descendant's CBC, dam's name, dam's SWH, dam's TWH, dam's ChC, dam's CBC.

RESULTS AND DISCUSSION

Characteristics of the comparative base

The database contains 48 descendants of the stallion 6062 Scyris (POL) which were born in the years 2011–2016, although no foals were born in a Czech Warmblood stud farm in 2015. The reason for this is that in 2014 the stallion was acting as a stud horse in Germany. The stallion 6062 Scyris (POL) was most favoured by Czech Warmblood breeders in the year 2013. There was then a decline in the rate of his offspring in the years that followed.

Monitoring variability in mated dams and their offspring

The class and basic measurements were determined for 14 daughters of 6062 Scyris (POL) and their dams. These measurements were then used to evaluate the minimum, maximum and mean values. The mean values obtained were then rounded off in accordance with the standard recording of body measurements in horses, where the cannon bone circumference (CBC) is rounded off to one decimal place and the remaining values (chest circumference – ChC, stick height at withers – SWH, tape height at withers – TWH) were rounded off to whole numbers. The mean values of the dams and daughters were then compared, and according to the results it can be stated that:

- average SWH value of daughters (164 cm) is the same as in dams (164 cm)
- average TWH value of daughters (173 cm) is 2 cm lower than in dams (175 cm)
- average ChC value of daughters (190 cm) is 6 cm lower than in dams (196 cm)
- average CBC value of daughters (20.4 cm) is 0.6 cm lower than in dams (21.2 cm)

From this we concluded that stallion 6062 Scyris (POL) reduces the shin circumference of his daughters, which is demonstrated by the lower CBC values for daughters than is the case with the dams. Which is undesirable for the breeding of the Czech warmblood, according to a member of the studbook.

Table 2 Of variability basic body measurements from aggregate statistics

	SWH of daughter	TWH of daughter	ChC of daughter	CBC of daughter	SWH of dam	TWH of dam	ChC of dam	CBC of dam
Diameter	164,071	173,357	190,214	20,414	164,142	175,214	195,714	21,200
Dispersion	18,071	17,478	43,565	0,349	18,285	17,873	71,912	0,650
Standard deviation	4,251	4,180	6,600	0,590	4,276	4,227	8,480	0,806
Variation coefficient	0,025	0,024	0,034	0,028	0,026	0,024	0,043	0,038

After establishing the variability from aggregate statistics, we determined that dams and their daughters are highly variable, which is confirmed both by the values of the variation coefficient and by the values of variance and standard deviation. This variability can be seen most clearly with the values ChC of daughter and ChC of dam. The values obtained confirm that the stud horse 6062 Scyris (POL) did not level out the variability in the properties of the mated mares, as the breed's advice wanted to.

Correlation

According to the correlation dependence of individual body measurements in daughters and dams, it was determined that there is medium correlation dependence between the attributes TWH, SWH and CBC, and according to this finding it can be stated that the influence of dams on the bone mass and withers height of daughters is probable but not conclusive. With the attribute ChC, low

correlation dependence between dams and daughters was recorded. This suggests that the dams have a lesser influence on the bulkiness of daughters.

Table 3 Correlation dependence of individual body measurements between daughters and dams

	CBC of daughter	ChC of daughter	SWH of daughter	TWH of daughter
CBC of dam	0.531	0.408	0.457	0.567
ChC of dam	-0.003	0.170	-0.242	-0.083
SWH of dam	0.364	0.154	0.494	0.539
TWH of dam	0.301	0.195	0.480	0.543

Linear regression

Table 4 Results of linear regression of mother class, class of daughters, offspring classes and mother's jump index, depending on the year of birth of the offspring

Dependent variable	Regression coefficient	Reliability value (%)	Probability F
Class of dams	0.003	0.28	0.718
Class of daughters	-0.094	15.48	0.163
Class of offspring	-1.243	16.00	*
Jump index of dams	-4.986	21.66	**

When evaluating the linear regression of the dams' class, we record an increasing tendency of the regression coefficient, although this exhibits a very low reliability value. This dependent variable also emerged as inconclusive in the test.

In the case of the daughters' class, the regression coefficient decreases, with explanatory power of 15.48%, and here the test is again inconclusive.

With the offspring's class, we again recorded a decreasing tendency of the regression coefficient, which exhibits 16% reliability and according to our test emerges as statistically conclusive. Based on this, it can be stated that the assessed class of offspring's of the sire 6062 Scyris (POL) does not improve – on the contrary, it decreases slightly.

The jump index of dams exhibits a high value for the downward trend (-4.9860) which is documented by 21.66% reliability. In this case, the test emerged as highly statistically conclusive. Based on this, it can be concluded that the mares mated with stallion 6062 Scyris (POL) are of relatively low quality in performance terms.

Analysis of the colouring of the offspring of stallion 6062 Scyris (POL)

It was determined that a total of 10 out of the 48 descendants had a grey dam and the remaining 38 were of other colouring. It was also established that 28 out of the 48 descendants are of grey colouring and the remaining 20 are of other colouring. Expressed in percentages, 21% were from grey dams and 79% from dams of another colour, and with the offspring 58% are grey and 42% of the offspring are of a different colour. From what has been established here, it can be stated that the breeding stallion 6062 Scyris (POL) carries a heterozygous allelic pair of G genes (Gg). Although in the heterozygous assembly this gene does not have a 100% influence on grey colouring, if it encounters a heterozygous set of the G gene in the dam, their offspring will be grey in colour.

CONCLUSION

The main aim of this thesis was to evaluate the importance of the stud horse 6062 Scyris (POL), which is a member of the English Thoroughbred breed, in the breeding of the Czech Warmblood. Two databases were compiled from all the background information on the descendants. The first was used to evaluate linear regression, where we observed changes in the class of all 48 descendants and a change in the dependence of the class of the 14 assessed daughters, and we evaluated a change in the dependence of the jump index and class of the dams of all 48 descendants –all of this depending on their year of birth. The second database was used to evaluate the Pearson correlation coefficient, where

we observed and assessed the correlation dependence of the individual body measurements in the 14 daughters that had been assigned a class and their dams. In this thesis we also recorded the minimum, maximum and mean values of the individual body measurements of the 14 daughters and their dams, and the numbers belonging to either sex, and we also performed an analysis of colouring. From all the information ascertained, we came to the conclusion that stallion 6062 Scyris (POL) did not balance out his offspring in exterior terms as expected and carries a heterozygous set of alleles in the G chromosome, which influences grey colouring. In the coming years it would be interesting to re-examine the results and conclusions that we have reached in this thesis.

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