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ANALYSIS OF FACTORS INFLUENCING BODY SIZE AND HAIR COAT QUALITY OF MINK (*MUSTELA VISON* SCH.)

Stanisław Socha, Dorota Markiewicz, Monika Bakuche

*Department of Breeding Methods and Fur Animals Breeding, University of Podlasie, Siedlce,
Poland*

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ABSTRACT

The aim of this study was an analysis of the factors that influence body size and hair coat quality of standard minks (*Mustela vison* Sch.). The analysis covered 3837 animals belonging to three genetic groups: one domestic (native) and two groups of half-imports (one of the parents, sire, imported from Denmark or Holland).

The group defined as "half-imports" was characterised by better hair coat quality and colour purity (differences statistically significant) in comparison with the minks obtained from domestic breeding. The results demonstrate

that the imported breeding material positively influenced the development of fur quality traits in the minks of the studied farm. Lower values of body size, however, were achieved in the group of half-imports, which in turn may demonstrate that the imported minks had not sufficiently adapted to our environmental conditions, especially to feeding.

Mean scores for body size and fur quality traits (except for colour type) of males and females differed significantly. Within most of the traits (apart from animal size), higher mean licence scores (expressed in points) were achieved in the group of males.

Total score was characterised by high mean value. Depending on the genetic group of minks, it ranged between 90.2 and 92.35% of maximum score for the trait. This demonstrates that the animals on the examined farm had high performance and breeding values. The coefficient of variability reached its highest values for colour purity (approx. 15%), while its lower values were observed for total score (approx. 6%).

Key words: mink, sex, genetic groups, body size, hair coat characteristics

INTRODUCTION

In the breeding of fur-bearing animals, including minks, proper quality of hair coat and animal's body size are the factors of the utmost importance from the economical point of view. Besides health, prolificacy and fertility, these features are essential for the economical results of the production.

Never before has mink farming in Poland reached larger extent than today. As demonstrated by achievements in other countries, e.g. in Denmark or Russia, one can assert that due to purposeful activity of man and proper feeding, obtaining large minks with excellent hair coat – thick, silky and springy – was successful. Prices of such animals' skins, achieved on world auctions, by 50% outdo the prices of Polish mink skins which are generally smaller and have numerous defects [1].

Breeding value of the animals in the livestock may change due to intentional and directed activities of the breeder. Selection is the main factor that changes the genetic structure of the herd. Another way consists in importing breeding material and crossbreeding with domestic animals. As a result, it is possible to obtain genetic progress much faster than through long-term selection of own breeding material [18]. Using imported animals, which have outstanding fur quality indices, will allow the breeders to radically improve the quality of fur produced in Poland, especially as the growing demand for imported breeding material is observed [3, 4, 15].

Comparison of phenotypic values in various genetic groups of polar foxes was the subject of studies by other authors [10, 11, 18]. However, there are no studies that would compare phenotypic value of hair coat quality of the minks belonging to various genetic groups. A range of studies on the species concerned reproduction features only [13, 19].

Considering all the above-mentioned aspects, we have undertaken the research aimed at an analysis of the factors that influence body size and hair coat quality of minks (*Mustela vison* Sch.) of standard variety.

MATERIALS AND METHODS

The analysis was carried out in a breeding farm of fur-bearing animals located in central Poland. The material was collected during two years (1997–1998) and was related to evaluation of conformation traits of young breeding animals (licence). The animals were evaluated according to the current standard for conformation evaluation [20]. The traits taken

into consideration during the licence body size and shape (represented here as body size), colour type (for the standards it is excluded from evaluation and 3 points are assigned for the trait), fur colour purity (denoted later as colour purity) and fur quality. The animals that obtained “0” points for at least one trait were eliminated from further breeding. Outstanding animals (with the top score for each trait) were able to get the maximum of 20 points. The animal's body size was determined through weighing.

The following genetic groups of animals were distinguished in the study:

- animals defined as *native* (obtained from both parents born in Poland),
- animals specified as *half-imports* (one of the parents, sire, imported or derived directly from imported animals).

Statistical parameters of the traits in the herd (arithmetic means and coefficients of variability) were estimated according to common rules. Analysis of variance was carried out for each trait basing on static mathematical model with respect to the following effects: year of evaluation, genetic group, animal's sex, and the interaction of these factors.

RESULTS AND DISCUSSION

The study presents the analysis of body size and hair coat quality traits for mink of *standard* variety. The sum of points for all the traits was called *total score*. Three genetic (origin) groups were taken into account: native, half-imports “A” (obtained from crossing sires imported from Holland with native dams) and half-imports “B” (obtained from crossing sires imported from Denmark with native dams).

Altogether, 3837 animals were examined. A number of 3440 minks were positively evaluated, and further calculations were carried out for that group. In 1997, 1593 animals (1122 females and 471 males) were positively scored, and in 1998, 1847 minks (1260 females and 587 males). The animals evaluated negatively constituted 10.3% (397 animals) of all the assessed minks. For those individuals, at least one trait was evaluated as having “0” points.

The analyses of variance for each trait demonstrated highly significant or significant effect of origin and sex on most of the analysed traits. The year of licence had highly significant effect on colour purity only, being insignificant for the remaining traits. On the other hand, the interaction between sex and year of licensing had highly significant influence on body size alone.

[Table 1](#) presents the statistical characteristic of the traits (means and coefficients of variability) regarding the year of evaluation and sex of the minks. In order to depict better the results, the mean values of the analysed traits are presented in graphs. [Figures 1–5](#) present the means in regard to origin and sex.

Table 1. Statistic characterisation of the animal size and fur quality in minks population

Traits	Year of evaluation	Males			Females			Total		
		n	\bar{x}	V	n	\bar{x}	V	n	\bar{x}	V
Size of animals (body size)	1997	471	5.36	13.05	1122	5.53	11.75	1593	5.48	12.22
	1998	587	5.26	13.43	1260	5.62	10.50	1847	5.51	11.80
	total	1058	5.31	13.24	2382	5.57	11.12	3440	5.49	12.01
Type of colour	1997	471	3.00	0.00	1122	3.00	0.00	1593	3.00	0.00
	1998	587	3.00	0.00	1260	3.00	0.00	1847	3.00	0.00
	total	1058	3.00	0.00	2382	3.00	0.00	3440	3.00	0.00
Purity of colour	1997	471	4.52	14.82	1122	4.41	16.10	1593	4.44	15.76
	1998	587	4.42	14.70	1260	4.31	16.00	1847	4.34	15.66
	total	1058	4.47	14.72	2382	4.36	16.05	3440	4.39	15.71
Quality of fur	1997	471	5.32	12.03	1122	5.01	14.77	1593	5.10	14.31
	1998	587	5.37	12.29	1260	4.96	15.12	1847	5.09	15.53
	total	1058	5.34	12.16	2382	4.98	14.94	3440	5.10	14.42
Total number of scores	1997	471	18.20	6.37	1122	17.95	6.80	1593	18.02	6.66
	1998	587	18.06	6.64	1260	17.90	6.48	1847	17.95	6.52
	total	1058	18.13	6.50	2382	17.92	6.64	3440	17.98	6.59

n – number of animals, \bar{x} – mean value, V – coefficient of variability.

Fig. 1. The means of licence evaluations of animals size in minks population

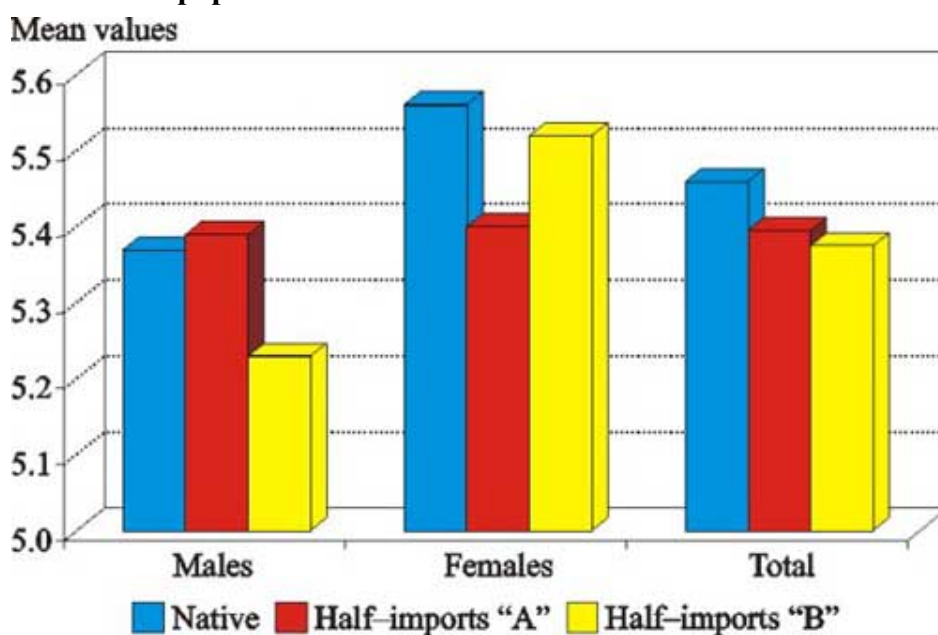


Fig. 2. The means of licence evaluations of colour type in minks population

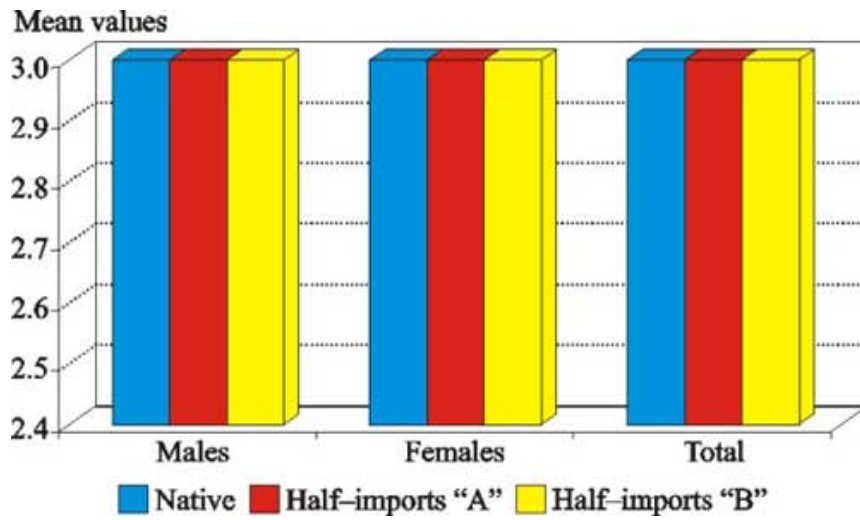


Fig. 3. The means of licence evaluations of colour purity in minks population

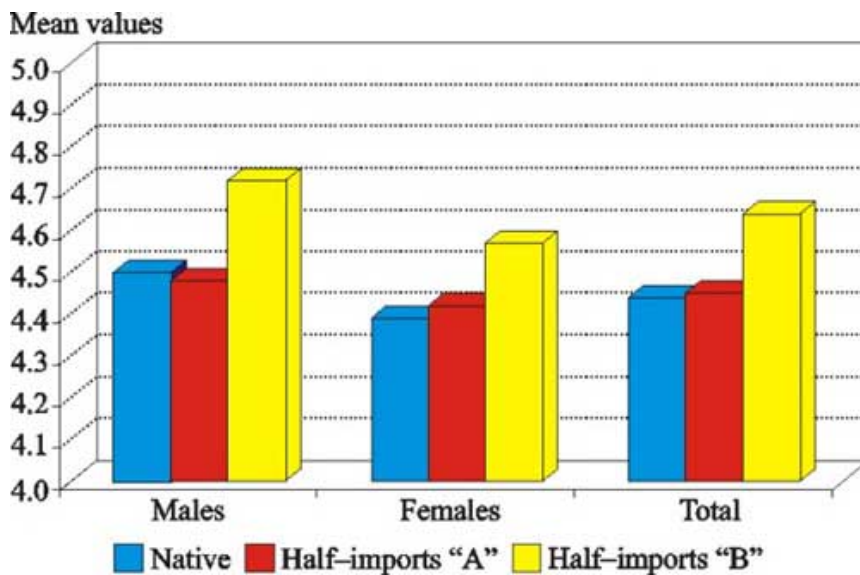


Fig. 4. The means of licence evaluations of fur quality in minks population

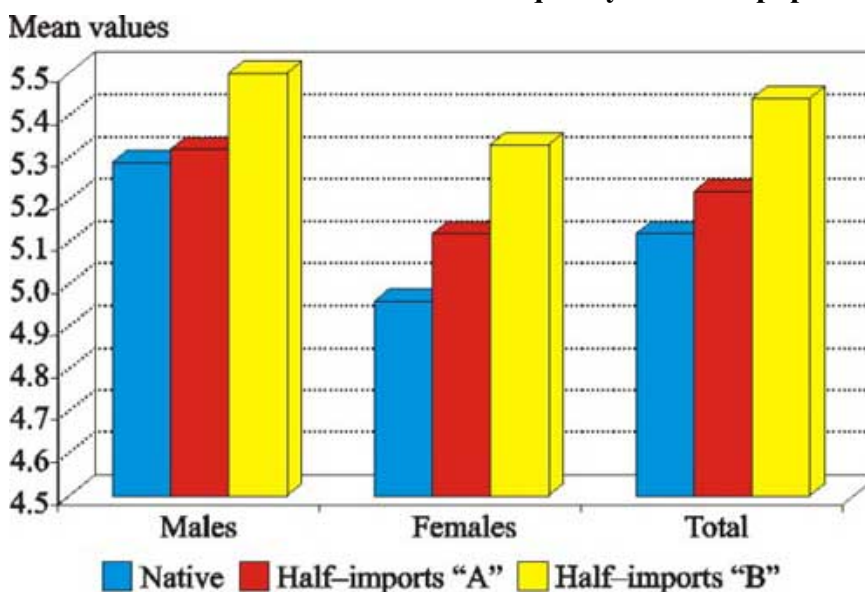


Fig. 5. The means of licence evaluations for total number of scores in minks population

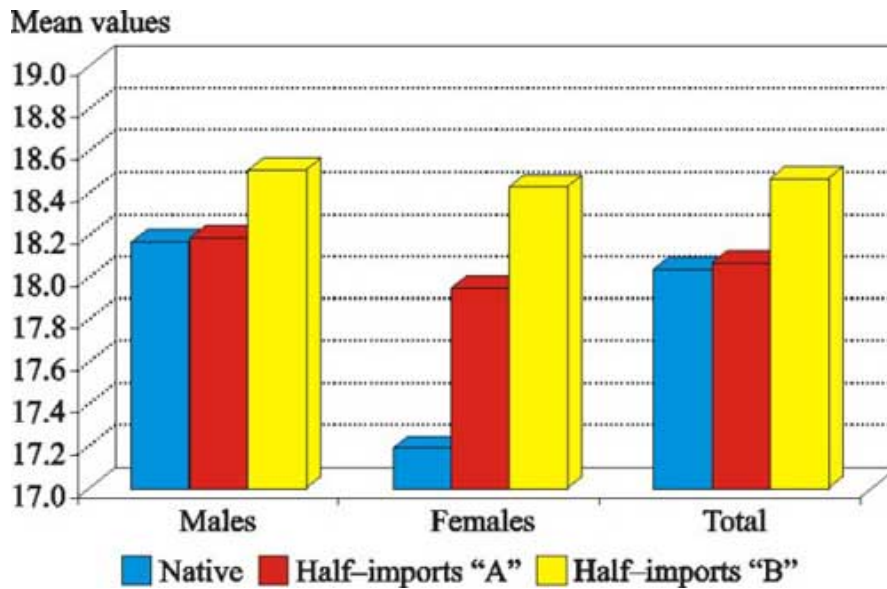
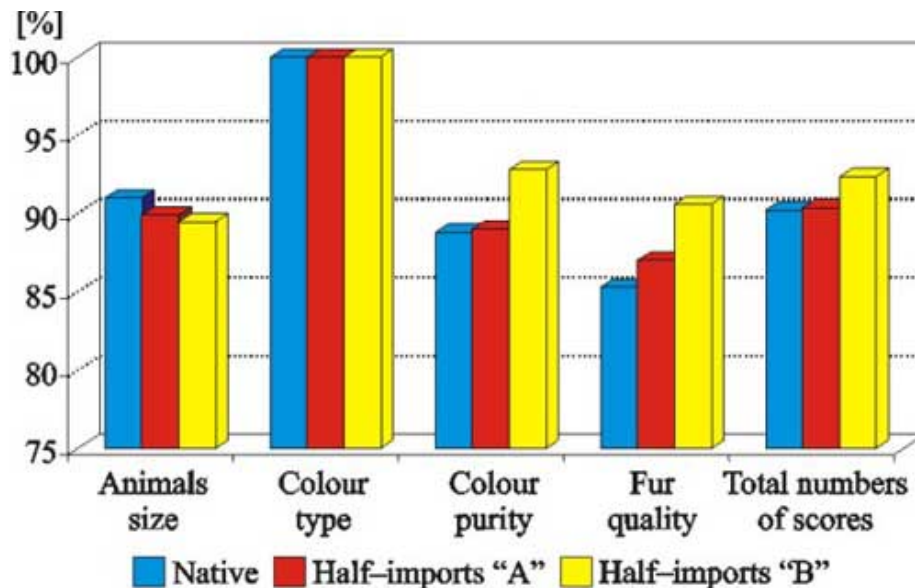


Fig. 6. The means licence (conformation) of minks expressed as % of maximal score for particular traits assumed as 100



According to the conformation evaluation standard [20], the standard minks that attain 2200 g or more (males) and 1200 g or more (females) of body weight get the highest score of 6 points. This study shows that the males and females of both native and half-import groups received more than 5 points for size, which is the score close to that of the standard. At the same time, slightly lower sizes were observed among the half-imports, which may demonstrate that the imported animals had not sufficiently adapted to our environmental conditions, especially to feeding.

Body size and its strong and proportional arrangement have considerable importance in breeding. Barabasz *et al.* [2] state that minks of smaller sizes should be taken for reproduction, as such males cover more efficiently, and such females are more prolific. Other studies [6] demonstrate negatively correlated reproductive efficiency with body weight of

minks. According to Lisiecki and Sławoń [12], breeding should tend toward obtaining as large minks as possible. Hence, larger body sizes of the offspring are obtained from such parents, and consequently higher auction prices for the skins can be attained [15].

The colour type, as previously mentioned, was excluded from the evaluation, and all the animals scored maximum 3 points [20]. Obviously, the variability for this trait, measured with the coefficient of variability, equalled 0% in this case.

Mean value of colour purity ranged between 4.34 and 4.52, depending on the year of evaluation (licence) and on the genetic group. Colour purity belonged to the traits with the highest coefficient of variability. Analysis of the variability by the sexes demonstrated higher variability in females, 16.05%, whereas in males it was 14.72%. Among the genetic groups, the lowest coefficient of variability was observed in the group of half-imports "B", with the value about 11.0%. In the remaining genetic groups, it exceeded 15.0% (detailed variability of particular genetic groups is not presented here).

Coat thickness and hair length are evaluated within the trait defined as hair coat quality. The variability of this trait in particular groups was 4.96 to 5.37. Hair coat quality belonged to the traits with the coefficient of variability oscillating around 12% in the groups. At the same time, a slightly lower variability of this trait was observed for half-imports "B".

The breeder attaches the highest importance to the total score, which is the sum of points for all the traits. According to the standard [20], the highest attainable score for all the traits is 20 points. In the analysed farm, the total score of licence points that the animals achieved within the two-year period was 17.98 on average. Native females and half-imports "A" achieved below 18 points, whereas for the males of the entire studied population and females of half-imports "B" the total score exceeded 18 points. The coefficient of variability of the trait was at a similar level in all the groups and was approximately 6.0%. The relatively low variability of the total score may have resulted from the fact that the animals received higher scores in some traits while achieving lower scores in the others [16]. As a consequence, a low variability in total score occurred.

The literature dealing with statistical characteristics of body size and hair coat in fur-bearing animals has been to a high degree based on experiments with foxes, therefore the results obtained here will be compared with the results by other authors, obtained mainly on foxes.

Most of the analysed traits within particular genetic groups were characterised with coefficients of variability being similar to those estimated by Socha [16]. They were lower than those reported by Kenttämies [9]. It should be stated that the variability of traits, apart from colour purity, was low in all the groups. There is certainly a number of reasons of such low variability of the traits. The animals subjected to the licence evaluation had been previously selected from the entire offspring in the given year, therefore the variability of the examined traits was sometimes surprisingly low. Breeding practice demonstrates that not the whole scale of scores is used during licence evaluation, but only its "higher" values [7, 17].

Direct comparison of traits, if various scales of score are applied, is very difficult if not impossible. Therefore, Figure 6 graphically presents deviations of the means of particular traits from peak scores, assumed as 100. Origin of animals was taken into account in the graph. As demonstrated in the picture, colour type (the trait excluded from evaluation for standard mink) and total score had proportionally the highest mean. In each group, the value

of total score ranged between 90.2 and 92.35% of the highest score attainable for the trait. Slightly lower deviations from the maximum scores were obtained in body size, colour purity and hair coat quality (the values ranged from 85.3 to 92.8%). The above results are similar to those obtained by Socha [18] for a herd of foxes.

The analysis of the traits pattern in particular genetic (origin) groups allowed concluding that the highest results were achieved by the minks from the group defined as half-imports “B”. The predominance of this group over domestic-bred minks is particularly apparent for fur quality and colour purity. The results prove that the imported breeding material had positive influence on the development of fur quality traits of the minks. The expression of desirable phenotypic properties in the “half-imports” group may demonstrate the positive influence of interactions of genetic-environmental and gene traits. Higher merits of foreign animals have been confirmed by auction results [14, 15]. According to Sławoń [15], skins of e.g. foxes from Scandinavian countries attain definitely higher prices in comparison with the Polish ones, mainly due to larger sizes and better quality of fur. That demonstrates univocally better genetic foundations of imported animals. In the future, the breeding should be aimed at improvement of hair coat quality of native minks, including thickness and proper length and uniformity of hair through crossing with imported breeding material and properly directed selection.

Mean scores for body size and fur differed for males and females ([Table 1](#) and [Figures 1–5](#)). Depending on the trait, the means in the groups of males were higher than in females. Body size was the exception among the discussed traits. The mean of this trait from licence evaluation of females exceeded the scores achieved by the males. The results obtained in this study are comparable with the results obtained by Kenttämies [8] for silver foxes. According to Socha [17], higher variability of scores for males in comparison with those for females may demonstrate that evaluation criteria were stricter for males than for females. Wider variability among the males may have also facilitated their selection for further breeding. This assertion does not relate to this study, as for most of the traits a higher variability was observed among the females. Higher variability of females’ traits may have resulted from the much higher number of animals evaluated in this group. Conformation evaluation covered over 2300 females and only above 1000 males.

On the other hand, the analyses of the scores in each year allow concluding that they were very unvarying (except for colour purity). During the period of two years, only a decrease occurred in the mean scores of evaluation for colour purity. The differences in this trait between the years were statistically significant. Mean score for hair coat quality, on the other hand, slightly increased in 1998. Some variations in scores between the years were due to random errors that are difficult to define. It should be stated that housing conditions on the farm during the period of the study were similar, or even slightly improved in 1998.

CONCLUSIONS

1. The group of animals defined as “*half-imports*” was characterised with better hair coat quality and colour purity (statistically significant differences) in comparison with the minks obtained from domestic breeding. The results demonstrate that imported breeding material had positive influence on the development of fur quality traits of the minks on the examined farm.
2. Expression of desirable phenotypic properties in the “*half-imports*” group may demonstrate the positive influence of interactions of genetic-environmental and gene

traits (these problems were not the subject of detailed studies and require further observations). On the other hand, lower scores for body size may demonstrate that imported animals had not sufficiently adapted to our environmental conditions, especially to feeding.

3. Mean total score was relatively high. Depending on the genetic group of minks, it ranged between 90.3 and 92.35% of the maximum score for the trait. This demonstrates that high performance and breeding value featured the minks on the examined farm.
4. Variability of traits, measured with the coefficient of variability, was the highest for colour purity (approx. 15%). Lower values were observed for total score (oscillating around 6%).
5. Mean score for body size and hair coat quality significantly differed between males and females (except for colour type). In most of the traits (apart from body size), higher mean scores from licence evaluation were obtained in the group of males.

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Submitted:

Stanisław Socha, Dorota Markiewicz, Monika Bakuche
Department of Breeding Methods and Fur Animals Breeding
University of Podlasie
B. Prusa 12, 08–110 Siedlce, Poland
Tel. (+4871) 348-41-42
e-mail: socha@ap.siedlce.pl

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