Morphological traits of bees kept in Poland and their changes over the past 20 years

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Bee races the most commonly kept in Poland are *Apis mellifera carnica, A. m. caucasica* and *A. m. mellifera*. Only the Black bees (*A. m. mellifera*) and several breeding lines of Carniolan bees are local, remaining ones are imported. Mathematical models for discrimination of bee races were developed in the early 80's (Gromisz 1981). These models were created for each race individually based on the length of the proboscis, the width of IV tergit and the cubital index. Bees to be regarded as pure should have all these features at the certain level.

Material for the models construction was 832 samples of bees elaborated in the 70'. Since the models have been introduced into the practice the majority of breeding apiaries inseminated bee queens to maintain pure race colonies. Only a few apiaries had then drone areas. Mean values of the morphological features, used for construction the models are shown in Table 1.

After over 20 years bees from 1042 colonies from breeding apiaries were examined. The average length of the proboscis was reduced in the Caucasian bees while in the Black bees and Carniolan bees proboscis became slightly longer. The average width of the IV tergit increased in Caucasian bees while decreased in Carniolan and Black bees. The highest change in the cubital index was for Carniolan and for Black bees (Tab. 1).

Table 1.

Mean values of the length of the proboscis, the width of IV tergit and the cubital index
of bees used for construction of mathematical models for discrimination of bee races and after over 20 years of breeding.

Date of morphometric measurements of bees	*A. m. carnica*			*A. m. caucasica*			*A. m. mellifera*		
	length of proboscis (mm)	width of IV tergit (mm)	cubital index (in Alpatov notation[%])	length of proboscis (mm)	width of IV tergit (mm)	cubital index (in Alpatov notation[%])	length of proboscis (mm)	width of IV tergit (mm)	cubital index (in Alpatov notation[%])
Mean values of the morphological features, used for construction the models in the early 80's	6.458	2.302	51.2	6.976	2.242	54.7	6.115	2.356	61.4
Mean values of the morphological features after over 20 years of breeding	6.500	2.301	46.7	6.776	2.241	51.5	6.240	2.300	55.3
Changes (%)	+0.8	-0.8	-8,8	-3	+0.7	-5.8	+2.2	-2.3	-10.6

It is thought that the changes were caused by import of various morphologically bees or an accidental crossing of different bee races. Changes in cubital index of Carniolan bees are probably caused by import of other lines of bees with different characteristics as those used for models construction. The reason for the changes of features could also be imperfect model. The capacity of the model was large that the values of certain features of the two lines of bees could overlap. Then the lines distinction was possible only with the third feature.

The changes in morphometric characteristics are reflected in the qualification of particular bee races. Using that model as a pure-bred, 9.2% of samples of Cariolan bees should not be classified because of the too low cubital index, 30.5% of samples of Caucasian bees because of the too low length of the proboscis, and 19.7% of samples of Black bees because of the low cubital index. The Polish breeding program can include into the breeding records only these queens, from which the workers characterize with the morphological features at the appropriate level. The biggest problem for beekeepers is to maintain the appropriate level for the most characteristic traits of these bee races: the length of the proboscis in Caucasian bees, cubital index in Cariolan and Black bees. A detailed description of the racial discrepancies of examined bees shows Table 2.

Table 2

The percentage of examined samples of bees that were not included into particular race due to inadequate morphometric traits

The level of morphometric features for workers from 1042 bee colonies	*A. m. carnica*			*A. m. caucasica*			*A. m. mellifera*		
	length of proboscis	width of IV tergit	cubital index (in Alpatov notation[%])	length of proboscis	width of IV tergit	cubital index (in Alpatov notation[%])	length of proboscis	width of IV tergit	cubital index (in Alpatov notation[%])
too high level of thefeature (%)	0.8	0.0	0.1	0.0	0.0	0.0	10.5	0.0	0.0
too low level of the feature (%)	0.0	0.0	9.2	30.5	0.0	10.2	0.0	3.5	19.7

References
Gromisz M. (1981) - Morfologiczna ocena populacji rojów w pasiekach zarodowych. Pszczeln. Zesz. Nauk. 25:51-66.