Comparative analysis of the exterior of culled cows of different breeds in the Baikal Region

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Abstract. This article provides an analysis of the exterior of cows by physique indices. The purpose of this work is a comparative study of the exterior of cows of black-and-white, Simmental breeds and their crossbreeds. When comparing the physique indices, it was found that the culled cows of Simmental breed and crossbreeds after fattening had the highest indices: elongation, plumpness, chest, pelvic and massiveness. The results show that cross-breed cows (black-and-speckled x Simmental) are the largest among the breeds. The smallest cows of these represented breeds are black-and-speckled.

1. Introduction
Modern methods of breeding dairy cattle are based primarily on the selection and sorting of cows for milk yield, fat and protein content in milk and some other economically important characteristics. However, scientific research has proved that the long-term use of cows is impossible without taking into account their exterior features.

The choice of breed is of primary importance to meet the demand of buyers for the composition of meat carcasses. There is no breed that perfectly meets the requirements of all consumers, just as there is no breed that is best adapted to the wide variety of environmental conditions in which beef is produced.

The main breeds in the Irkutsk region are black-speckled (more than 70\% of the total number of bonited animals) and Simmental (about 30\%). The black-speckled breed is represented by animals of the Siberian offspring and holsteinized crossbreeds of different bloodlines. Simmental cattle were mainly imported from the central part of the former Soviet Union (Ukraine, Udmurtia, Voronezh region).

A fairly complete idea of the typicality and direction of productivity of cows is given by their external assessment by measuring individual articles of the body. For a more objective characterization of the exterior and body of cattle, a number of scientists also recommend using body indices and the most important indices that give an idea of the animal type are the following: leg length, elongation, pelvic, chest, plumpness, bony, broad-bodied and meatiness \cite{1, 5, 7}.

Cattle is the most important of all domestic animals and, following dogs, is the oldest one. Extremely useful qualities have caused its wide distribution and the most diverse use \cite{2, 3}.

In cattle breeding, selection by physique and appearance is particularly significant, since a large number of animals that are owned by agricultural producers have not been bonited, and the maintenance of
livestock is of economic and practical importance. Nevertheless, judging cattle by the appearance, they judge the strength of the physique and the adaptability to the conditions in which it exist and is used.

The black-and-speckled and Simmental breeds are one of the most famous and numerous breeds of cattle not only in our country, but also around the world.

The aim of this work was to compare the appearance of culled cows of different breeds before and after fattening.

2. Conditions, materials and methods
The collection of materials was carried out in the agricultural production cooperative "Okinsky" and peasant farms of the Ziminsky district of the Irkutsk region.

The primary material for research was taken from the cow breeding cards. The cows were divided into breeds: black-and-speckled, Simmental, and crossbreeds (black-and-speckled x Simmental). The number of animals was limited to 15 heads.

Absolute measurements of individual articles of cows are usually insufficient to compare the body proportions of some individuals and do not allow to assess the exterior in full. Therefore, to compare the types of exterior and determine the development of a particular article, physique indices were used.

The most important indices that give an idea of the type of animal are the following: leg length (shows the relative development of legs in length), elongation (the ratio of trunk length to height at the withers), pelvic (the ratio of chest width behind the shoulder blades to the width in the iliac wing protuberance), chest (the ratio of chest width behind the shoulder blades to the depth of the chest), plumpness (the ratio of the circumference of the chest to the oblique body length), overgrowth (the ratio of height at the sacrum to the height at the withers), the massiveness of Durst (body length x chest width x depth of the chest : 10000), bony (the ratio of the pastern girth to the height at the withers) [1, 3, 7, 8].

3. Results and discussion
In improving the productive qualities of cows, an important role is played by identifying individuals of the desired body type. The study of the main economically useful features of the studied cows indicates the undoubted advantage of fattened cows in comparison with them before fattening. Thus, the live weight of culled cows before fattening is inferior to cows after fattening.

A fairly complete idea of the typicality and direction of productivity of animals is given by their external assessment by measuring individual articles of the body.

The study used the external characteristics of cows by size and physique indices as a necessary element of their comprehensive assessment, as well as for the classification of the exterior.

Nine body measurements of culled cows were taken before and after fattening. In general, it should be noted that culled cows have a proportionally developed head, shoulders slightly lower than the iliac wing protuberance, withers of moderate height and width, wide loins and iliac wing protuberance, long and wide rump, thighs are deep and straight at the back, broad and moderately are plump on the outer sides, the ischial mounds are widely spaced.

Absolute measurements often cannot give an idea of the exterior of cattle. In such cases, a valuable material is the ratio of measurements that characterize the physique of cattle.

W. Durst suggested that body indices were calculated on the basis of measurements (the ratio of anatomically related measurements) expressed as a percentage [3].

According to the authors [6, 7, 9], the following indices are most often used in cattle breeding: elongation (of format), long-legged, chest, massiveness and meatiness.

To compare the features of the exterior, to determine the degree of development of a particular article and the proportion of the physique, calculate the physique indices, that is, the ratio of anatomically related measurements.

The body indices of culled cows before and after fattening are presented in tables 1 and 2. Thus, the highest body elongation indices before feeding had the cows of the Simmental breed (121,8 %); long-legged were the cows of black-speckled breed (46,2 %); chest had the crossbreeds (black-and-speckled x Simmental) (57,4 %); plumpness had the crossbreeds (125,7 %); massiveness had the hybrids (47,8...
pelvic had the cows of Simmental breed (76.6%) and bony had the cows of black-and-speckled breed (14.2%).

At the same time, it should be noted that the cows of Simmental breed had the highest stretch index (121.8%) and pelvic (76.6%). When comparing these indices, they are more than by black-and-speckled cows by 3.9% and 0.7% and by the cows of crossbreeds by 1.6% and 0.6% respectively.

### Table 1. Body indices of culled cows before fattening, %.

| Body indices       | Body indices, % | black-and-speckled | Simmental | black-and-speckled | x Simmental |
|--------------------|-----------------|--------------------|-----------|--------------------|-------------|
| elongation         | 117.9           | 121.8              | 120.2     |                    |             |
| long-legged        | 462             | 45.4               | 45.5      |                    |             |
| chest              | 56.9            | 57.1               | 57.4      |                    |             |
| plumpness          | 122.3           | 123.5              | 125.7     |                    |             |
| Durst massiveness  | 46.6            | 47.3               | 47.8      |                    |             |
| pelvic             | 75.9            | 76.6               | 76.0      |                    |             |
| bony               | 14.2            | 14.1               | 13.8      |                    |             |

Based on the measurement data, significant differences in the body indices of culled cows were marked depending on before and after fattening. The results obtained in table 2 for the body indices of Simmental cows again show that cows have the highest values for the indices: elongation (122.4%) and pelvic (79.6%), and cross-breed cows (black-and-speckled x Simmental) breast (60.2%); plumpness (127.3%), massiveness (52.1%). At the same time, it should be noted that Simmental cows had the highest pelvic index (79.6%) and elongation (122.4%). When comparing these indices, they are higher than in black-and-speckled cows by 2.6% and 4.2%, and in cross-breed cows by 1.2% and 1.1%, respectively.

Each analyzed breed has its own characteristics of the exterior, which must be taken into account when fattening livestock. For culled black-and-speckled cattle, it is preferable to use longer fattening, in comparison with the Simmental breed and crossbreeds (black-and-speckled x Simmental). Favorable feeding conditions during fattening allow the most complete manifestation of the exterior features of cows.

### Table 2. Body indices of culled cows after fattening, %.

| Body indices       | Body indices, % | black-and-speckled | Simmental | black-and-speckled | x Simmental |
|--------------------|-----------------|--------------------|-----------|--------------------|-------------|
| elongation         | 118.2           | 122.4              | 121.3     |                    |             |
| long-legged        | 45.8            | 43.3               | 43.6      |                    |             |
| chest              | 58.6            | 59.4               | 60.2      |                    |             |
| plumpness          | 124.6           | 126.0              | 127.3     |                    |             |
| Durst massiveness  | 48.2            | 50.9               | 52.1      |                    |             |
| pelvic             | 77.0            | 79.6               | 78.4      |                    |             |
| bony               | 15.3            | 15.0               | 15.1      |                    |             |

From the data in table 2, it can be seen that the culled cows had the higher indices of elongation, chest, plumpness, massiveness and pelvic which increased after fattening, and the decreased index of long legged. At the same time, the compared culled cows of different breeds had significant differences in body indices.

### 4. Conclusion

Thus, the culled cows of the black-and-speckled breed have a less proportional body, longer limbs, and
the cows of the Simmental breed and crossbreeds (black-and-speckled x Simmental) have a proportional body, are more plump and massive ones.

The results of this work showed that when comparing breeds of cattle, differences were identified, which indicate that cattle of the Simmental breed and crossbreeds (black-and-speckled x Simmental) are larger in size than cows of the black-and-speckled breed. The smallest cows of these represented breeds are black-and-speckled. Cross-breeds (black-and-speckled x Simmental) are intermediate in magnitude measurements.

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