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THE NUMBER OF RIBS IN THE OX AND PIG

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Modern literature in Veterinary Anatomy is too often compelled to use such vague expressions, as "often, frequently, seldom, rarely", as comments on the precision of the numerical data it sets forth. Similar expressions are employed to indicate frequency in the occurrence or absence of certain structures. In case of numerical limits, it is often considered rather useless to insist on the fixation of the relative (percentage) value (probability) of those limits or of the figures they comprise. But if numerical data are thought to be indispensable, their accuracy ought to be insisted on.

It can be easily understood that the deficiency in question is caused by substantial reasons, first of all by the paucity of scientists in comparison with the objects of investigation. Moreover, if deviations are to be treated, the species of domestic animals will no longer suffice, but we shall indispensably have to extend our interest to the subdivisions in the form of breeds or animals of a certain country, and that will only diversify our observations.

It is scarcely necessary to say that, if exterior (externally designated anatomic) qualities as well as efficiency based on the structure and the functions of the animal body serve to classify animals into different breeds, certain differences ought to occur too in an animal's externally hidden structures. Several inquiries, particularly those in racial anthropotomy, where an international society, CIRP (Comité international des recherches sur les parties non-osseuses [molles]), has been established for the collection and investigation of the respective observations, prove it convincingly. Anatomy, human as well as animal, is nowadays no longer an international science, which can neglect the differences between separate countries, but in conformity with other biological sciences, claims the recognition of the peculiar conditions of any country.

Numerous observations are required to verify numerical data. Although the material provided by the dissection-room can be used for this purpose, the observations obtained are limited. But many problems, especially those that submit to statistics, might be cleared up if slaughter-house material, which till now has found little consideration from the anatomical point of view, is treated.

Some of the series of the observations that have been undertaken in the slaughter-house will follow here. The observations have been started with the following objects in view: a) to revise and supplement anatomical data, particularly the numerical part, by those from this country, b) to discover anatomical differences in local breeds and c) to characterize anatomically our cattle (mostly of mixed breeds) as a whole. On account of the scarcity of racial material our observations concerning the anatomical differences between local breeds require a longer period of time.

The data concerning cattle published herein have been collected by one of us (Keerd) in the Tartu slaughter-house during the winter term of about 6 months. The cattle under observation were from the neighbourhood of Tartu, of home and overwhelmingly mixed breeds, of fully grown cows and a few bulls. The observations were carried out on 3000 animals with the purpose of fixing the number of ribs and characterizing the last ribs.

According to structure and form of attachment, ribs are divided in this treatise into three types: 1) normal, if they are articulated with the corresponding vertebra or vertebrae on one side and if their cartilages with the preceding ribs help to form the costal arch; 2) floating, if they have lost connection with the costal arch, their articulation being sometimes replaced by synostosis; 3) unattached ribs, if they lack connection (either by articulation or in the form of synostosis) with the vertebral column.

In differentiating the untypical ribs from lumbar transverse processes their lesser width, their caudo-ventral direction and their notably dorsal convexity has been considered. The structure of the corresponding vertebra could not be taken into consideration, but it is to be understood, that in the case of untypical ribs their corresponding vertebra could not be regarded as

Diagram illustrating the Number of Ribs and the Character of the Last Rib in the Ox.

Total Number of Registered Cases: 3000.

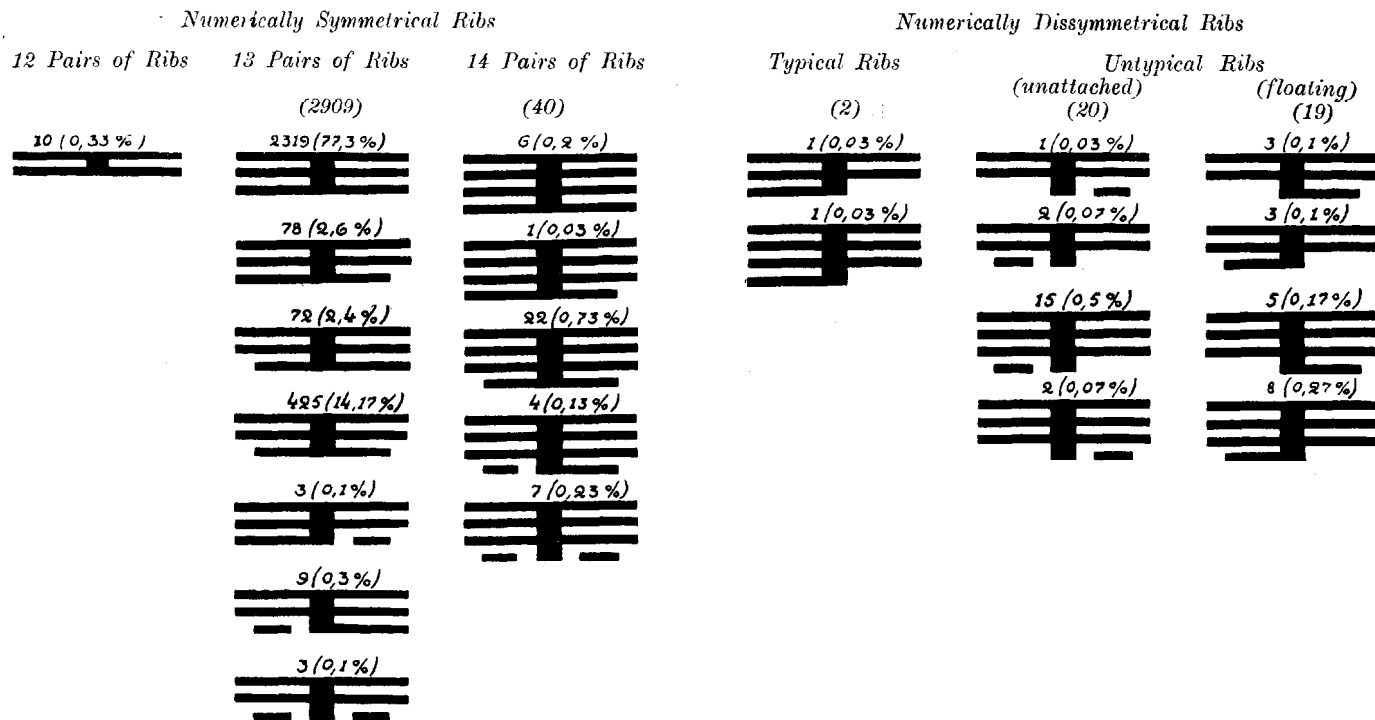


Fig. 1.

a lumbar vertebra. Some casual observations permit the conclusion that the ox has an equivocal vertebra more frequently between thoracic and lumbar regions than in any other division of the vertebral column. In defining the notion of the rib we do not think it necessary to consider the nature of the corresponding vertebra, *viz.*, that the notion of the rib does not require the simultaneous existence of a typical thoracic vertebra at the same level.

The results obtained are shown in the preceding diagram, where in each scheme the vertical black line marks the vertebral column, the intersecting upper horizontal line the 11-th rib, and its parallel downward lines the 12-th, 13-th and 14-th respectively. Normal ribs have been marked by the longest line, the next in length connected with the vertical black line denotes the floating rib and the shortest, which does not reach the vertical line, denotes the unattached rib. The side of the diagram on the right of the vertical line corresponds to the right and the opposite side to the left side of the animal. In the same diagram on account of the relative scarcity of data the animal's breed and sex have not been differentiated, but the present figures must be regarded as referring to the whole of our cattle.

From the diagram in question, we can see, that

1) The numerical variation of ribs in the ox extends from 12 to 14 inclusively. In the case of the minimum number, the last pair of ribs proved normal without exception, *viz.*, the reduction of the 12-th pair did not occur either numerically or structurally in the cases under observation.

2) By far the most frequent — and so the normal — number of ribs is 13. The group of cattle with this number of ribs is 96.97 per cent. (2909 animals). Subtracting from this figure all the cases where the 13-th pair is untypical on one or both sides (590 cases), we see that the numerically and structurally typical picture of the ribs in our cattle comprises 77.3 per cent. (2319 animals).

3) Numerical deviation on one or both sides of the animal generally occurs supernumerically, *viz.*, the increased number of ribs proves to be greater than the reduced. Thus we observe the reduction of ribs on one or both sides only in 20 cases (0.67 per cent.) against 91 (3.33 per cent.) supernumerical cases. Of those we find in the case of reduction the typically developed

12-th pair in 10 cases (0.33 per cent.) and of supernumerical cases we find the normal 14-th pair in 6 cases (0.2 per cent.). Disregarding the structure of the ribs, the 14-th pair occurs in 40 cases (1.33 per cent.). Numerical dissymmetry occurs in 41 cases (1.37 per cent.). Adding the structural dissymmetry this figure rises by 167. The percentage of the whole dissymmetry, if the absence of the correlative or its belonging to another group of ribs is taken into account (with no regard to its length in the case of untypical ribs), is 6.93. The dissymmetry is localized only in the last pair of ribs. The last but one pair proves typical without exception.

4) Disregarding the differences in the form and amount of distension of the digestive organs, which are located against the last ribs in the ox, the deviations which cause the numerical and structural dissymmetry in ribs occur in almost equal numbers on both sides. So we see, in the case of the 13-th pair, the floating rib on the left 72 and on the right side 78 times. We also see such rare deviations, presumably depending on the smallness of material under observation in other cases.

5) Untypical ribs occur predominantly as floating ones. The proportion of floating ribs to unattached ones is as 613 to 38 or a percentage of 20.43 to 1.26. This allows of the inference that the reduction of ribs as a rule begins at the ventral extremity. In numerically symmetric ribs the untypical ones occur, in the case of the 13-th pair, in 20.28 per cent. and, in the case of the 14-th pair, in 85.00 per cent. Thus supernumerical ribs are predominantly untypical. Floating and unattached ribs occur simultaneously in our observations only in 4 cases (0.13 per cent.).

Other conceivable conclusions can be deduced by means of the diagram presented.

Besides the manner of attachment, the untypical ribs, both floating and unattached, differ in length. From the normal length of the rib it decreases to 2—3 centimetres. Some of the unattached ribs of various lengths are given in fig. 2. Extremely short unattached ribs are frequently cartilaginous. In longer ribs the cartilage, if present, is attached only ventrally.

It was not possible to control the proportion of the number of lumbar vertebrae to that of the reduced and supernumerical ribs in the slaughter-house material. But on the ground of some observations where in the case of supernumerical ribs the

interval between the tuber coxae and the caudal border of the last rib was less than the interval in the case of the normal number of ribs, the conclusion may be drawn that the total number of the presacral vertebrae remains more constant than the number of those in the subdivisions of vertebral column, *i. e.*, that there is a certain compensation in the number of lumbar and thoracic vertebrae: the increase in one class of vertebrae

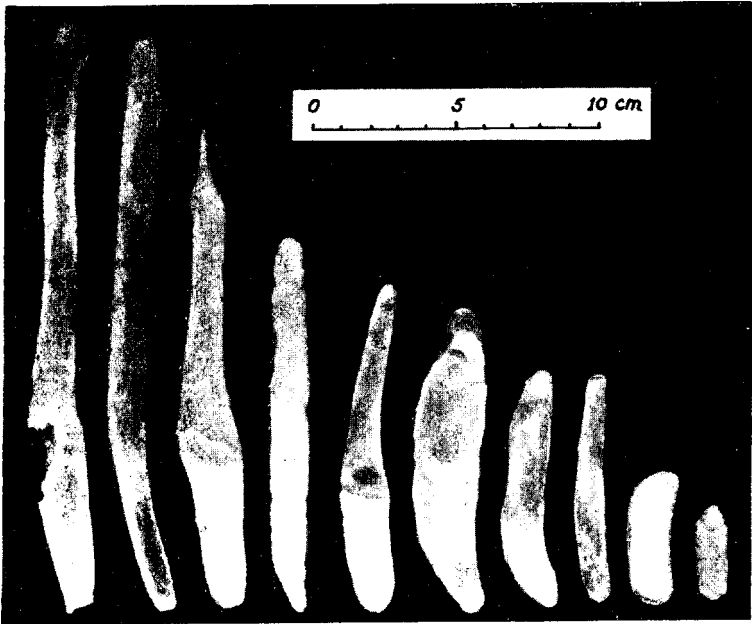


Fig. 2.

brings about a decrease in another class and vice versa. One case of the compensation mentioned is shown in fig. 3. Between the two regions an equivocal vertebra is located with two floating ribs attached to it by articulation (on the left) and by synostosis (on the right). In the present case these floating ribs are supernumerical, but the number of typical lumbar vertebrae has been reduced by one.

In very rare cases the number of ribs may increase on account of cervical ribs. One such case, which was disregarded in the statistical data, we see in fig. 4, where a typically developed right cervical rib articulates both with the transverse

process of the 7-th cervical vertebra and with the cartilage of the next rib. It has no correlative in the case in question. The frequency of this occurrence will be the object of further observation.

On comparing the results obtained with the corresponding data in literature one has to mention the absence of analogical respectively comparable observations.

In the text-books of veterinary anatomy (Ellenberger & Baum, 2, Martin, 4, Zimmerl, 8, Klimov, 3) 13 pairs of ribs is given as normal and a rare occurrence of 12 and 14 pairs is added. The following, a little more detailed, description is given by Sisson (7): "The presence of a fourteenth rib is not very rare. It is usually floating and may correspond to an additional thoracic vertebra or to the first lumbar. Reduction on the thirteenth is more common".

Avtokratov (1) mentions in his text-book only a single case of the supernumerary rib observed by Vinogradov and Lebedev.



Fig. 3.

From the point of view of cattle-breeding, Dr. Savamägi has been interested in the number, more properly in the character, of the ribs in the cattle of this country. His observations relating to this matter have been published in Bulgarian in a thesis and in an abridged issue in Estonian (5). The respective observations were carried out almost exclusively on living animals and his classification of ribs differs from the present one. Being interested only in the floating (according to our terminology floating and unattached) ribs he has not registered the cases of the normally developed 12-th and 14-th pairs. Those facts,

and the suspicion that the ordinal number of the last rib and the untypical ribs cannot be fixed with absolute precision in the living animal, will not allow a detailed comparison of the present observations with those of his. The notably greater percentage of untypical ribs in our cases can be probably explained only by our more perfect possibilities of registration. A difference can be noticed also in both observations in the average occurrence on one or both sides of the untypical rib. Thus the proportion of the occurrence of untypical ribs on both sides to that on one



Fig. 4.]

side is 457 to 200, but in Savamägi's data it is 356 to 228. But both data agree that the untypical ribs most frequently take the place of the 13-th pair of ribs.

The series of analogical observations in the pig in the export slaughter-house at Tartu has not been finished yet. Up to now the data provided by 250 pigs, regardless of sex and breed, have been

treated and they show that 15 pairs of ribs occur most frequently (56.8 per cent.), followed by 14 pairs — 34.00 per cent. and 16 pairs — 6.40 per cent. Each of the other variations of numerical dissymmetry and the 17-th pair of ribs occurred in the data referred to only once. In these data the fact should be emphasized that the 15-th pair occurs notably oftener than the 14-th. This numeral superiority will remain even if we subtract 36 cases of the untypical rib from the 142 cases when 15 pairs of ribs occur. The proportion of the predominant groups (15 and 14 pairs) of ribs is 106 to 76, instead of the former 142 to 76 in favour of the 15-th pair.

In the enumeration of thoracal vertebrae of 1000 pigs arranged by Schmaltz (6) in the Berlin slaughter-house the

occurrence of the 14-th pair of vertebrae proved to be greater than our present data. The figures given by text-books agree with the data obtained by Schmaltz. Also the 16-th pair of ribs occurs oftener in our data than in the Schmaltz's observations, which fact allows of the inference that the pigs of this country have a greater number of ribs and consequently of thoracal vertebrae. The object of further observations is to inquire closer into the truth of this conclusion and into the relation of the number of ribs to the sex and age of the animal.

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