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STUDIES ON THE EUROPEAN HARE. XXXIV

Sex Dimorphism in Certain Bone Elements of the European Hare

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Sobocińska-Janaszek J., 1976: Sex dimorphism in certain bone elements of the European hare. Acta theriol., 21, 1: 3—17 [With 8 Tables & 20 Figs].

Morphological and osteometric studies were made of some of the bone elements of 34 skeletons of the European hare, *Lepus europaeus* Pallas 1778, caught in the Wielkopolska region of Poland during the period 1969—1970. The studies showed that sex dimorphism is clearly expressed only in the structure of the pelvis and *os sacrum*. Both *ossa coxae* are situated almost parallel to each other in females, whereas in males these bones converge in a caudal direction. In addition a large *cavum pelvis* is observed in females. *Os sacrum* in females curves to a lesser degree dorsal, and consequently the chord is greater than in males. It is, however, impossible to define sex dimorphism of *ossa longa* on the basis of the values of dimensions or calculated indexes.

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1. INTRODUCTION

Studies published on the European hare, *Lepus europaeus* Pallas 1778, include that on variations in the pelvis and *os sacrum* by Bujalska (1965), who stated that sex dimorphism in the pelvis and *os sacrum* of the hare is expressed primarily in the different growth dynamics and changes in the various measurements and indexes in males and females.

Our task, however, was to show the sex differences occurring in some bone elements of a physiologically mature hare, such as pelvis, *os sacrum* and *ossa longa* of both limbs.

2. MATERIAL AND METHODS

The study material consisted of 34 skeletons of the hare caught in the Wielkopolska region in 1969 and 1970, 27 of which were females and 7 males. All the skeletons were chosen as belonging to adult individuals, *i.e.*, those in which the basal thickening of the ulna (Stroh's mark) had already been replaced by synostosis. In accordance with the suggestions made by Bujalska (1965), and Cabon-Raczyńska & Raczyński (1965) direct observation was made of the

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prepared underarm skeleton for this purpose. It can therefore be said that the hares examined were over 12 months old.

Morphological analysis was next made of the bone material in order to grasp characteristic features and differences between the sexes. Measurements of the bones were made by S a l l e r's (1930) and D ü r s t's (1926) methods, on the pelvis, *os sacrum* and *ossa longa* of both limbs. The numbers of measurements on the figures correspond to the numbers of measurements made on the bones.

Latin nomenclature was used in accordance with *Nomina Anatomica Veterinaria* (Vienna, 1968).

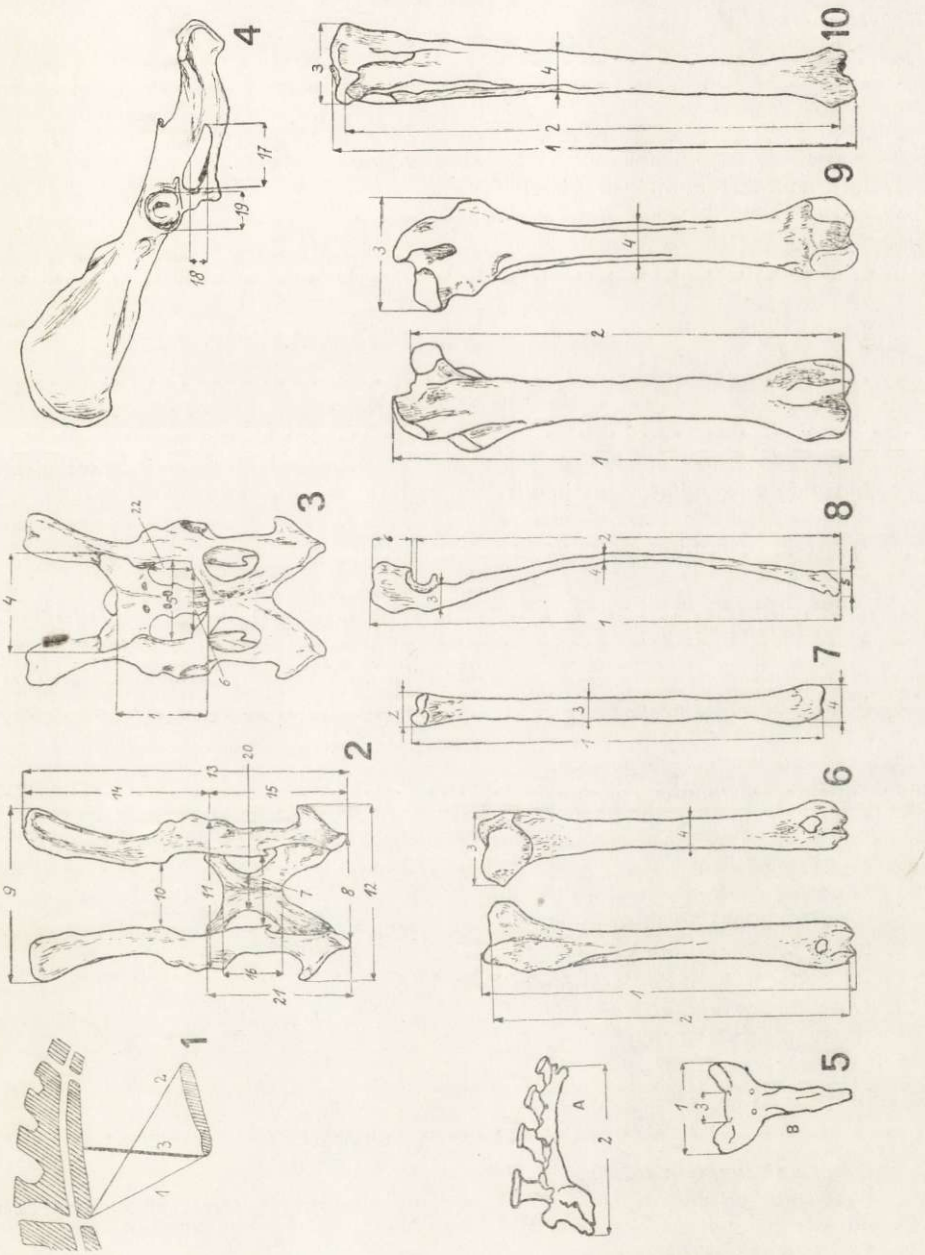
Pelvis (Figs. 1, 2, 3, 4)

1. *Conjugata vera-discessus promontorium et pecten ossis pubis*
2. *Conjugata diagonalis-discessus promontorium et margo caudalis symphysis pelvis*
3. *Diameter verticalis cranialis* — vertical straght line on *margo cranialis pecten ossis pubis*
4. *Diameter transversa dorsalis* corresponds to *latitudo transversa basis (alae) ossis sacri*
5. *Diameter transversa mediana s. distantia psoadica-discessus amborum tubercula psoadica*
6. *Diameter transversa ventralis-discessus amborum cristae iliopectineae*
7. *Diameter mediana cavum pelvis-discessus minimus amborum spinae ischiadicae*
8. *Diameter caudalis pelvis-discessus amborum anguli mediales tubera ischiadica*
9. *Discessus maximus amborum tuberum coxae*
10. *Discessus minimus amborum tuberum sacralia*
11. *Discessus amborum margines acetabulae*
12. *Discessus maximus amborum tuberum ischii*
13. *Longitudo ossis coxae-discessus tuber coxae et tuber ischii*
14. *Longitudo ossis ilii-discessus centrum acetabuli et tuber coxae*
15. *Longitudo ossis ischii-discessus centrum ocetabuli et tuber ischiadicum*
16. *Longitudo symphysis pelvis*
17. *Diameter longitudinalis foraminis obturatorii*
18. *Diameter transversa foraminis obturatorii*
19. *Diameter longitudinalis acetabuli*
20. *Latitudo minima symphysis pelvis*
21. *Longitudo fundi pelvis-discessus tuberis ischii et eminentiae iliopectineae*
22. *Discessus eminentiae ilipectinae et facies auricularis ossis ilii*

Index 1 = (3 × 100) : 21
Index 2 = (3 × 100) : 2
Index 3 = (5 × 100) : 1
Index 4 = (5 × 100) : 2
Index 5 = (5 × 100) : 3
Index 6 = (7 × 100) : 21

Os sacrum (Fig. 5)

1. *Latitudo transversa basis (alae) ossis sacri*
2. *Longitudo ossis sacri*
3. *Latitudo transversa facies articularis cranialis ossis sacri*
4. *Diameter transversa foraminis cranialis canalis ossis sacri*
5. *Diameter verticalis foraminis cranialis canalis ossis sacri*



Figs. 1—10. Method of measuring different bones of a hare skeleton. Numbers correspond to the measurements made, the values of which are given in the text. 1. Pelvis — schema, 2. Pelvis — *norma dorsalis*, 3. Pelvis — *norma ventralis*, 4. Pelvis — *norma lateralis*, 5. *Os sacrum*, A — *norma lateralis*, B — *norma ventralis*, 6. Humerus, 7. Ulna, 8. Radius, 9. Femur, 10. Tibia.

6. *Discessus promontorium et apex ossis sacri*

Index 1 = (1 × 100) : 2
Index 2 = (1 × 100 : 6

Humerus (Fig. 6)

1. *Longitudo maxima humeri*
2. *Longitudo physiologica-discessus caput humeri et trochlea*
3. *Latitudo extremitatis proximalis*
4. *Latitudo minima corporis ossis humeri*
5. *Latitudo extremitatis distalis*
6. *Latitudo trochleae ossis humeri*

Index 1 = (3 × 100) : 1
Index 2 = (4 × 100) : 1
Index 3 = (5 × 100) : 1

Ulna (Fig. 7)

1. *Longitudo maxima ulnae*
2. *Longitudo physiologica-discessus processus styloideus ulnae et incisura olecrani*
3. *Latitudo extremitatis proximalis*
4. *Latitudo minima corporis ossis ulnae*
5. *Latitudo extremitatis distalis*
6. *Longitudo olecrani*

Index 1 = (6 × 100) : 1
Index 2 = (4 × 100) : 1

Radius (Fig. 8)

1. *Longitudo maxima radii*
2. *Latitudo extremitatis proximalis*
3. *Latitudo minima corporis radii*
4. *Latitudo extremitatis distalis*

Index 1 = (3 × 100) : 1

Femur (Fig. 9)

1. *Longitudo maxima femoris*
2. *Longitudo physiologica-discessus caput femoris et fossa intercondylica*
3. *Latitudo extremitatis proximalis*
4. *Latitudo minima corporis femoris*
5. *Latitudo extremitatis distalis*

Index 1 = (3 × 100) : 1
Index 2 = (4 × 100) : 1
Index 3 = (5 × 100) : 1

Tibia (Fig. 10)

1. *Longitudo maxima tibiae*
2. *Longitudo physiologica-discessus condylus lateralis et facies articularis extremitatis distalis*
3. *Latitudo extremitatis proximalis*
4. *Latitudo minima corporis tibiae*
5. *Latitudo extremitatis distalis*

Index 1 = (3 × 100) : 1
Index 2 = (4 × 100) : 1
Index 3 = (5 × 100) : 1

3. RESULTS

The morphological analysis made by the visual observation method revealed distinct sex differences in the pelvis and *os sacrum*, whereas such differences were difficult to grasp visually in the case of *ossa longa*. *Pelvis feminina* is larger and more massive than in males. Both *ossa coxae* are situated almost parallel to each other, *discessus maximus amborum tuberum ischii* (Fig. 2—12) is almost identical with *discessus maximus amborum tuberum coxae* (Fig. 2—9). *Diameter transversa mediana* and *diameter verticalis* are larger than in males. *Pelvis masculina* is smaller than in females. Both *ossa coxae* run convergently in a caudal direction and consequently *discessus maximus amborum tuberum ischii* (Fig. 2—12) is smaller than *discessus maximus amborum tuberum coxae* (Fig. 2—9). *Diameter transversa mediana* and *diameter verticalis* are smaller than in females.

Table 1

The dimensions of the pelvis.

Dimensions	Females (n=27)		Males (n=7)	
	Min.-Max.	Avg.	Min.-Max.	Avg.
1. *Conjugata vera*	30—39	35.1	28—31	29.5
2. *Conjugata diagonalis*	46—57	54.2	51—54	52.0
3. *Diameter verticalis cranialis*	33—42	36.0	26—31	29.0
4. *Diameter transversa dorsalis*	34—44	39.2	32—37	35.0
5. *Diameter transversa mediana*	32—39	35.0	28—35	31.0
6. *Diameter transversa ventralis*	23—32	29.4	20—26	22.8
7. *Diameter mediana cavum pelvis*	25—33	28.2	22—27	24.2
8. *Diameter caudalis cavum pelvis*	23—37	31.2	24—31	26.7
9. *Discessus maximus amborum tuberum coxae*	59—74	67.1	56—67	61.4
10. *Discessus minimus amborum tuberum sacralia*	18—27	22.6	18—25	20.7
11. *Discessus amborum margines acetabuli*	46—60	53.1	46—52	46.0
12. *Discessus maximus amborum tuberum ischii*	53—68	60.4	55—61	56.7
13. *Longitudo ossis coxae*	98—107	102.2	95—105	100.7
14. *Longitudo ossis ilii*	49—57	53.0	45—54	51.2
15. *Longitudo ossis ischii*	46—53	49.5	46—53	49.8
16. *Longitudo symphisis pelvis*	25—32	27.9	21—30	26.5
17. *Diameter longitudinalis foraminis obturatorii*	20—23	21.8	19—23	21.1
18. *Diameter transversa foraminis obturatorii*	14—18	15.8	14—16	15.1
19. *Diameter longitudinalis acetabuli*	10—13	12.0	11—13	11.8
20. *Longitudo minima symphysis pelvis*	9—15	12.5	7—11	8.4
21. *Longitudo fundi pelvis*	51—59	54.7	52—58	54.4
22. *Discessus eminentiae iliopectineae et facies auricularis ossis ilii*	17—23	21.4	18—20	19.2

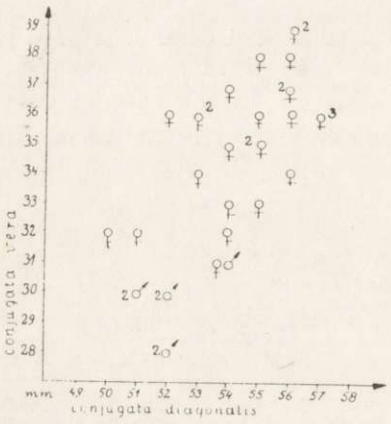


Fig. 11.

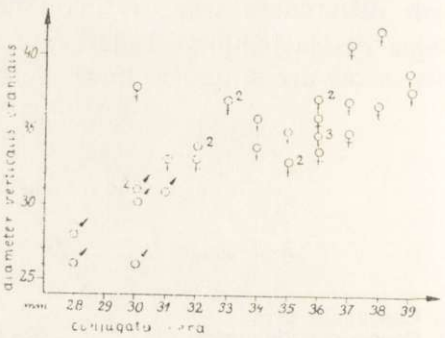


Fig. 12.

Fig. 11. Pelvis. Relation of *conjugata vera* to *conjugata diagonalis*.
Fig. 12. Pelvis of *diameter verticalis cranialis* to *conjugata vera*.

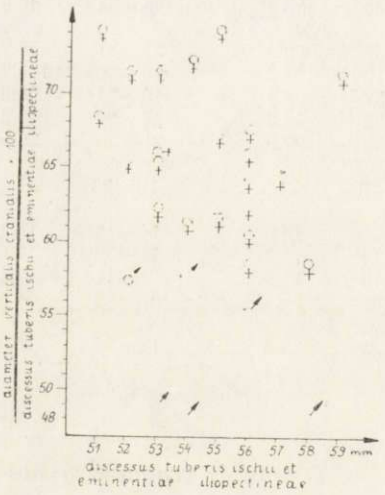


Fig. 13.

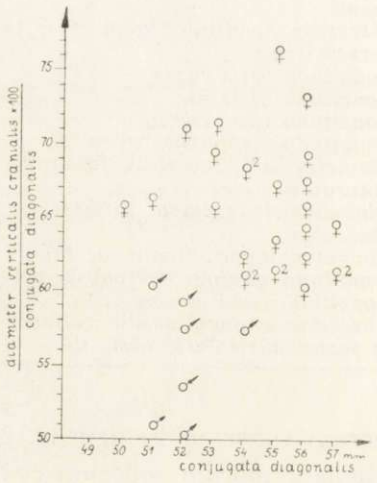


Fig. 14.

Fig. 13. Pelvis. Relation of index: (*diameter verticalis cranialis* × 100): *discessus tuberis ischii et eminentiae iliopectineae*.
Fig. 14. Pelvis. Relation of index: (*diameter verticalis cranialis* × 100): *conjugata diagonalis* to *conjugata diagonalis*.

A greater curve in the dorsal direction can be seen at the first glance on *os sacrum* in males; in females this curve is less distinct. The following measurements are most important in examination of sex differences: 1. *conjugata vera*, 2. *conjugata diagonalis*, 3. *diameter verticalis*, 5. *diameter transversa mediana*, 7. *diameter transversa mediana cavum pelvis*, 21. *longitudo fundi pelvis*.

Table 2

The dimensions of *os sacrum*.

Dimensions	n	Females		Males	
		Min.--Max.	Avg.	Min.--Max.	Avg.
1. *Latitudo transversa basis (alae) ossis sacri*	27	37—44	40.7	35—39	37.1
2. *Longitudo ossis sacri*	24	45—51	47.7	43—50	46.8
3. *Latitudo transversa faciei articularis cranialis ossis sacri*	27	15—19	17.1	15—18	16.5
4. *Diameter transversa foraminis cranialis ossis sacri*	27	7—9	7.6	6—9	7.4
5. *Diameter verticalis foraminis cranialis canalis ossis sacri*	27	3—5	3.7	3—5	3.8
6. *Discessus promontorium et apex ossis sacri*	24	40—47	43.6	39—45	42.7

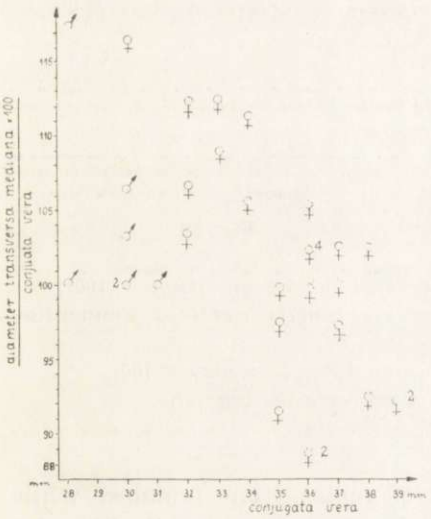


Fig. 15.

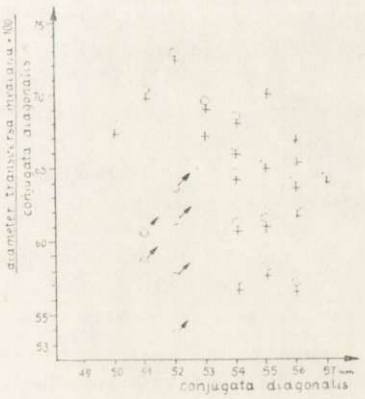


Fig. 16.

Fig. 15. Pelvis. Relation of index: (*diameter transversa mediana* × 100): *conjugata vera* to *conjugata vera*.

Fig. 16. Pelvis. Relation of index: (*diameter transversa mediana* × 100): *conjugata diagonalis* to *conjugata diagonalis*.

Calculation was made on the basis of these measurements of 6 indexes for the two sexes (Table 2), and the relations between *conjugata vera* and *conjugata diagonalis* (Fig. 11), and *conjugata vera* and *diameter verticalis* (Fig. 12) were plotted on graphs. In both cases there is clear dividing line between individuals of the two sexes, males being grouped near the smaller values. This is also confirmed by the values of the calculated indexes. The relation of index 1 (Table 1, 2) and *longitudo fundi*

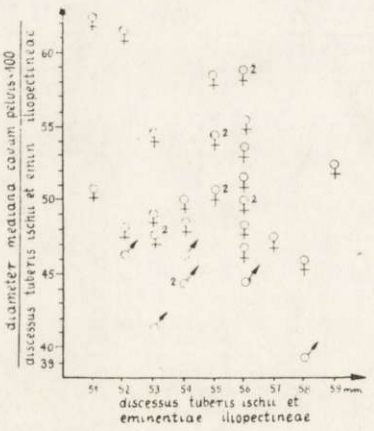


Fig. 17.

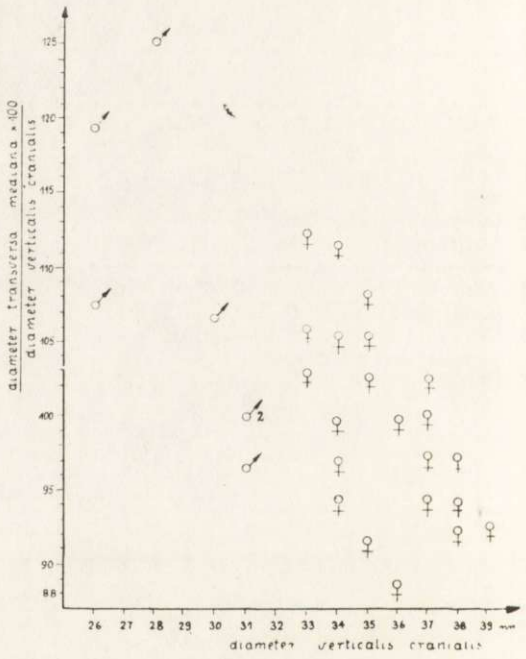


Fig. 18.

Fig. 17. Pelvis. Relation of index: (*diameter mediana cavum pelvis* × 100): *discessus tuberis ischii et eminentiae* to *discessus tuberis ischii et eminentiae iliopectineae.*

Fig. 18. Relation of index: (*diameter transversa mediana* × 100): *diameter verticalis cranialis* to *diameter verticalis cranialis.*

pelvis (Fig. 13) reveals the separateness of males from females, while the relation of index 2 (Table 1, 2) and *conjugata diagonalis* (Fig. 14) shows the characters of females and males as similar to the relations between *conjugata vera* and *conjugata diagonalis* (Fig. 12) and the relations between *conjugata vera* and *diameter verticalis* (Fig. 12). The value of index 3 (Table 1, 2) decreases with increase in the value of *conjugata vera* (Fig. 15), males being grouped near the lower values of *conjugata*

vera. If we take into account the relation of index 4 (Fig. 1, 2) and *conjugata diagonalis* (Fig. 16) and relation of index 6 (Table 2) and *longitudo fundi pelvis* (Fig. 17), we obtain a picture similar to that when the relation between index 1 and *longitudo fundi pelvis* are considered (Fig. 13). If, however, we take into consideration the relation of index 5 (Table 1, 2) and *diameter verticalis* (Fig. 18) the relation of males and females is similar to that of index 3 and *conjugata vera* (Fig. 15), the boundary between the two sexes being more distinct on Fig. 18.

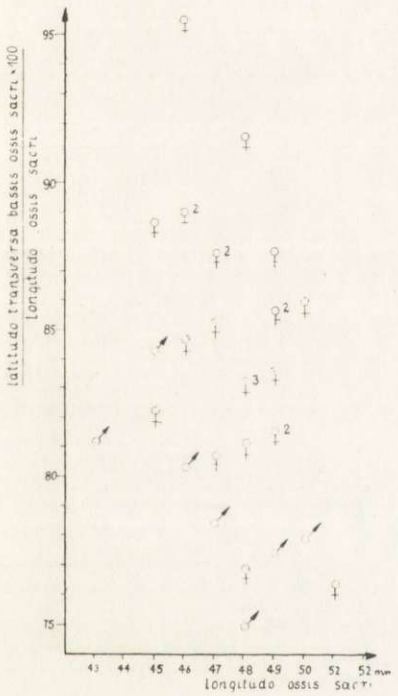


Fig. 19.

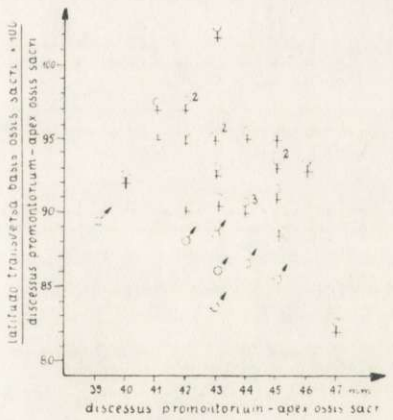


Fig. 20.

Fig. 19. *Os sacrum*. Relation of index: (*latitudo transversa basis ossis sacri* × 100): *longitudo ossis sacri* to *longitudo ossis sacri*.

Fig. 20. *Os sacrum*. Relation of index: (*latitudo transversa basis ossis sacri* × 100): *discessus promontorium et apex ossis sacri* to *discessus promontorium et apex ossis sacri*.

Among 6 measurements of *os sacrum* (Fig. 6) 3 proved to be significant for sex differences, as follows: 1. *latitudo transversa basis (alae) ossis sacri*, 2. *longitudo ossis sacri*, 6. *discessus promontorium et apex ossis sacri* (Table 2). Two indexes were calculated on the strength of these measurements (Table 8).

Table 3

The dimensions of the humerus.

Dimensions	Females (n=18)		Males (n=7)	
	Min.-Max.	Avg.	Min.-Max.	Avg.
1. *Longitudo maxima humeri*	102—117	107.2	104—112	107.5
2. *Longitudo physiologica*	98—114	108.8	100—107	103.7
3. *Longitudo extremitatis proximalis*	15—17	16.1	15—17	16.2
4. *Latitudo minima corporis (diaphysis) ossis humeri*	6—7	6.1	5—6	5.57
5. *Latitudo extremitatis distalis*	12—13	12.3	12—13	12.1
6. *Latitudo trochleae ossis humeri*	6—7	6.1	6—7	6.1

Table 4

The dimensions of the ulna.

Dimensions	Females (n=27)		Males (n=7)	
	Min.-Max.	Avg.	Min.-Max.	Avg.
1. *Longitudo maxima ulnae*	126—144	132	127—138	132.9
2. *Longitudo physiologica*	115—125	119.7	116—125	120.5
3. *Latitudo extremitatis proximalis*	8—10	9.0	8—9	8.7
4. *Latitudo minima corporis ossis ulnae*	3—6	4.3	4—5	4.7
5. *Latitudo extremitatis distalis*	3—5	3.6	3—5	3.4
6. *Longitudo processus olecrani*	10—13	11.7	11—13	11.8

Table 5

The dimensions of the radius.

Dimensions	Females (n=27)		Males (n=7)	
	Min.-Max.	Avg.	Min.-Max.	Avg.
1. *Longitudo maxima radii*	108—125	114.3	112—120	116
2. *Latitudo extremitatis radii*	9—10	9.4	9—10	9.2
3. *Latitudo minima corporis (diaphysis) radii*	6—7	6.9	6—7	6.5
4. *Latitudo extremitatis distalis*	9—11	10.0	10—11	10.5

Table 6

The dimensions of the femur.

Dimensions	Females (n=27)		Males (n=7)	
	Min.-Max.	Avg.	Min.-Max.	Avg.
1. *Longitudo maxima femoris*	125—141	133.5	129—138	133.4
2. *Longitudo physiologica*	116—133	125.0	122—129	125.1
3. *Latitudo extremitatis proximalis*	25—28	26.6	26—28	26.7
4. *Latitudo minima corporis (diaphysis) femoris*	8—19	10.9	9—10	9.4
5. *Latitudo extremitatis distalis*	19—22	20.5	20—21	20.1

Os sacrum exhibits certain differences in breadth of alae: in males this dimension varies within limits of 35—39 mm and in females within limits of 37—44 mm (Table 2, 8). In connection with the distinct dorsal bend of the bone in males, the chord measured from promontorium to S_4 (*vertebra sacralis*) is shorter in them (39—45 mm) than in females (40—47 mm) (Table 2). The value of index 1 (Table 8) is smaller (Fig. 19) in males than in females. A more distinct difference occurs in the relation of males and females when the chord is taken into consideration, and here a distinct dividing line can be drawn between individuals of the two sexes (Fig. 20).

Similarly use was made of indexes calculated on the basis of certain measurements for analysing *ossa longa*. Four out of the 6 measurements made on the humerus (Fig. 6, Table 3) were used for calculating indexes. as follows:

Table 7

The dimensions of the tibia.

Dimensions	Females (n=27)		Males (n=7)	
	Min.-Max.	Avg.	Min.-Max.	Avg.
1. *Longitudo maxima tibiae*	140—161	150.6	145—157	151.4
2. *Longitudo physiologica*	136—155	144.8	140—152	145.5
3. *Latitudo extremitatis proximalis*	19—22	20.5	19—21	20.1
4. *Latitudo minima corporis (diaphysis) tibiae*	7—9	8.1	8—9	8.3
5. *Latitudo extremitatis distalis*	14—18	16.0	16—17	16.1

1. *longitudo maxima humeri*, 3. *latitudo extremitatis proximalis humeri*, 4. *latitudo minima corporis humeri*, 5. *latitudo extremitatis distalis humeri* (Table 8). The total length of this bone does not exhibit any great differences in females and males, being 107.2 mm for females, and 107.5 mm in males. Certain differences occur in average values of measurements and indexes (Table 3, 8). A distinct difference can be observed between the average values of index 2, which is 5.17 in males and 5.74 in females (Table 8).

Six measurements were also made on the ulna (Fig. 7, Table 8), 3 of which were used to calculate 2 indexes (Table 8): 1. *longitudo maxima ulnae*, 2. *latitudo minima corporis ulnae*, 6. *longitudo olecrani*. Total lengths of this bone for females and males, being 126—144 mm (avg. 132.0) for females and 127—138 mm (avg. 132.9) for males, only the average value of index 2 for males being higher than in females; this difference is 0.23 (Table 4, 8).

Of the 4 measurements made of the radius (Fig. 8, Table 5) use was made of *longitudo maxima radii* and *latitudo minima corporis radii* for calculating the index (Table 8). This bone does not exhibit sex differences in respect of *longitudo maxima radii* (Table 5), while the average value of index 1 in females is higher than in males — this difference is 0.44 (Table 8). Five measurements were made on the femur (Fig. 9,

Table 8

Observed ranges and averages of indexes calculated.

Indices	Females (n=27)		Males (n=7)	
	Min.-Max.	Avg.	Min.-Max.	Avg.
PELVIS				
1. (3×100) : 21	58.6— 74.5	65.9	48.1— 57.6	53.1
2. (3×100) : 2	60.7— 82.6	66.6	50.0— 60.7	55.7
3. (5×100) : 1	88.8—116.6	98.4	100.0—117.8	103.9
4. (5×100) : 2	57.1— 76.0	68.4	53.8— 63.4	59.0
5. (5×100) : 3	88.8—112.1	95.4	96.7—125.0	107.8
6. (7×100) : 21	45.7— 62.5	52.0	39.6— 46.2	45.8
OS SACRUM				
1. (1×100) : 2	76.4— 95.6	84.9	75.0—84.4	79.3
2. (1×100) : 6	82.9—102.3	93.1	83.7—89.7	86.7
HUMERUS				
1. (3×100) : 1	13.67—16.50	15.24	13.76—16.34	15.03
2. (4×100) : 1	4.58— 6.86	5.74	4.58— 5.76	5.17
3. (5×100) : 1	10.9 —12.87	11.66	11.0 —11.60	11.29
ULNA				
1. (6×100) : 1	7.69—10.27	8.91	8.52—9.70	8.94
2. (4×100): 1	2.38— 4.68	3.31	2.91—3.93	3.54
RADIUS				
1. (3×100) : 1	3.52—6.48	6.05	5.00—6.25	5.61
FEMUR				
1. (3×100) : 1	19.11—21.25	19.99	19.25—20.93	20.02
2. (4×100) : 1	5.56— 8.95	7.47	6.61— 7.75	7.21
3. (5×100) : 1	14.28—16.53	15.39	14.70—15.50	15.09
TIBIA				
1. (3×100) : 1	12.66—14.76	13.60	12.73—14.48	13.23
2. (4×100) : 1	4.69— 6.04	5.43	5.09— 6.20	5.38
3. (5×100) : 1	9.61—11.76	10.62	10.19—11.03	10.80

Table 6) and 3 indexes (Table 8) calculated on the basis of 4 dimensions: 1. *longitudo maxima femoris*, 3. *latitudo extremitatis proximalis femoris*, 4. *latitudo minima corporis femoris* and 5. *latitudo extremitatis distalis femoris*. There are no important differences in the values of measurements and indexes of this bone (Table 6, 8). Only the average values of indexes

2 and 3 are clearly higher than in males: differences in value are 0.26 and 0.30 (Table 8). The average values of index 1 exhibit the smallest difference, *i.e.*, 0.03 (Table 8).

The same measurements were made on the tibia (Fig. 10, Table 7) and 3 indexes were also calculated (Table 8). Average values of indexes 1, 2 in males are lower than in females (Table 7, 8), but index 3 in males has an average value higher than that in females, the difference being 0.18 (Table 8). It can be taken on the strength of the above data that *ossa longa* in the hare do not exhibit sex dimorphism.

4. DISCUSSION

The morphological observations and osteometric studies made showed that sex differentiation in the structure of the pelvis in the hare is distinct, as it is in many other species of mammals. Studies of this kind have been made by, *inter alia*, Schrammowa (1967), Boessneck, Müller & Teichert (1964) in sheep and goats, while Lempenau (1964) has made similar studies of other species of domestic and wild ruminants. This dimorphism is apparent not only in the reciprocal position of the two *ossa coxae* and *os sacrum*, but primarily in the values of indexes calculated on the basis of measurements made. Of the pelvis dimensions the most important are those of *conjugata vera* and *conjugata diagonalis, diameter verticalis* and *diameter transversa*, which are of particular importance in veterinary obstetrics (Szczudłowski, 1948; Franck & Opermann, 1922; Studencov, 1949).

Studies on sex dimorphism of the skeleton have been, and continue to be carried out on domestic and wild animals, the question having been most thoroughly investigated in many domestic animals, particularly in relation to *metacarpus* and *metatarsus*. The indexes calculated for the permit of defining the sex of the individual from which the given bone originates. It must be added that owing to the possibility of establishing these coefficients the coefficient of height can be calculated, taking into consideration the ratio of length of the bone to height at the rump. This is of great significance in the case of ruminants, in which sex dimorphism is also expressed in their dimensions — males are larger than females. It must be added here that the effect of castration is evident also in the bones of these animals: *metacarpus* or *metatarsus* in bullocks have similar indexes to those of female bones, but are far longer.

The sex dimorphism of *metapodia* was used for calculation of indexes and height coefficients in domestic ruminants such as the cow (Boessneck, 1956; Calkin, 1960; Fock, 1966; Koudelka, 1886), sheep

(Haak, 1965; Calkin, 1961) and goat (Schramm, 1967). For the latter two animals examination was made of the other *ossa longa* (Haak 1965; Koudelka, 1886). In the case of the goat all *ossa longa* were examined by Schrammowa (1967). Koudelka (1886) calculated the breadth-length index for *metapodia* and the remaining *ossa longa* and drew attention to the fact that it is always higher in males than in females. Koudelka's observations were later confirmed by other authors (Boessneck, 1956; Calkin, 1960; Godynicki, 1965, 1970; Haak, 1965; Schramm, 1967). In wild animals the sex dimorphism of the *ossa longa* has been described by Koudelka (1886) and Godynicki (1965, 1970) in the red deer and roe deer.

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DYMORFIZM PŁCIOWY NIEKTORYCH ELEMENTÓW KOSTNYCH ZAJĄCA SZARAKA

Streszczenie

W celu wykazania dymorfizmu płciowego niektórych elementów kostnych dojrzałego fizjologicznie zająca szaraka, *Lepus europaeus* Pallas, 1778 przeprowadzono badania miednicy, kości krzyżowej i kości długich obu kończyn, należących do 34 osobników, w tym 27 samic i 7 samców, odłowionych na terenie Wielkopolski w latach 1969—1970 (Tabela 1). Wiek zwierząt określono metodą Stroha.

Obserwacje morfologiczne i badania osteometryczne, przeprowadzone metodami Sallera i Dürsta wykazały, że dymorfizm płciowy uwydatnia się wyraźnie jedynie w budowie miednicy i kości krzyżowej. Obie kości miednicowe u samic są ułożone prawie równolegle. Odległość między guzami kulszowymi (Ryc. 2—12) jest prawie taka sama jak największa szerokość między kośćmi biodrowymi (Ryc. 2—9). Szerokość środkowa wejścia miednicowego i wysokość wejścia miednicowego są większe niż u samców. Także u samic jest obszerna jama miednicowa. U samców kości miednicowe są zbieżne w kierunku doogonowym i tym samym szerokość między guzami kulszowymi (1—12) jest mniejsza od szerokości między kośćmi biodrowymi (Ryc. 2—9). Także obliczone wskaźniki (Tab. 2) i przedstawione na wykresach zależności sprzężnej właściwej (*conjugata vera*) i sprzężnej przekątnej (*conjugata diagonalis*) (Ryc. 11) oraz sprzężnej właściwej i wysokości wejścia miednicowego (*diameter verticalis*) (Ryc. 12) wykazują wyraźne rozgraniczenie osobników obu płci, przy czym samce układają się przy wartościach mniejszych. Znajduje to również potwierdzenie w wartościach obliczonych wskaźników (Tabela 2) oraz zależności ich wartości od wartości pomiarów (Ryc. 13—18). Kość krzyżowa u samic jest mniej wygięta dogrzbietowo i tym samym cięciwa jest większa niż u samców. Zaznacza się również różnica w szerokości skrzydełek (Tabela 2). Wartości obliczonych wskaźników wykazują różnice w układzie samców i samic (Tabela 8, Ryc. 19, 20). Kości długie nie wykazują w zasadzie dymorfizmu płciowego i dlatego określenie płci na podstawie wartości wymiarów czy obliczonych dla tych kości wskaźników jest niemożliwe (Tabele 3—8).