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REMARKS ON THE 'BREEDS' OF DOG
(*CANIS LUPUS F. FAMILIARIS*) IN THE POLISH LOWLAND
IN THE ROMAN PERIOD, THE MIDDLE AGES AND POST-MEDIEVAL
TIMES IN THE LIGHT OF ARCHEOZOLOGICAL RESEARCH

Introduction

For contemporary humans, the dog is the most faithful and one of the most popular animal companions in their life. Looking at this species as a whole and bearing in mind the breed standards and the variety of ordinary mongrels, one realizes the remarkable natural variation present in one species regarding their size, bodily proportions and colour. Such external qualities and associated physical traits¹ of an animal (including its morphological type,² or form), determine the breed³. The individual and species-related behaviours constitute the so-called temperament or character,

which results in many dogs being used by humans for specific purposes as well as their more general functions. Both the physical traits and the temperament of a dog, as a domestic animal, have been shaped by a number of factors. Human influence may be considered as the most important determinant here, because the animal has been bred and developed in captivity, unlike its wild ancestor the wolf, which has always lived in natural conditions. Nowadays, it is hobbyists and snobbish fanciers, who want to perpetuate a particular line or modify a strain characteristic of a historical breed, using the knowledge and numerous hints found in abundant kennel literature and manuals. In addition to detailed instructions concerning breed standards, these handbooks contain the classification of dogs from the point of view of their functionality and usefulness for humans. The classification includes, among others, herding, protecting and guarding dogs, hunting dogs used for small and large game⁴ and dogs kept for companionship⁵.

For dog lovers, one of the most intriguing issues is the history of breed formation and development. Archeological and zooarcheological research plays a major role in providing information about earliest times. Thanks to detailed analyses of skeletons and bone fragments as well as careful examination of archaeological context, a hypothesis about the domestication of the wolf and the importance of the dog in symbolic culture and the human economy has been formulated⁶. It is

¹ In zootechnical literature, the term 'physical traits' denotes a set of morphological (phenotypic) qualities, which can be estimated in a living animal by, for example, taking its measurements; cf.: J. G e d y m i n, *Podstawowe wiadomości z genetyki i metod doskonalenia zwierząt (Basic Information on Genetics and Animal Selection Methods)*, Poznań 1982, p. 189; J. M a c i e j o w s k i, J. Z i e b a, *Genetyka zwierząt i metody hodowlane (Animal Genetics and Breeding Methods)*, Warszawa, p. 370.

² To some extent, in archaeozoology, the term "breed" corresponds to such expressions as 'form of the animal', 'morphotype', or 'morphological type'. They are usually defined using osteometric measurements and the estimated withers height of an animal as one of its physical traits. These qualities determine breed variations. In the present paper, the term 'breed' is used in this sense.

³ The breed – in zoological systematics, it is a taxonomic unit below the species, usually used independently of the typical form of the species and distinguished by qualities important to the taxonomy of a particular group. In zootechnics, three types of breed are used: primitive breeds (less influenced by humans and more by natural conditions), transitory breeds (refined primitive breeds), cultured breeds (produced by intensive and long breeding), which are also used to improve primitive or transitory breeds, cf.: *Nowa encyclopedia powszechna (The New Popular Encyclopedia)*, Vol. 5, PWN, Warszawa 1998, p. 460.

⁴ *Psy rasowe w Polsce (Breeds of Dog in Poland)*, Warszawa, 1987.

⁵ D. N o j m a n o v á, Z. H u m p á l, *Psy rasowe (Breeds of Dog)*, Warszawa, 1987.

⁶ N. B e n e c k e, *Der Mensch und seine Haustiere. Die Geschichte einer jahrtausendealten Beziehung*, Konrad

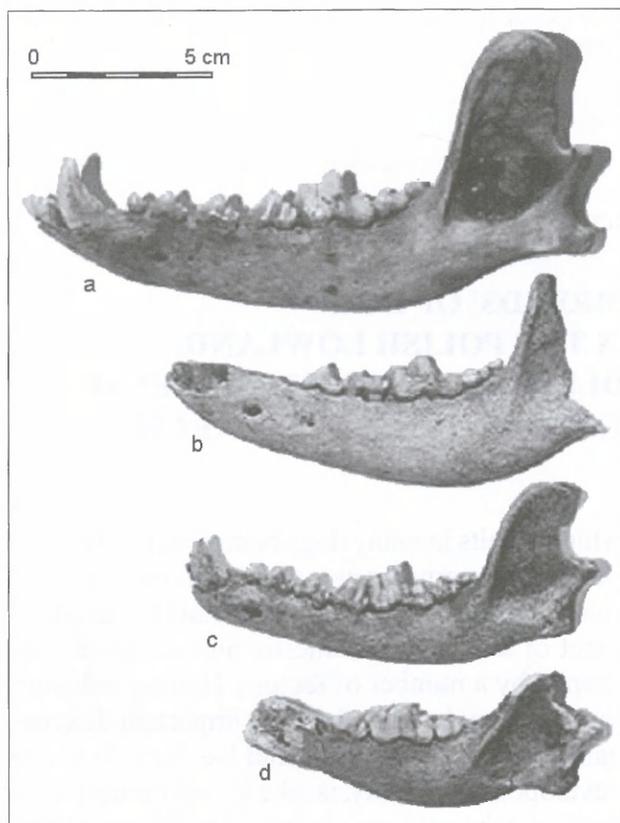


Fig. 1 – Diversity of mandible sizes in dogs from the Kujawy region: a) dog similar to German shepherd (Alsatian). Withers height 58 cm. Sławsko Wielkie, site 16, the Roman period; b-d) Osłonki, site 1, the globular amphorae culture.

assumed that the first attempts to domesticate the animal were made in the Upper Paleolithic Period, about 40-13 thousand years BC. The basic premises of this argument follow from the examination of the mandibles of wolves from Predmosti and Dolni Vestonice, Moravia, Mezina and Kostienki, Ukraine: many of the specimens were characterized by malformations of the mandible tooth row, such as overlapping, missing or extra teeth⁷. Nowadays modifications like these are found in wolves kept in captivity (such as those born and raised in zoological gardens) which are affected by the presence of humans and isolated from wide open spaces. From the point of view of osteometry, however, the mandibles unearthed from Moravia and the Ukraine clearly belong to *Canis lupus*.

Another feature suggesting that wolves were kept in captivity is a decrease in the length of the skull. In the wolf remains discovered at the sites of mammoth hunters in Mezina, Chernihiv oblast (province), Ukraine, there is a size difference of 26 mm between the highest and the lowest value of this feature (mandibles with teeth irregularities were also recorded at this site⁸).

The domestication of the wolf has been confirmed independently in a number of places within its Eurasian range, at the turn of the Pleistocene. Archaeologists have found dog remains dating back to the period between 13000 and 7000 BC. After the initial domestication of the wolf, similar processes resulted in the appearance of many different physical traits in dogs. As a consequence, we see the emergence of breeds, in the modern sense of the term. There was a large variety of dog forms ('breeds') in Europe as early as the Neolithic Period, as evidenced by remains of dogs at Neolithic sites in the Kujawy region (Fig. 1).

Although it would be difficult to present the whole range of breeds of dog and other farm animals using the results of archeozoological research, one of the dog forms is easy to identify. This class is comprised of dachshund-like dogs. Most probably, dogs of this type were bred as early as ancient Egypt, as evidenced by the representations from tomb 3 at Beni Hasan (Fig. 2) and tomb 2 at El Bersche, both dating back to the time of the 12th dynasty (the Middle Kingdom). According to some researchers, dogs of this type were pampered pet dogs living in palaces and residences with their owners⁹. Skeletal remains of dachshund-like dogs found during excavations are scanty. The oldest finds, coming from, among others, Magdalensberg, Mühlberg, Heidelberg, Feddersen Wirde, Arae Flaviae-Rottweil, Herzprung, TÁC-Gorsium, have been dated at the period of the development of the Roman Empire¹⁰. A large group of specimens, dating from the Late La Tène period and the early phases of the Roman period, can be found in the Kujawy region, for example, at Jacewo, site 4b, and Inowrocław, site 100 (unpublished data collected by the author). The Romans considered

Theiss Verlag, Stuttgart 1994; N. B e n e c k e, *Archäozoologische Studien zur Entwicklung der Haustierhaltung in Mitteleuropa und Südkandinavien von den Anfängen bis zum ausgehenden Mittelalter*, Berlin.

⁷ Particularly, the last type of irregularity points to modifications which occurred at genetic level in domesticated animals as a result of their isolation from the wild population.

⁸ N. B e n e c k e, *Der Mensch...*; N. B e n e c k e, *Archäozoologische Studien...*

⁹ *Ibidem*.

¹⁰ M. T e i c h e r t, *Brachymel Dogs*, "Archeozoologia", 1, 1987, pp. 69-75; M. T e i c h e r t, *Nachweise von zwerge- und teckelartigen Hunden aus ur- und frühgeschichtlicher Zeit*, "Der Hund", no. 1, 1988, pp. 12-14; where further literature.

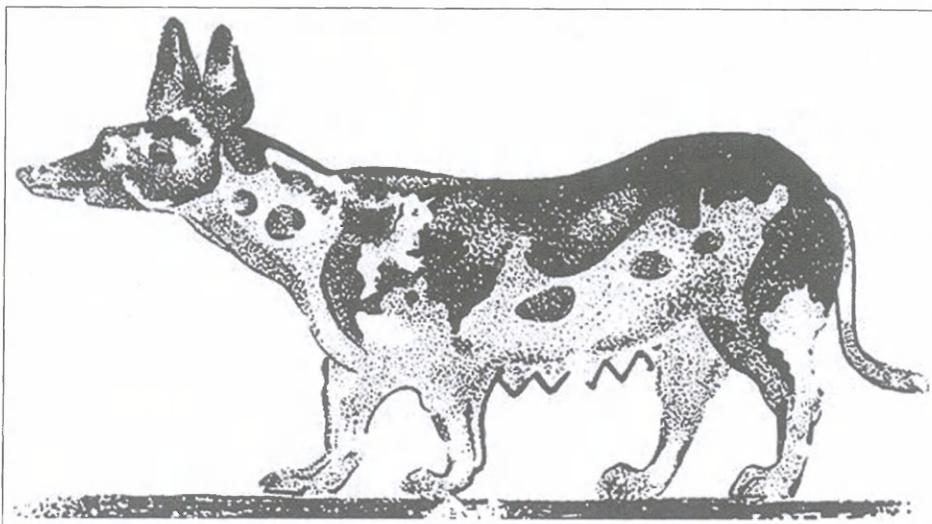


Fig. 2 – Dachshund-like dog – Egypt, Beni Hasan (tomb 3, the 12th dynasty – the Middle Kingdom)⁷⁰.

dogs a symbol of a high standard of living and luxury, they pampered and spoiled them¹¹. Probably, such pet dogs and associated exclusive lifestyles were introduced in the Polish Lowland through contacts with the Empire.

Regrettably, all bone analyses and conclusions regarding the appearance of dogs presented so far are to be found in monographs dealing with the skeletal remains of all the species unearthed on a site and only sporadically with dogs exclusively¹². Previous archeozoological analyses suggest only that in the earliest ages of human history and the Middle Ages, dogs living in the Polish Lowland were characterized by great diversity in size and that some types of dog correspond to modern breeds¹³ as well as to some excavated forms, such as *Canis intermedius*, *Canis palustris* Rütim, *Canis intermedius* Woldr¹⁴. Thus, despite

the fact that the morphological ('breed') diversity of dogs has been a subject of archaeological studies for a long time, no attempt has been made so far to present the issue in a broader context of time and space and to discuss the dynamics of changes occurring in the forms (morphological types) of dogs. The present paper is an attempt to discuss the issue at length.

Material and methods

The present paper discusses a selection of dog bone finds described by the author in his published and unpublished works (Table 1). Analysis of withers height made a valuable contribution to the discussion of the issue. Withers height was the only basic characteristic which could be estimated accurately, accomplished through measurement of long bone lengths. This value was calculated using previous established coefficients¹⁵. A total of 308 height measurements were collected¹⁶. The skeletal material for the present analysis came from several regions of Poland: Pomerania, Kujawy, Great Poland and Lower Silesia, *ad hoc* selected

¹¹ *Ibidem*.

¹² K. W o d z i c k i, *Studia nad prehistorycznymi psami Polski (Studies into the Prehistoric Dogs of Poland)*, "Wiadomości Archeologiczne", Vol. 13, 1935, pp. 1-75; P. W y r o s t, *Badania nad typami psów wczesnośredniowiecznego Opola i Wrocławia (Research into the Types of Dog of Early Medieval Opole and Wrocław)*, "Silesia Antiqua", Vol. 5, 1963, pp. 198-233.

¹³ P. W y r o s t, *Badania nad...*; M. S o b o c i ń s k i, D. M a k o w i e c k i, *Szczątki kostne zwierząt z osady wielokulturowej w Tądowie Górnym, woj. Sieradzkie (Animal Skeletal Remains from the Multicultural Settlement at Tądów Górny, Sieradz Province)*, "Roczniki Akademii Rolniczej w Poznaniu" 237, "Archeozoologia" 17, 1992, pp. 197-207.

¹⁴ M. K u b a s i e w i c z, *Szczątki zwierząt wczesnośredniowiecznych z Wolina (Early Medieval Animal Remains from Wolin)*, Szczecin, 1959, Vol. 2; M. K u b a s i e w i c z, J. G a w l i k o w s k i, *Szczątki zwierzęce z wczesnośredniowiecznego grodu w Kołobrzegu (Animal Remains from the*

Early Medieval Stronghold at Kołobrzeg), Szczecin, 1965, Vol. 24, fasc. 2.

¹⁵ Mainly by A. R. H a r c o u r t, *The Dog in Prehistoric and Early Historic Britain*, "Journal of Archaeological Science" 1, 1974, pp. 151-175; Exceptionally by F. K o u d e l k a, *Das Verhältniss der Ossa longa zur Skelethöhe bei den Säugethieren*, "Verhandlungen des naturforschenden Vereines in Brünn", Bd. 24, Heft 1, 1886, pp. 127-153.

¹⁶ The height of dogs kept by the people of Przeworsk culture was measured using almost exclusively skeletal material.

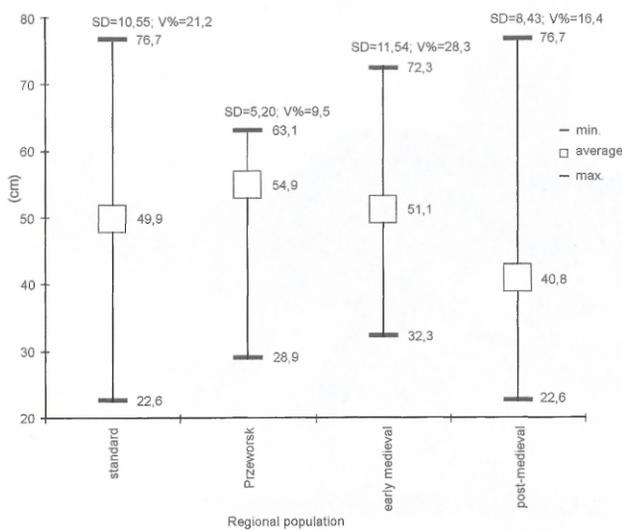


Fig. 3 – Characteristics of withers height in dogs and the average characteristic values in an assumed standard population and period populations. The standard deviation – SD – and variability coefficients – V% – are given above each range.

by the author (Table 1). The chronological range of the finds extends from the Roman period¹⁷ and the Middle Ages to Post-Medieval Time.

The analysis results of the samples, arranged in chronological and regional order, are shown in diagrams representing, the minimal and maximal characteristic values, the average value, and the span between the extreme values. The standard deviation (SD) and the variability coefficient (V%) are included.

In order to standardize the terminology and clarify the narration, the following terms are used in the present paper:

I) The standard (basic) population – dogs coming from all periods and regions whose bones were examined regarding their withers height (the Roman period – modern times).

II) Period populations – the dogs whose bones were classified according to the chronological and cultural criterion: a) the population from the Roman period (the Przeworsk population), b) the early medieval population¹⁸, c) the modern population¹⁹.

¹⁷ A small number of skeletons dating from the early pre-Roman period come exclusively from the Kujawy region. They were found in settlements inhabited by the people of Przeworsk culture.

¹⁸ Bones belonging to this group are dated at the period up to the end of the fourteenth century (cf.: Table 1).

¹⁹ This group comprises bones dated at the late medieval period (from the fourteenth century onwards) coming from towns founded according to the German law (cf.: Table 1).

III) Regional populations – the animals whose bones come from either a particular region or a settlement centre (centres)²⁰: a) the Kujawy population, from settlements in the Kujawy region, b) the Lower-Silesian stronghold population, from Opole and Wrocław c) the Gdańsk stronghold population, d) the town of Gdańsk population.

Results

The statistical characteristics of the standard population

The standard population was characterized by a considerable span of heights. The smallest dog examined was 22.6 cm in height and the largest animal was 76.7 cm in size (Fig. 3). Thus there was a size difference (span) of 54.1 cm between the two extremes. The considerable standard deviation (SD=10.548) and the variability coefficient (21.2%) suggest that the population examined was

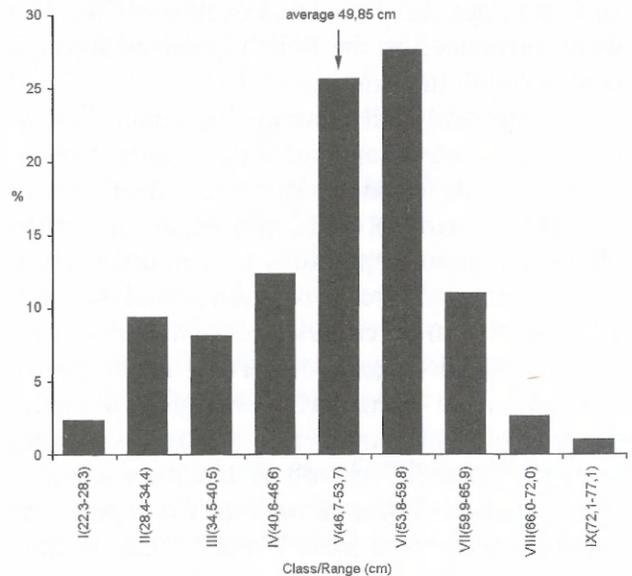


Fig. 4 – Distribution of dog class (group) frequency according to withers height. Members of the standard population living in the period from c the 1st century BC. to 17th century A.D.

characterized by a large variability. Consequently, it may be expected that these results reflect a great diversity of dog breeds and uses of dogs observed over a vast spatial and chronological area.

Both the range and frequency of withers height values show a bimodal distribution (Fig. 4), suggesting that the population in question was comprised of at least two major size groups. The first group consisted of short (small) dogs belonging to classes

²⁰ Cf.: Table 1.

I-III. The second group comprised medium size and large dogs. In the whole population, the average value was 49.85 cm and it was found in group V. This suggests that dogs belonging to group VI, which was the most numerous, were taller.

The characteristics of period populations

The population of dogs from the Roman period is the most homogenous group regarding the range of withers height (Fig. 5). There is a height difference of about 34.2 cm between the shortest and the tallest animals. The standard deviation and variability coefficient are the smallest (Fig. 4). This is probably a result of the fact that in the Roman period, the distribution of frequencies in individual classes is almost unimodal and that the dominant class, class VI, constitutes nearly 50% of the entire set analysed (Fig. 5). Although short dogs were present in the population, their proportion was small compared with the basic population and the dogs coming from later periods. The average withers height value is 54.85 cm, the largest height value among the populations examined. In the diagram showing the range of this parameter, it reaches the maximum value (Fig. 3), placing it within class VI (Fig. 5). The variability coefficient ($V\%=9.4$) is the smallest among the populations analysed. Thus, this population of dogs from the Roman period is, to a large extent, homogenous.

The average withers height value of early medieval dogs is 51.1 cm, which is slightly taller than that of the basic population but smaller than that of dogs from the Roman period (Fig. 3), placing it within the middle class (V) of the range set (Fig. 5). The span of sizes between the shortest and the tallest animals is about 40 cm, larger than the span of dog sizes from the Roman period. The variability coefficient ($V\%=28.3$) for this group is also largest. Therefore, it can be stated that the bones examined come from dogs characterized by the greatest diversity in withers height. However, the frequency distribution of particular dog classes is bimodal (Fig. 5), with classes V (46.7-53.7 cm) and III (34.5-40.5 cm) being the best represented. The former is more numerous (comprising 40 percent of the population), while the latter comprises only 10 percent. Thus the proportion of small dogs had increased compared with the Roman period. This phenomenon contributed to a decrease in the average withers height value. The appearance of tall dogs (classes VIII and IX) and a larger proportion of short dogs resulted

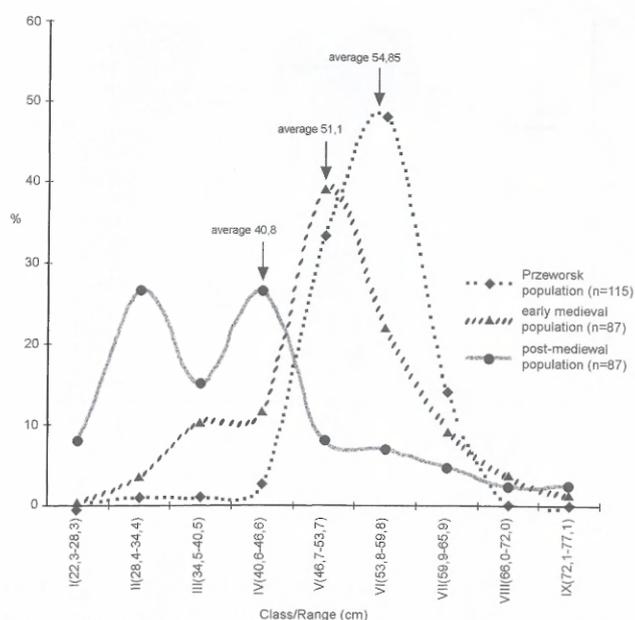


Fig. 5 – Distribution of dog class (group) frequency according to withers height, including the chronological and cultural phases.

in an increase in the variability coefficient (Fig. 5). Thus, early medieval dogs were a distinctly diversified population in comparison with the population of Przeworsk culture.

In Post-Medieval Times, the span of sizes between the largest and the smallest dogs is 54.1 cm, which is larger than in preceding periods. The average value has declined: it is smaller by 10% compared to earlier values. What is more, the average value is closest to the minimum height range (Fig. 3), and belongs to class IV, preceding the middle range (class V, Fig 5). The graphic representation of particular class frequencies is clearly bimodal. However, in contrast to the characteristics of earlier populations, classes II and III directly affect this distribution and are characterized by a frequency of 26.4% each (Fig. 5). The proportion of dogs belonging to classes from V to IX is much smaller, and does not exceed 8 percent. Therefore, in the Przeworsk and early medieval dog populations, one of the classes was clearly dominant, whereas in Post-medieval times no dominant class is observed. Generally speaking, in the post-Roman period, short and medium size dogs outnumber tall animals (those in ranges V-IX).

In conclusion, it may be noted that to a great extent the picture of the standard population as a whole differs from its constituent period populations. Consequently, we can assume that 'cultural development' has been accompanied by

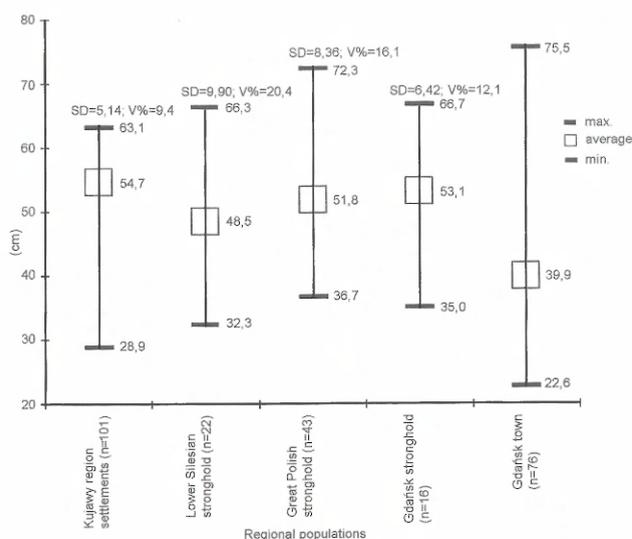


Fig. 6 – Characteristics of withers height in dogs from selected regions based on the ranges and average values of a particular quality. The standard deviation – SD – and variability coefficient – are given above each range.

a progressively increasing diversity of dog forms (breeds).

The characteristics of regional groups

Taking into consideration the average height, the tallest dogs were kept in the settlements of Przeworsk culture in the Kujawy region (Fig. 6). The span of sizes between the shortest and the tallest dogs was about 34.2 cm. Bearing in mind that the variability coefficient is the smallest in this case, it may be assumed that the population in question was relatively the least diversified. The smallest dogs had short, curved legs and could be described as dachshund-like animals (Fig. 7).

At the early medieval stronghold centres of Wrocław and Opole, the dogs were shorter, but the span of sizes between the tiniest and largest animals was 34 cm, the same as seen in the Kujawy region population. However, the variability coefficient suggests that the stronghold population was much more diversified. Dachshund-like dogs were also present here²¹. Dogs kept at the strongholds of Great Poland were slightly taller than their Lower-Silesian counterparts. The span of sizes between the largest and the smallest animals was similar and the variability coefficient was slightly smaller. At the stronghold of Gdańsk, the average withers height was the tallest, but the variability coefficient and the span of sizes were the smallest.

Therefore it may be assumed that the local dog population was the least diversified in respect of the quality in question.

The most distinct characteristics were revealed in the sample representing the town population of modern Gdańsk. Both the variability and the span of sizes of dogs have the largest values and as a consequence, the diversity of withers height was the largest. The average value is placed in the lower range (Fig. 6), suggesting that the majority of the dogs were small to medium sized²². Among small dogs were dachshund-like individuals (Fig. 8).

As in the case of the chronological approach, while discussing the settlement category criterion, some differences can be observed between the characteristics of individual animals regarding their height. To a large extent, these variations follow the pattern presented above, which is partly a result of the fact that the 'regional approach' overlaps the 'chronological approach'.

Conclusion

If we assume that withers height is one of the determinants of breed diversity, the above analyses allow us to draw a number of conclusions. The inhabitants of the settlements examined owned 'breed-like' sets of dogs, which differed depending on the chronological period and the settlement centre. The population of the Roman period from the Kujawy region seems to have been the most homogenous group, whereas the most heterogeneous population was kept in the modern town of Gdańsk. The most distinct group, comprised of dogs bearing a similarity to modern breeds, were the dachshund-like individuals which lived at Kujawy during the Przeworsk culture.

The analyses reported here reveal a chronologically unidirectional tendency toward a diversity of withers heights in dog populations. With the passage of time, more diversification of forms (breeds) of dog occurred. A characteristic quality of the chronological trend was its unidirectional tendency toward a decrease in the proportion of large dogs and a simultaneous increase in the

²² This is also a result of the fact that the modern population is comprised of dogs coming from Gdańsk. Thus, the characteristics of modern population frequency (Fig. 5) may be considered adequate for the distribution of the town population.

²¹ P. Wyrost, *Badania nad...*



Fig. 7 – Diversity of dog bone morphology in dogs from Kujawy in the Roman period (the 2nd-3rd c) based on: (a) humeral bones, b) radial bones, c) ulnar bones, and d) femoral bones (Jacewo, site 4b, from the vicinity of the amber workshop)⁷¹; withers heights 59.1 cm, 28.9 cm.

number of small animals. Although tall dogs were recovered (sometimes taller than 65 cm), they were much less numerous than small dogs.

The changes in frequency of breed-like sets of dogs must have been connected with transformations occurring in the organization as well as the economic and social character of settlements inhabited by the dog owners. The appearance of towns became a primary factor inducing growth in the number of short and medium-sized dogs. It must also be noted that lack of skeletal finds from rural areas renders any comparative analysis of town and village dogs impossible. However, we can assume that the breed sets typical of rural areas were different from the corresponding urban populations, due to the fact that in addition to being their owners' companions, rural dogs were almost certainly working animals that served specific functions, such as guarding, herding and hunting (dogs used for game were usually kept at manors).

The present article should be considered a starting point for further studies into the history of diversification of dog forms and breeds. The

results presented here, obtained using only a set of subjectively selected bone finds, appear to be sufficiently encouraging to take up the challenge. Further research ought to include more material collected within a larger territorial range. It would be essential to examine individual bones from the Roman period as the skeletal remains used in the present study frequently come from ritual contexts and may not constitute representative samples. Similarly, more representative bone finds discovered on the sites of hamlets, villages, granges and castles dating from the stronghold and town period should be examined. In addition, osteometric and statistical analysis of dog skulls ought to be carried out. Analysis of this type together with postcranial skeletal data would contribute a lot to our knowledge about the diversity of breeds. Only such complex studies and analyses would form the basis for further discussion on the breed diversity of dogs and the functional range of historical dog populations kept in the Oder and Vistula river basins.

Translated by Zuzanna Poklewska-Parra

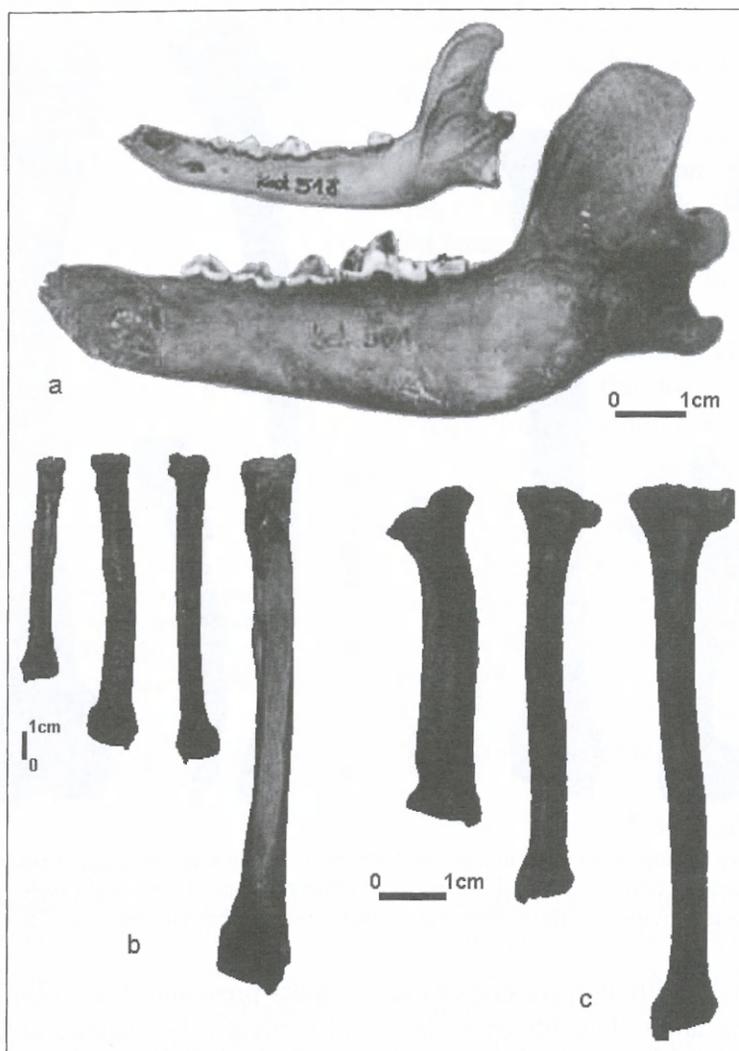


Fig. 8 - Diversity of dog bones in the town population of Gdańsk (Gdańsk – Zielona Brama [the Green Gate]) based on: a) mandibles, b) radial bones – withers heights: 36.7 cm, 37.8 cm, 43.0 cm, 64.0 cm; c) tibial bones – the first sample has a curvature characteristic of a dachshund. Withers heights 30.0 cm, 39.4 cm.

Table 1. Catalogue of sites with dog bones and skeletons used in the paper.

Place/Site	Settlement category	Province/population	Chronology/population
Inowrocław/100 ²³	settlement	Kujawy-Pomerania (kujawsko-pomorskie)/Kujawy	Przeworsk culture/Przeworsk
Inowrocław/95 ²⁴	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Jacewo/4b ²⁵	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Janikowo/11 ²⁶	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Konary/28 ²⁷	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Krusza Zamkowa/3 ²⁸	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Łagiewniki/5 ²⁹	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Łącko/5 ³⁰	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Łojewo/4 ³¹	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Mutowo/2 ³²	settlement	Great Poland (wielkopolskie)/standard ³³	Przeworsk culture/Przeworsk
Polanowice/4 ³⁴	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Przedbojewice/1 ³⁵	settlement	Kujawy-Pomerania/Kujawy	Przeworsk culture/Przeworsk
Rogowo/23 ³⁶	settlement	Kujawy-Pomerania/standard	Wielbark culture/'Przeworsk'
Stanisławie/37 ³⁷	settlement	Pomerania (pomorskie)/standard	Wielbark culture/'Przeworsk'
Tądów Górny/3 ³⁸	settlement	Łódź (łódzkie)/standard	Przeworsk culture/Przeworsk
Czarnków/Plac Wolności (Liberty Square) ³⁹	town	Great Poland/standard	12 th ?-15 th c/standard
Kruszwica/4a ⁴⁰	stronghold/castle	Kujawy-Pomerania/standard	The Middle Ages/standard
Czerwona Wieś/1 ⁴¹	settlement	Great Poland/Great Polish stronghold	10-11 th c/early medieval
Gdańsk/1 ⁴²	stronghold	Pomerania/Gdańsk stronghold	10 th -13 th c/early medieval
Giecz/1 ⁴³	stronghold	Great Poland/Great Polish stronghold	9 th -14 th c/early medieval
Gniezno/15 ⁴⁴	stronghold	Great Poland/Great Polish stronghold	9 th -10 th c/early medieval
Kołobrzeg/Budzistowo 1 ⁴⁵	stronghold	Western Pomerania (zachodnio-pomorskie)/standard	9 th -12 th c/early medieval
Mietlica/1 ⁴⁶	motte	Kujawy-Pomerania/Great Polish stronghold	7 th -9 th /first half of the 11 th c/early medieval
Opole/Ostrówek ⁴⁷	stronghold	Opole (opolskie)/Lower Silesian stronghold	10 th -12 th c/early medieval
Ostrów Lednicki/1 and 2 ⁴⁸	stronghold and the grange	Great Poland/Great Polish stronghold	9 th -13 th c/early medieval
Poznań/Ostrów Tumski (Archbishop's Garden) ⁴⁹	stronghold	Great Poland/Great Polish stronghold	Second half of the 11 th -12 th c/early medieval
Wiślica ⁵⁰	stronghold	Świętokrzyskie/standard	10 th -13 th c/
Wrocław/Ostrów Tumski ⁵¹	town	Lower Silesia/Lower Silesian stronghold	end of the 11 th -beginning of the 13 th c/early medieval
Gdańsk/2 ⁵²	craftsmen's district	Pomerania/Gdańsk stronghold	13 th -14 th c/early medieval

Gdańsk/4 ⁵³	grange-harbour	Pomerania/Gdańsk stronghold	12 th -14 th c/early medieval
Człuchów/High Castle ⁵⁴	castle	Pomerania/standard	14 th -15 th ? c/modern
Dobrzyń-on-Wisła/1 ⁵⁵	castle	Kujawy-Pomerania/standard	14 th -15 th c/modern
Gniezno ⁵⁶	town	Great Poland/standard	13 th -15 th c/modern
Kołobrzeg/E. Gierczak St ⁵⁷	town	Western Pomerania/standard	14 th -15 th c/modern
Kołobrzeg/Ratuszowa St ⁵⁸	town	Western Pomerania/standard	Second half of the 13 th -15 th c/modern
Słupsk/Stary Rynek (Old Marketplace) ⁵⁹	town	Pomerania/standard	13 th /14 th c/modern
Szamotuły/Górkowie Castle ⁶⁰	castle	Great Poland/standard	15 th -first half of the 16 th c/modern
Gdańsk/Zielona Brama (the Green Gate) ⁶¹	town	Pomerania/Gdańsk town	14 th -17 th c/modern
Gdańsk/Rajska St ⁶²	town	Pomerania/Gdańsk town	14 th -16 th /17 th c/modern
Gniezno ⁶³	town	Great Poland/standard	14 th -16 th c/modern
Międzyrzecz/Rynek (Marketplace) ⁶⁴	town	Lubuskie/standard	14 th -16 th c/modern
Poznań/Stary Rynek 42 and 43 (42 and 43 Old Marketplace) ⁶⁵	town houses	Great Poland/standard	15 th -18 th c/modern
Chojnice/Stary Rynek (Old Marketplace) ⁶⁶	town	Pomerania/standard	14 th -17 th c/modern
Gdańsk/Plac Heweliusza (Hevelius Square) ⁶⁷	town	Pomerania/Gdańsk town	15 th -17 th c/modern
Gdańsk/Długie Ogrody (Long Gardens) ⁶⁸	town	Pomerania/Gdańsk town	16 th -17 th c/modern
Międzyrzecz/Spokojna St-Świerczewskiego St ⁶⁹	town	Great Poland/standard	16 th -18 th c/modern

²³ Archaeozoological research: D. M a k o w i e c k i – unpublished data.

²⁴ *Ibidem.*

²⁵ *Ibidem.*

²⁶ *Ibidem.*

²⁷ *Ibidem.*

²⁸ *Ibidem.*

²⁹ *Ibidem.*

³⁰ *Ibidem.*

³¹ *Ibidem.*

³² *Ibidem.*

³³ It was not included in the descriptions of regional or period populations.

³⁴ Archaeozoological research: D. M a k o w i e c k i – unpublished data.

³⁵ *Ibidem.*

³⁶ *Ibidem.*

³⁷ *Ibidem.*

³⁸ Archaeozoological research: M. S o b o c i ń s k i, D. M a k o w i e c k i, *Szczątki kostne zwierząt z osady...*

³⁹ Archaeozoological research: D. M a k o w i e c k i – unpublished data.

⁴⁰ Archaeozoological research: M. S o b o c i ń s k i, *Material kostny zwierzęcy z obiektów wczesnośredniowiecz-*

nych i fosy średniowiecznej w Kruszwicy [stanowisko 4a] (Animal Skeletal Material from the Early Medieval Sites and the Medieval Moat at Kruszwica [Site 4a]), "Roczniki Akademii Rolniczej w Poznaniu" 103, "Archeozoologia" 4, 1978, pp. 109-118.

⁴¹ Archaeozoological research: D. M a k o w i e c k i – unpublished data.

⁴² Archaeozoological research: M. K u b a s i e w i c z, *Badania archeozoologiczne na terenie Gdańska IX-XIV wieku (Archaeozoological Research in Eleventh-Fourteenth Century Gdańsk), "Gdańsk wczesnośredniowieczny", Gdańsk, 1977, Vol. 9.*

⁴³ Archaeozoological research: M. S o b o c i ń s k i, *Szczątki kostne ssaków domowych z wykopalisk w Gieczu (Skeletal Remains of Domestic Mammals from the Excavations at Giecz), "Roczniki Akademii Rolniczej w Poznaniu" 164, "Archeozoologia" 10, 1985, pp. 59-86.*

⁴⁴ Archaeozoological research: M. S o b o c i ń s k i, Z. S c h r a m m, *Zwierzęcy material kostny z wykopalisk w Gnieźnie (Animal Skeletal Material from the Excavations at Gniezno), "Zeszyty Naukowe Uniwersytetu Mikołaja Kopernika w Toruniu, Nauki Humanistyczno-Społeczne", fasc. 45, "Archeologia" 3, 1972, pp. 163-221.*

⁴⁵ Archaeozoological research: D. M a k o w i e c k i,

M. Makowiecka – unpublished data.

⁴⁶ Archaeozoological research: S. Jernigan, M. Sobociński, *Ogólna charakterystyka materiału kośnego zwierzęcego z wykopalisk w Mietlicy (General Characteristics of the Animal Skeletal Material from the Excavations at Mietlica)*, "Roczniki Akademii Rolniczej w Poznaniu", 115, "Archeozoologia" 5, 1979, pp. 37-61; S. Jernigan Maloney, M. Sobociński, *Materiał kośny zwierzęcy z wykopalisk w Mietlicy wydobyty w roku 1978 (Animal Skeletal Material from the Excavations at Mietlica Unearthed in 1978)*, "Roczniki Akademii Rolniczej w Poznaniu" 145, "Archeozoologia" 8, 1983, pp. 43-68.

⁴⁷ Archaeozoological research: P. Wyrost, *Badania nad...*

⁴⁸ Archaeozoological research: D. Makowiecki, *Hodowla oraz użytkowanie zwierząt na Ostrowie Lednickim w średniowieczu. Studium archeozoologiczne (Breeding and utilization of animals in Ostrów Lednicki in the Middle Ages. An Archeozoological Study)*, "Biblioteka Studiów Lednickich", Vol. 6, Poznań.

⁴⁹ Archaeozoological research: D. Makowiecki – unpublished data.

⁵⁰ Archaeozoological research: M. Sobociński, *Szczątki kośne z wykopalisk w Wiślicy (Skeletal Remains from the Excavations at Wiślica)*, "Roczniki Wyższej Szkoły Rolniczej w Poznaniu" 36, 1967, pp. 175-213.

⁵¹ Archaeozoological research: P. Wyrost, *Badania nad...*

⁵² Archaeozoological research: M. Kubasiewicz, *Badania archeozoologiczne...*

⁵³ *Ibidem.*

⁵⁴ Archaeozoological research: M. Sobociński, *Szczątki kośne zwierząt domowych z wykopalisk w Człuchowie (Skeletal Remains of Domestic Animals from the Excavations at Człuchów)*, "Roczniki Akademii Rolniczej w Poznaniu" 121, "Archeozoologia" 6, 1980, pp. 113-129.

⁵⁵ Archaeozoological research: M. Sobociński, *Zwierzęcy materiał kośny z wykopalisk w Dobrzyńniu nad Wisłą (Animal Skeletal Material from the Excavations at Dobrzyń-on-Vistula)*, "Roczniki Akademii Rolniczej w Poznaniu", 184, "Archeozoologia" 12, 1987, pp. 91-117.

⁵⁶ Archaeozoological research: M. Sobociński, Z. Schramm, *Zwierzęcy materiał kośny...*

⁵⁷ Archaeozoological research: A. Gręzak, *Zwierzęce*

szczątki kośne (Animal Skeletal Remains), [in:] *Archeologia średniowiecznego Kołobrzegu*, M. Rębkowski ed., Vol. 3, Kołobrzeg, 1998, pp. 289-317.

⁵⁸ Archaeozoological research: A. Gręzak, *Zwierzęce szczątki kośne (Animal Skeletal Remains)*, [in:] *Archeologia średniowiecznego Kołobrzegu. Badania przy ul. Ratuszowej 9-13*, M. Rębkowski ed., Vol. 1, Kołobrzeg, 1996, pp. 345-384.

⁵⁹ Archaeozoological research: J. Janaszek, *Materiał kośny zwierzęcy z wykopalisk w Słupsku (Animal Skeletal Material from the Excavations at Słupsk)*, "Roczniki Akademii Rolniczej w Poznaniu", 115, "Archeozoologia" 5, 1979, pp. 19-35.

⁶⁰ Archaeozoological research: M. Sobociński, D. Makowiecki, *Zwierzęce szczątki kośne z wykopalisk w zamku Górków w Szamotułach (Animal Skeletal Remains from the Excavations at Górkowie Castle in Szamotuły)*, "Roczniki Akademii Rolniczej w Poznaniu" 184, "Archeozoologia" 12, 1987, pp. 167-192.

⁶¹ Archaeozoological research: D. Makowiecki – unpublished data.

⁶² *Ibidem.*

⁶³ Archaeozoological research: M. Sobociński, Z. Schramm, *Zwierzęcy materiał kośny...*

⁶⁴ Archaeozoological research: D. Makowiecki – unpublished data.

⁶⁵ Archaeozoological research: M. Sobociński, *Materiał kośny zwierząt z wykopalisk w Poznaniu-Stary Rynek 42 i 43 (Skeletal Material of the Animals from the Excavations at Poznań – 42 and 43 Old Marketplace)*, "Roczniki Akademii Rolniczej w Poznaniu" 184, "Archeozoologia" 12, 1987, pp. 141-152.

⁶⁶ Archaeozoological research: D. Makowiecki – unpublished data.

⁶⁷ *Ibidem.*

⁶⁸ *Ibidem.*

⁶⁹ *Ibidem.*

⁷⁰ According to M. Teichert, *Brachymel...*

⁷¹ According to D. Makowiecki, *Wędrowki zwierząt jako przykład działalności gospodarczej i pozagospodarczej człowieka (Animal Migrations as an Example of Human Economic and Non-Economic Activity)*, [in:] *Wędrowki rzeczy i idei w średniowieczu. Spotkania bytomskie*, S. Moździoch ed., Vol. V, Wrocław, 2004, pp. 335-362.

