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What does the mandible say about wild boar: Ontogenetic development, sexual dimorphism and habitat preferences

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Abstract: Wild boar (*Sus scrofa L.*) is one of the most discussed game species, distributed across Europe, therefore the management of this species is considered important. This management should be based on data presented, population quality and preferences and craniometric dimensions show the development of the individual and its prosperity. A sample of 148 male and 153 female wild boar mandibles was studied to compare differences in craniometric measurements, especially to find out wild boar environmental demands and population trends. The width of the *caput mandibulae* and angle of the mandible showed significant difference between males and females. Measurements analysed with forest area size and other data also showed that larger craniometric dimensions were reached in hunting areas with at least 200 ha of forested area, which may be due to the wild boar's need for safety and vegetative cover in the first months of piglet development with respect to its home range. The development of young wild boar is dependent on rest and shelter in the first months of life. A forest cover of at least 200 ha appears to be sufficient in this respect. Information on habitat preferences and individual development can lead to improvements in wild boar management.

Keywords: home range; wildlife management; growth; craniometry; spatial ecology

Wild boar (*Sus scrofa*) is one of the most adaptable animals, and despite some adverse effects, population density is increasing (McClure et al. 2015). Given the impact that the wild boar has on the current agricultural landscape is often a species of concern, the damage it causes in both agricultural areas and forests is not negligible (Gómez et al. 2003; Calenge et al. 2004; Schley et al. 2008). Due to its widespread distribution across Europe, the growing population (Neet 1995; Feichtner 1998) and the intolerable damage to agricultural crops (Geisser 2000; Geisser, Reyer 2004) it is necessary to find ways of suitable management that will be based on detailed knowledge of the species. Mandible is a representative sign of good physical development of the individual, it can be noted that the size of the mandible correlates directly with the individual's weight (Mitchell, Brown 1974; Mitchell et al. 1976; Staines 1978; Suttie, Mitchell 1983; Groves, Grubb 1993; Genov

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et al. 1995; Moretti 1995; Oberez 1996; Brudnicky 2005). Weight is one of the indicators of physical vitality and can thus provide information on the condition of the individual, the whole population and its development (Sprem et al. 2011). Weight is also one of the limiting factors for the birth of young females, usually reported as a threshold weight of 30 kg (Gethöffer et al. 2007; Servanty et al. 2009). Therefore, it could be a useful tool for wildlife management because it may reflect the population quality and its development can be significantly influenced by habitat conditions, such as food supply, shelter, climate and others (Hennig 1981; De Crombrugghe et al. 1989; Hewison et al. 1996; Lentle et al. 2000).

The prosperity of the wild boar is mainly affected by the environment (Knyazev et al. 1985; Randi et al. 1989; Genov et al. 1995) and food supply (Briedermann 1990; Okarma et al. 1995; Feichtner 1998). The original habitats for wild boar were warm, deciduous forests in the lowlands but through time, wild boar have adapted to mixed and coniferous forests. These play an especially important role in the sexual maturation of individuals (Ostfeld, Keesing 2000) and, in particular, for the synchronization of piglet rearing (Maillard, Fournier 2004). Wild boar is an opportunistic omnivore and it is dependent not only on woody plants. Its food sources are dependent on space and time with regard to current agricultural practices and overproduction (Herrero et al. 2006), suggesting that the individual components of a wild boar diet are the result of the ecological characteristics of its environment, agriculture and oversupply. Food supply also depends on the size of a home range. Sex, age and population density affect the home range size (Sanderson 1966; Attuquayefio et al. 1986; Litvaitis et al. 1986; Ostfeld 1990). A wild boar's home range can also be influenced by hunting pressure (Janeau, Spitz 1984). The size of the home range is between approximately 1.1 and 7.7 km^2 (Diong 1982; Boitani et al. 1994; Gabor et al. 1999; Gaston et al. 2008; Keuling et al. 2008; Friebel, Jodice 2009), wild boar in Poland shows 240 ha (Podgórski et al. 2013). In day hunting areas, the home range is larger than in night culling areas, without seasonal effects (Fattebert et al. 2017). In general, males have larger home ranges than females (Keuling et al. 2010). In agricultural areas, the home range of the pig is smaller than in forest-dominated areas (Herbst, Keuling 2014), with the smallest home ranges occurring in areas poor in food supply and shelter (D'Andrea et al. 1995; Keuling et al. 2008). Their daily movement area in the lowlands is between 60.3 ha·day^{-1} and 112.5 ha·day^{-1} and from 113.5 ha·day^{-1} to 125.2 ha·day^{-1} in high, hilly regions (Jánoska et al. 2018).

The current management of the wild boar does not meet the general concept of species control and disproportionate agricultural damage caused by them, hunting is currently influenced by ASF (African swine fever). The purchase of mandibles from hunters of mostly young individuals is used as a means of motivation in the Czech Republic. In order to successfully reduce the damage to farmed areas, social structures must not be disturbed and management of this species should not be practiced only as a form of accidental hunting. The individual's prosperity and its full development are important aspects of a healthy population.

The aim of this study is to describe the dependence of craniometric variables on an individual's condition by weight and, hence, wild boar population quality. A partial aim is to prove the effect of habitat preferences on the quality of the population through the measured craniometric dimensions of the mandibles of wild boar and the representation of forested and agricultural areas in individual hunting areas.

MATERIAL AND METHODS

Study area. The Vysočina region occupies a central position within the Czech Republic. The average population density is 75 inhabitants per km^2. The total area of 6 796 km^2 consists of 29.8% of forests (202.7 ha), a woody species is spruce (73.2%), followed by pine (10.9%), larch (3.1%) and fir (0.9%). Of deciduous trees, beech (3.6%), oak (2.3%), alder (1.8%) and birch (1.4%) are the most frequently represented tree species. The proportion of conifers increases significantly with altitude, so a higher proportion of deciduous trees is found mainly at lower positions or along watercourses. Vysočina is located in a temperate climate zone, with the average annual temperature reaching 6–8 °C and the average rainfall ranging from 500 mm to 800 mm. In this region, there are more than five hundred hunting areas. In 2016, a total of 11 616 wild boar individuals were hunted, 1.7 individuals per km^2. The wild boar mandibles that were measured

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Table 1. Characteristics of individual districts

District	Area	Acreage (km^2)	Relief	Lowest–highest altitude (m a.l.s.)	Afforestation	Coniferous	Deciduous	Agricultural area	Wild boar hunted in 2016
					(%)				
Pelhřimov	Pacov	234.61	highland, rugged	406–765	30.0	91.1	7.3	potato 97.2; mountain 2.8	1 367
	Pelhřimov	827.42			29.3	88.7	9.9		621
	Humpolec	228.03			31.0	88.1	11.2		378
Jihlava	Telč	291.34	highland, rugged	422–837	31.0	87.8	11.1	potato 92.4; mountain 7.6	1 654
	Jihlava	916.89			30.7	87.3	11.5		664
Třebíč	Moravské Budějovice	414.02	highland, lowland in the south	239–711	24.1	78.9	20.1	potato 94.5; beetroot 5; mountain 0.5	649
	Náměšť nad Oslavou	211.28			32.8	63.2	35.4		380
	Třebíč	837.45			26.3	80	18.1		1 631

came from three districts – Pelhřimov, Jihlava and Třebíč (Table 1).

Samples. The studied mandibles come from young wild boar hunted in the Vysočina region from 2016 to 2017. All individuals were hunted as part of standard game management by hunters with valid hunting licenses and permits required for hunting in the Czech Republic. The animals were not hunted for study purposes. The overall dataset included 1 135 samples of mandibles used for ontogeny development and P1a (first premolar) occurrence analysis. For additional analysis, a subset of 301 wild boar mandibles with complete determination of age, weight and sex of the indi-

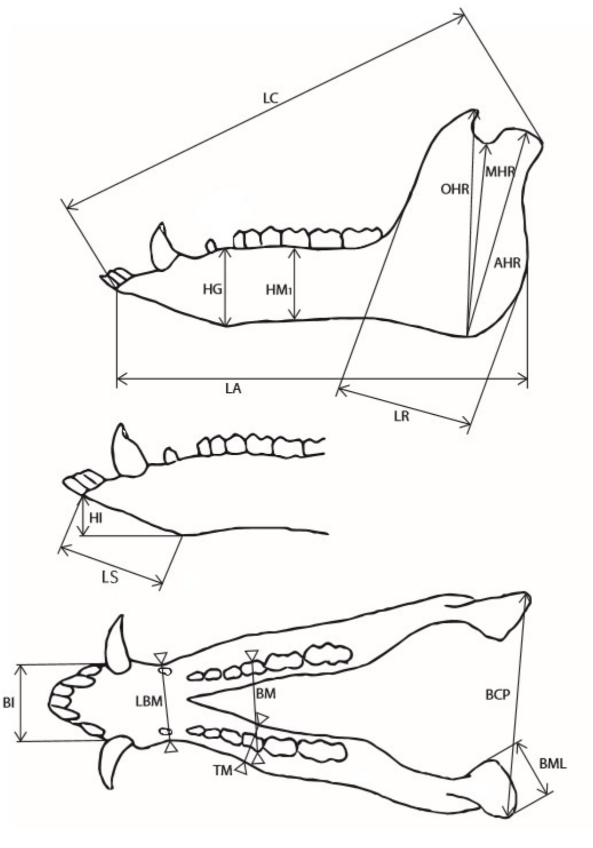

Figure 1. Craniometric dimensions of the mandible

AHR – aboral height of the vertical ramus from the lower part of *tuberosistas musculi mandibulare* to the top of the *caput mandibulae*; BCP – width of the mandible between the borders of medial and lateral points of the *caput mandibulae*; BI – width of the *arcus alveolari* at *pars incisiva*, from the border of *jugum alveolare* i3; BM – width of the mandible from *septum interalveolare* at m_1; BML – width of *caput mandibulae*; HG – height of the mandible from the bottom of *symphysis mandibulae* to the top of the *margo interalveolaris*; HI – distance between the middle of *arcus alveolaris incisiva* and fixed pad; HM_1 – height of the mandible at *septum interalveolare* m_1; HR – middle height of the vertical ramus from the lower part of *tuberosistas musculi mandibulare* to the top of the *incisura mandibulae*; LA – length from the front part of *pars incisive* to anterior-most point of *collum mandibulae*; LBM – least width of the mandible; LC – length from the front part of *pars incisive* to anterior-most point of *processus condylaris*; LR – width of the mandible between *ramus mandibulae* and *angulus mandibulae*; LS – length of *symphysis mandibulae*; OHR – oral height of the vertical ramus from the lower part of *tuberosistas musculi mandibulare* to the top of the *processus coronoideus*; TM – thickness of the mandible *septum interalveolare* of m_1

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vidual was included. There was a total of 148 male and 153 female mandibles, aged between 1 and 16 months. These individuals were from the described districts – Pelhřimov (89 samples), Jihlava (92 samples), Třebíč (120 samples).

Measurements. The mandibles were measured using a Kinex 6040-02-300 digital calliper (KINEX Measuring s.r.o., Czech Republic). Before each measurement, calibration was performed and each measurement was made twice to increase the accuracy of results. Measurement accuracy given by the manufacturer varied between 0.02 and 0.04 mm, depending on the object size being measured. A total of 16 craniometric dimensions were measured, based on the measurement work of Endo et al. (2002) (Figure 1). One of the dimensions measured was to determine the mandibular slope in the incisor part. Dimensions were measured on the left side of the mandible.

The age of the individual was always determined by the same researcher based on the dental development table created by Kolář (2002). Given that it is not possible to estimate exact age based on dental development, age categories have been created to determine the age more accurately (Table 2).

We also registered the weight of the animal (dressed – without head and legs, stated by the hunter), date of the hunt and hunting area for each hunted specimen. The size of the forest, agricultural and water areas were found from basic data on the localities/hunting areas, which are managed by the regional authority. For agricultural land, categories of up to 200 ha, 200–500 ha, 500–1 000 ha and over 1 000 ha have been created. For woodland, categories of up to 200 ha (113 individuals), 200–500 ha (97 individuals) and over 500 ha (96 individuals) were selected. The forest area was calculated as the sum of all forest plots, it did not comprise only continuous forest complexes. The hunting pressure was based on statistical data from every year hunt.

Table 2. Age category – Distribution of mandibles into age categories according to the individual's age in months

Age category	Age (months)
1	0–3
2	4–6
3	7–8
4	9–10
5	11–12
6	13–14
7	15–16

Statistical analyses. One-way analysis of variance, including Tukey's HSD post hoc tests, was used to evaluate differences between age classes and factorial analysis of variance to test interactions. The testing of ontogeny of the craniometrical dimensions was done without sex differentiation, because there were no significant differences between males and females. Pearson correlations were used to evaluate the influence of the forest size on selected dimensions. Additionally, multivariate procedures were used to explain variance in our data. Principal component analysis (PCA) was used to reduce the dimensionality of data, while interactions between dimensions and environment (forest area size, agricultural area size, hunting pressure) were tested by this analysis. All tests were conducted using Statistica (Version 14.0, 2020) and the results were considered significant when $P < 0.05$.

RESULTS

Ontogeny of mandible dimensions. The mandibular width BCP (width of the mandible between the borders of medial and lateral points of the *caput mandibulae)* and the mandibular length LA (length from the front part of *pars incisive* to anterior-most point of *collum mandibulae*), LC (length from the front part of *pars incisive* to anterior-most point of *processus condylaris)* were increasingly significant ($P < 0.001$) in all age categories. The mandibular width (BCP) significantly increased during the first eight months ($P < 0.001$) in all age categories. Then the following increase of the dimension is not significant till the age of 15 months. The final age category showed a significant increase ($P = 0.03$). The mandibular width increased with the age of the individual. The mandibular width (BCP) was 66.03 ± 2.04 mm (mean ± SE) in piglets up to 3 months of age, and the width of those at 4–6 months of age was 83.40 ± 0.60 mm. It was both the first and the second age category (0–3 months, 4–6 months) that had the largest increase in mandibular width by 17.37 mm in the recorded period. The mandibular width increased by 36.8 mm up to 16 months of age (Figure 2).

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LA and LC significantly increased until the age of 8 months (P < 0.001). The mandibular length LA was 115.59 ± 4.07 mm till the age of 3 months. The mandibular length LC was 123.15 ± 4.42 mm up to 3 months of age (Figure 2).

BM (width of the mandible from *septum interalveolare* at m_1), LBM (least width of the mandible), BI (width of the *arcus alveolari* at *pars incisiva*, from the border of *jugum alveolare* i3), HG (height of the mandible from the bottom of *symphysis mandibulae* to the top of the *margo interalveolaris)* and OHR (oral height of the vertical ramus – from the lower part of *tuberosistas musculi mandibulare* to the top of the *processus coronoideus)* increased with the age of the individual (P < 0.001). TM (thickness of the mandible *septum interalveolare* of m_1), HM1 (height of the mandible at *septum interalveolare* m_1), MHR (middle height of the vertical ramus – from the lower part of *tuberosistas musculi mandibulare* to the top of the *incisura mandibulae)* and AHR (aboral height of the vertical ramus – from the lower part of *tuberosistas musculi mandibulare* to the top of the *caput mandibulae)* increased with the age of the individual but the highest value reached was in the sixth age category. LR (width of the mandible between *ramus mandibulae* and *angulus mandibulae)* significantly increased (P < 0.001) with the age of the individual till 8 months of age, then there was no significant increase. BML (width of *caput mandibulae)* significantly increased (P < 0.005) with the age of the individual till the age of 12 months and also reached its highest value, then there was no significant increase. LS did not increase with age (Table 3).

Sexual dimorphism of craniometrical dimensions. The differences between males and females were significant for BML, HG and angle of the mandible in the incisor part (P < 0.001). BML reached higher values for males 19.44 ± 0.26 mm than for females 18.08 ± 0.31 mm, P < 0.001. HG shows also higher values for males 29.67 ± 0.46 mm than for females 27.85 ± 0.50 mm, P < 0.01 (Figure 3).

On the basis of visible shape differences, the angulation of the mandible in the incisor section was evaluated. The difference is significant (P < 0.05) till the age of 6 months. The angle of the mandible is 70.20 ± 0.31 mm for males and 72.43 ± 0.36 mm for females (Figure 3).

The principle component analysis was used to test possible interactions among most of the measurements (craniometrical dimensions, weight, sex,

Table 3. Mean ± standard error of the mandible dimensions (mm) in the relation of the age category

Age category	BM	TM	LBM	BI	HG	HM1	OHR	MHR	AHR	LR	BML	LS
1	0.00 ± 3.77	0.00 ± 1.38	24.65 ± 0.40	23.76 ± 0.79	21.55 ± 0.62	0.00 ± 1.99	49.72 ± 2.50	41.96 ± 1.43	45.98 ± 1.64	37.56 ± 1.23	13.15 ± 0.41	13.13 ± 2.87
2	37.37 ± 1.72	13.41 ± 0.63	29.47 ± 0.18	29.23 ± 0.36	27.26 ± 0.28	19.61 ± 0.91	72.76 ± 1.14	61.35 ± 0.65	67.55 ± 0.75	51.80 ± 0.56	18.21 ± 0.19	20.24 ± 1.31
3	50.55 ± 2.95	19.50 ± 1.08	31.93 ± 0.31	32.52 ± 0.62	31.76 ± 0.48	28.47 ± 1.56	84.09 ± 1.96	71.25 ± 1.12	78.48 ± 1.28	57.80 ± 0.96	20.39 ± 0.32	20.05 ± 2.25
4	51.08 ± 4.24	19.72 ± 1.55	32.66 ± 0.45	35.15 ± 0.88	32.51 ± 0.69	29.73 ± 2.24	85.18 ± 2.82	73.75 ± 1.61	81.28 ± 1.84	56.95 ± 1.38	20.54 ± 0.46	22.68 ± 3.23
5	53.00 ± 5.81	21.09 ± 2.13	33.69 ± 0.62	34.01 ± 1.21	35.59 ± 0.95	31.95 ± 3.06	91.53 ± 3.86	79.65 ± 2.20	86.90 ± 2.52	57.50 ± 1.89	22.88 ± 0.63	20.38 ± 4.43
6	55.72 ± 11.6	24.40 ± 4.25	33.58 ± 1.23	33.78 ± 2.42	35.92 ± 1.90	34.50 ± 6.12	95.72 ± 7.71	83.41 ± 4.41	92.54 ± 5.04	55.96 ± 3.78	22.77 ± 1.26	16.93 ± 8.85
7	59.67 ± 8.21	23.36 ± 3.01	35.65 ± 0.87	36.17 ± 1.71	36.36 ± 1.34	33.75 ± 4.33	96.82 ± 5.45	83.08 ± 3.12	92.07 ± 3.56	58.92 ± 2.67	22.60 ± 0.89	16.31 ± 6.26

BM – width of the mandible from *septum interalveolare* at m_1; TM – thickness of the mandible *septum interalveolare* of m_1; LBM – least width of the mandible; BI – width of the *arcus alveolari* at *pars incisiva*; HG – height of the mandible from the bottom of *symphysis mandibulae* to the top of the *margo interalveolaris*; HM1 – height of the mandible at *septum interalveolare* m_1; OHR – oral height of the vertical ramus from the lower part of *tuberosistas musculi mandibulare* to the top of the *processus coronoideus*; MHR – middle height of the vertical ramus from the lower part of *tuberosistas musculi mandibulare* to the top of the *incisura mandibulae*; AHR – aboral height of the vertical ramus from the lower part of *tuberosistas musculi mandibulare* to the top of the *caput mandibulae*; LR – width of the mandible between *ramus mandibulae* and *angulus mandibulae*; BML – width of *caput mandibulae*; LS – length of *symphysis mandibulae*

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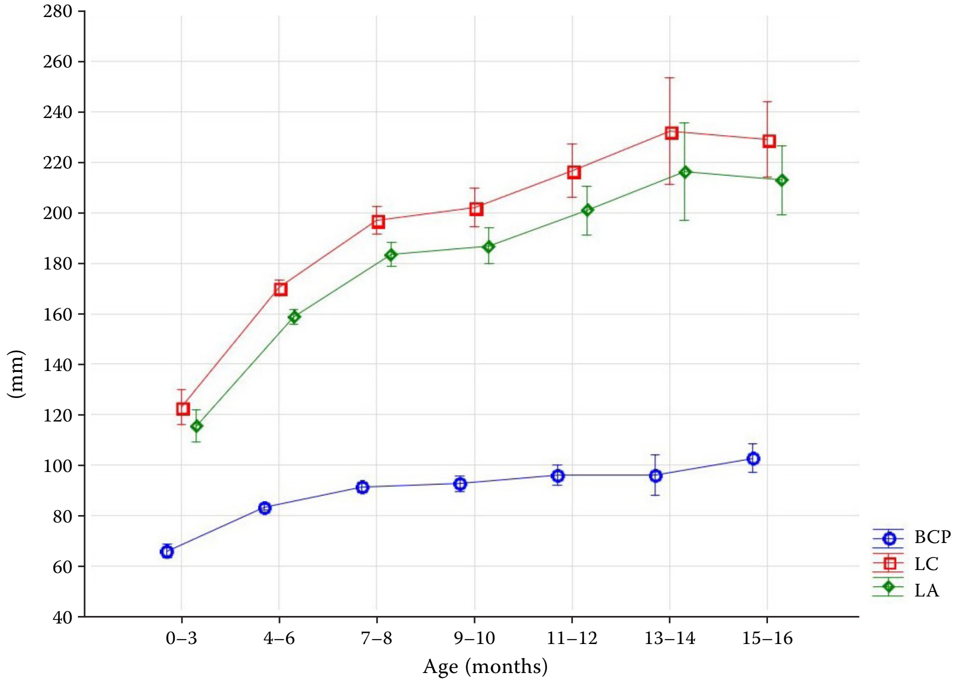

Figure 2. The mandible dimensions BCP, LA, LC compared to the age category

BCP – width of the mandible between the borders of medial and lateral points of the *caput mandibulae*; LA – length from the front part of *pars incisive* to anterior-most point of *collum mandibulae*; LC – length from the front part of *pars incisive* to anterior-most point of *processus condylaris*

habitat conditions, hunting pressure). The first two principal components explained 80.3% of variation (Figure 4). The second principal component, which explained 20.9% of variation, correlated with females and the presence of P1a premolars while the first principal component correlated with all other measurements. LC and LA mostly correlated with the first component (r = 0.11) while sex correlated with the second component (r = 0.14). Contribution of all other measurements correlated with the first principal component was similar between all of them.

Then it was tested whether these principal components differed between males and females. The first principal component did not differ (t_{168} = –1.15, P = 0.48), while a significant difference was found in the second principal component (t_{168} = –1.3, P < 0.001) (Figure 4). P1a is a temporary tooth that grows based only on the proportion of individuals. In our study, it was shown that this premolar occurs in 83% of individuals. This larger sample (N = 1 135) included mandibles of individuals without sex determination. The smaller sample group shows that the P1a tooth is mostly missing in males. The occurrence of P1a is more frequent in female than in male individuals, in percentage 94% of females and 75% of males have this tooth.

Habitat influence. The influence of landscape type on mandible morphology was tested. The size of hunting areas, agricultural areas, and water

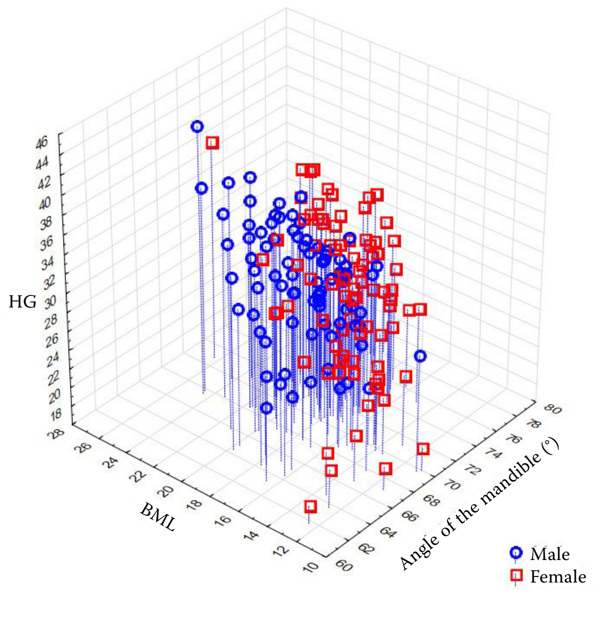

Figure 3. Scatterplot of BML, HG and angle of the mandible in dependence of sex

BML – width of *caput mandibulae*; HG – height of the mandible from the bottom of *symphysis mandibulae* to the top of the *margo interalveolaris*

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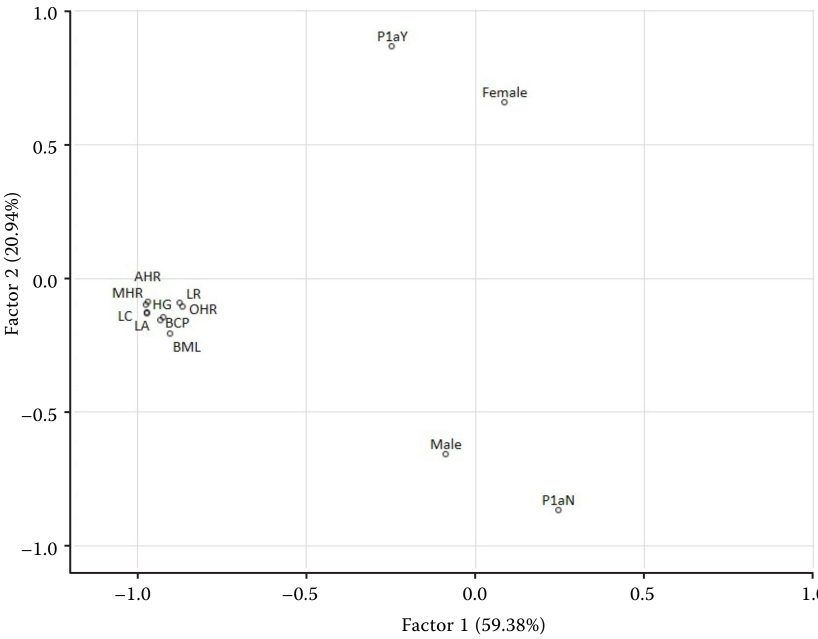

Figure 4. Principal components analysis – craniometrics dimension and occurrence of the P1a (first premolar) compared to the sex of the individual

P1aY – there was an occurrence of the P1a; P1aN – there wasn't an occurrence of the P1a; for abbreviations of craniometric dimensions, see Figure 1

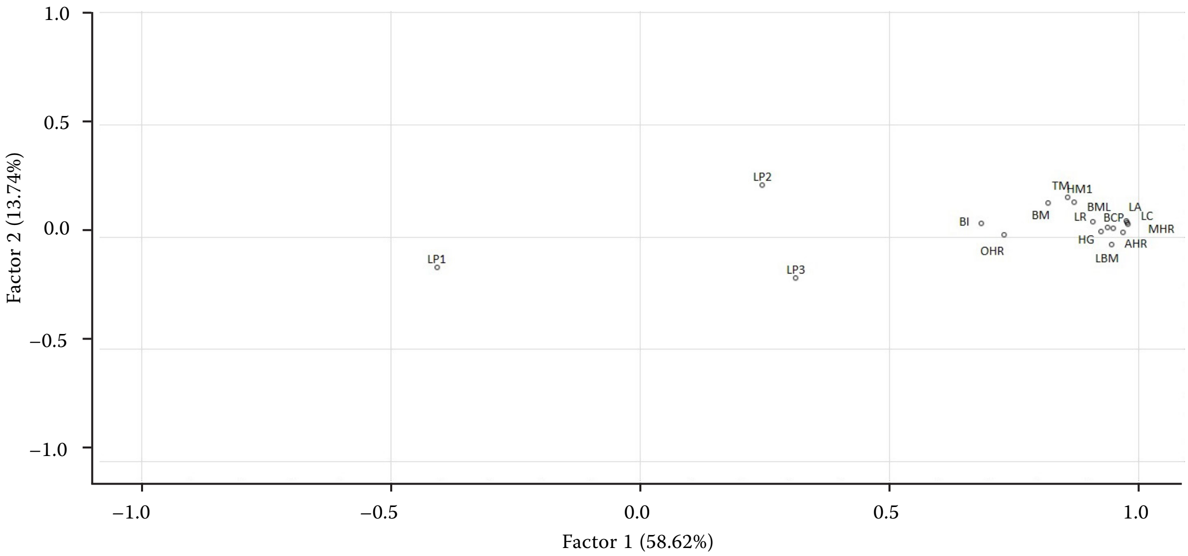

Figure 5. Principal component analysis of forested areas and craniometric dimensions

LP1 – forest area size < 200 ha; LP2 – forest area size 200–500 ha; LP3 – forest area size > 500 ha; for abbreviations of craniometric dimensions, see Figure 1

bodies was also tested but without significant results. The potential influence of the absolute forested area size was tested instead of the relative one. The measurements indicated that individuals from localities containing at least 200 ha of forest had a highly positive correlation. It means that the mandibles of such individuals showed higher measurement values than those from individuals with less forested areas (Figure 5). The first two principal components explained 72.4% of variation. Such influence was also confirmed by significant correlations of some measurements with respect to forested area sizes (Table 4). The hunting pressure was also tested without significant results.

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Table 4. Correlations of craniometrical dimensions with forested area size

Dimension	*r*	*P*–value
BCP	0.422	0.001
BM	0.353	0.008
TM	0.362	0.007
LBM	0.439	0.001
BI	0.340	0.011
LC	0.369	0.006
LA	0.376	0.005
HG	0.430	0.001
HM_1	0.375	0.005
OHR	0.327	0.015
MHR	0.414	0.002
AHR	0.369	0.006
LR	0.420	0.012
BML	0.385	0.004

for abbreviations of the craniometrical dimensions, see Figure 1

DISCUSSION

Craniometry has not reached its limits yet, and current studies show that other features and dimensions can be found that suggest a lot about an individual's life. One of the basic findings is that the skull and mandible show sexual dimorphism. Different body sizes of males and females confirm the basic sexual dimorphism (Pérez-Barbería et al. 2002). Body size is also associated with skull size, which in the condylobasal length is 4.7–11.2% larger in adult males than in adult females (Groves, Grubb 1993; Genov et al. 1995; Moretti 1995;). The sexual dimorphism of the wild boar's skull is pronounced in adults, mainly due to different shape of the canines which are larger in males (Herring 1972). It is the placement of large canines that requires more mandibular space, when the height of the mandible from the bottom of the *symphysis mandibulae* to the top of the *margo interalveolaris* is reaching higher values for males than for females, as well as the angle of the mandible in the incisor part is smaller in males than in females. This is a sign of the mandible adaption to the tusks growing in the future. The tooth growth starts during the embryonic development (Tucker, Sharpe 2004); this fact explains that it is possible to observe differences between males and females also at a very early age. At the same time, the occurrence of P1a indicates sexual dimorphism on the mandible. The permanent dentition of the wild boar has 44 teeth, dental formula 3143/3143 (Thenius 1989; Hespeler, Krewer 2007), characterized by unstable growth of one of the P1a premolars (Kolář 2002; Hespeler, Krewer 2007). In wild boars, dental anomalies are more common than in domestic pigs, most often olygodontia, polydontia, and various types of rotation (Feldhamer, McCann 2004). Anezaki et al. (2008) recorded the occurrence of the P1a on average in 59% of the individuals around the Japanese Islands, in our case it seems that 83% of individuals have this tooth. The dimorphism in the occurrence of P1a, when the occurrence is lower in males in females, is also connected with the massive canine teeth of males.

The size of the mandible is one of the dimensions correlated with weight, and with good development there is also a regular growth of the mandible (Wolf 1995; Oberez 1996). Distress, stress, or lack of food in the first months of life can cause growth retardation or cessation, which will affect an individual's future life and can also shorten the life (Metcalfe, Monaghan 2001; Hamel et al. 2016). During winter, and shortly after it, the role of forest ecosystem is to provide a good base for healthy piglet development in peace, with source of food and shelter (Baubet et al. 2003; Melis et al. 2006). Most of the piglets from our study (58%) were born between February and March, which is usually the time of the year when there are no crops to provide shelter, so forested areas are the only places to offer quiet and safe spaces. It was found that mandibles from individuals living in localities with larger forested areas (categories 200–500 ha and more than 500 ha) showed higher measurement values than those from less forested areas. These larger forested areas probably offer better shelter possibilities than field areas, which is crucial during the first few months of life as tranquillity can positively influence development of the young individual. Wild boar prefers forest stands even during the growing season of agricultural crops, even in a situation when they are ASF positive – most of the carcasses were found in forests (Cukor et al. 2020). The first months of life are very important for piglet healthy development with any frequent disturbances and higher stress levels increasing the possibility of lower food intake, and thus reducing milk production in females (Mullan et al. 1992; Black et al. 1993). Piglets raised in enriched environments are losing a maximum of 0.04 $kg \cdot day^{-1}$ whereas piglets raised in standard environments are losing 0.11 $kg \cdot day^{-1}$ (Brajon et al. 2017). The home range

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size can be influenced by food, anthropogenic influences, or seasonal changes (Singer et al. 1981; Maillard, Fournier 1995; Calenge et al. 2002). Wild boars are mostly nocturnal animals and rest during the day in forested areas within their home range at an acreage of 1.1 km^2 to 3.9 km^2 (Boitani et al. 1994). The mean activity range of wild boar observed in Sweden was 104.4 ha (Lemel et al. 2003), in Switzerland the wild boar home range was on average 400 ha, with no seasonal effect (Fattebert et al. 2017); Maillard and Fournier (1995) found that from January to April, the home range of wild boar females in France was 395 ha versus the home range from May to August being around 200 ha. Home ranges were found to be larger in animals living in family groups (Keuling et al. 2008).

CONCLUSION

Craniometric dimensions are among the important indicators of an individual's healthy development. Due to the fact that craniometric dimensions positively correlated with the age of the individual, it is possible to monitor the development of an individual from the first weeks of life to adulthood. The populations living in larger forested areas (with at least 200 ha of forest) achieve higher craniometric values than those in smaller forested areas. Higher craniometric values are positively correlated with the weight of an individual, which indicates a vital and healthier population. For piglet healthy development, it is necessary to have a food source from mother and milk production that may be influenced by distraction and following stress for the animal. Thanks to sufficient forested areas which provide enough peace and rest for mothers, piglets can grow and prosper normally in their first months of development. According to other studies this size (200 ha) is a lower limit for the home range of wild boars, especially of females.

The craniometric dimensions provide important information about the development of the individual, from which it is possible to draw constantly new information. Such data can be a tool for population monitoring and subsequent adjustment of the appropriate management of feral pigs for a given area, which is currently more than desirable.

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