

Craniometrical features in wild Italian south-central Apennines wolf

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Abstract – Nine unscarified wolf skulls from south-central Apennines were measured on digital radiographic imaging for 14 selected features and observed for dental congenital abnormalities. The results confirm the hypothesis about gradual adaptive reduction in wolf skulls size, moving from north pole to south. The females were slightly smaller than male, but the sexual dimorphism in the Italian wolves was less noticeable than in northern population. No congenital dental abnormalities were reported.

Introduction - *Canis lupus* has the widest natural range of spread respect to any wild species of living mammals; this species has adapted to very different habitat, from the Arctic circle to Arabian desert and from the Iberian peninsula through Eurasia and North America. Several craniometric studies had been carried out on different wild wolf populations, with the aim to verify if there are significant differences in the craniometrical features of wolf skulls found in various time and habitat and if subspecies exist. These craniometrical studies, performed with calliper on scarified skulls from museum collections, had focused on wolves in Russia (Rossolino O.L.,1965), Poland (Okarma H.,1993), Artic (Clutton-Brock J.,1994) Latvia (Andersone Z., 2000), Israel (Mendelsohn H., 1982), Arabia and Iraq (Harrison D.I.,1968), and Italy and Spain (Siracusa A.M., 2004). The aim of this study is to obtain a craniometrical study by Digital Radiographic Imaging (DRI) on unscarified wolf skulls and to confront the value obtained to the literature.

Materials and methods - Fourteen animals (9 adults and 5 immature), killed by car accident, were studied. The animals were found between 2002 and 2003 on the borders of three National Parks of the Abruzzo Region. The skeleton immaturity was established in 5 subjects on the basis of the presence of vital epiphysis on axial skeleton radiographies. The nine adults (4 males and 5 females) were included in the study and the unscarified skulls were radiographed in double standard D-V (dorsal-ventral) and L-L (lateral-lateral) views. The main craniometrical parameters were measured on each radiographic digital image as described in literature (Andersone Z., 2000), with DICOM Ferrania Software. The craniometrical features measured were shown in figure 1. The parameter measures were divided by the sex in two Groups. In each group the Mean and Standard deviation (SD) were analyzed with software Graph Pad Prism for evaluate the Variance inside the group. The parameters values of the Female group were compared with those of the Males group by Anova and Unpaired t test for $P < 0,05$, with software GraphPad Instat. Storer's Index for sexual dimorphism was carried out besides (Storer R.W., 1966). Dental formula was registered for potential dental changes.

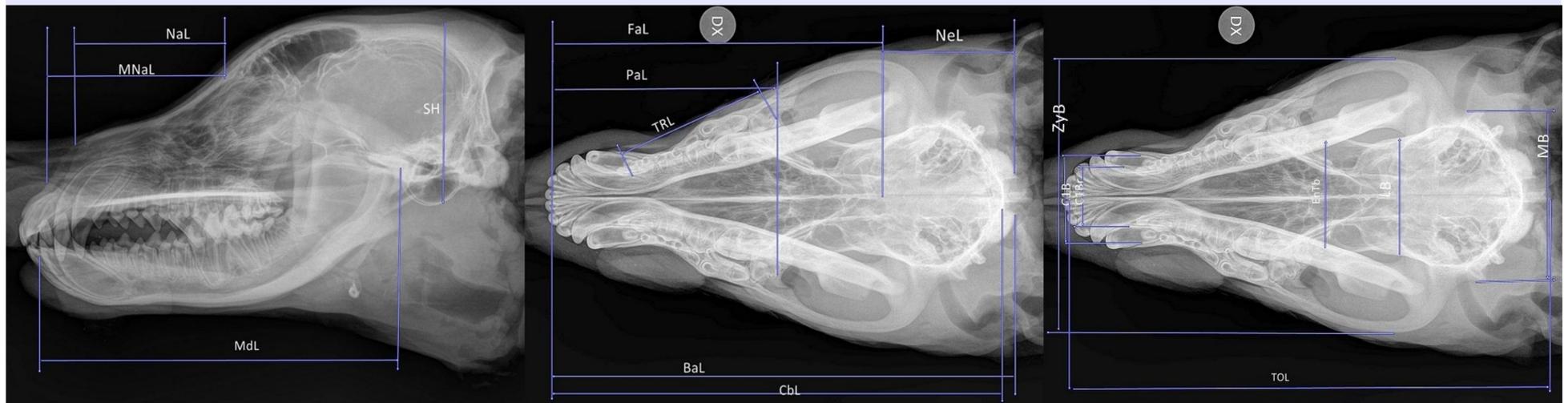


Figure 1: craniometrical features measured on wolf skulls

Results – CbL (fig 1) ranged in adult males and females from 18,2 to 23,8cm; the mean \pm SD was $21,9 \pm 1,7$ cm; in males mean CbL was $22,8 \pm 1,2$ cm and in females $21,3 \pm 1,3$ cm. For both males and females, the mean ZYB (fig.1) was $13,2 \pm 1,4$ cm and SH (fig.1) measured $7,9 \pm 0,9$ cm. The mean variance in each Group didn't significantly range and no statistic differences were demonstrated between the mean craniometrical parameters of the two Groups. This last data is confirmed by Storer's Index, showing lower values than other populations. We didn't find dental abnormalities.

Conclusion - Our results confirm the hypothesis about gradual adaptive reduction in wolf skulls size, moving from north pole to south. These variations could be relate to the size of the natural wolves preys (Okarma H.,1993). The CbL range values in our sample (18,2–23,8 cm) are similar to those reported for museal population in Italy and Spain (Siracusa AM, 2004), but smaller than the measures reported for wolves studied in Poland, 21,4–26 cm (Okarma H.,1993), Latvia, 23–24,4 cm (Andersone Z., 2000), and Russia 23,5–24,4 cm (Rossolino O.L., 1965). In Middle East countries, the CbL is lower than our data: in Israel were reported measures ranging from 18,6 to 21,8 cm (H. Mendelsohn, 1982); in Arabia and Iraq the values vary from 16,9 to 21,4 (Harrison D.I., 1968).

The sexual dimorphism in our study is less pronounced than in northern wolf populations (Okarma H., 1993). Male skulls are medially longer and larger than female skulls, but this differences weren't significant. Despite the sexual dimorphism, Storer's Index was positive for almost all parameters. It didn't show so marked differences as reported for Polonia's and Latvia's population and northern population (Okarma H.,1993) (Andersone Z., 2000).

In the present study, no dental congenital abnormalities were reported, in contrast to the high incidence of anomalies due to genetic defects (poliodonty, oligodonty) described in Russian (38,3%) (Yudin V.G., 1989) and Latvia report (9,6%) (Andersone Z.,2000).

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Measured Craniometric Parameters

