Upper pleistocene marmota marmota Linnaeus, 1758 remains from Como province (Lombardy-Northern Italy) : Osteological study and morphometric observations

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Upper Pleistocene *Marmota marmota* Linnaeus, 1758 remains from Como Province (Lombardy-Northern Italy). Osteological study and morphometric observations

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Abstract: About three hundred remains of *Marmota marmota* L., 1758 from two localities of the Como Province (Bulgarograsso and Olgiate Comasco) (Lombardy) are morphologically and osteometrically studied. From the comparison of dental, craniometric and mandibular parameters between the Pleistocene and recent marmots from Parmorari Cave (Borgio Verezzi, Savona, Liguria Region) and from the Piedmont, it has been demonstrated that the Como collection specimens can be included in the recent marmots variability and, more in particular, that they have a smaller size compared to the ones of Piedmont. The larger size of the Pleistocene marmots is confirmed, whereas the observed morphologic differences between the Como and the Piedmont marmots could be due to the sexual diversity or, more probably, to slight habitat variations.

Riassunto: Vengono studiati morfologicamente e osteometricamente circa 300 reperti di *Marmota marmota* L., 1758 provenienti da due località della provincia di Como (Bulgarograsso e Olgiate Comasco). Nel confronto fra parametri dentali, craniali e mandibolari con resti di marmotte pleistoceniche provenienti dalla Grotta dei Parmorari (Borgio Verezzi - Savona) ed attuali (Piemonte), è stato dimostrato che i reperti della collezione comasca possono essere inclusi nella variabilità delle marmotte recenti e che più in particolare, hanno una taglia inferiore rispetto alle piemontesi. È confermata la taglia superiore delle marmotte pleistoceniche, mentre le differenze morfologiche riscontrate fra le marmotte comasche e quelle piemontesi potrebbero dipendere o da diversità sessuale o, più verosimilmente, da leggere variazioni dell'ambiente di vita.

Key words: Marmota, osteological and morphometric study, Pleistocene.

INTRODUCTION

The marmots are a characteristic component of the faunistic association of the Alps and because of their style of life it is very difficult to find the fossil remains. The studies effected on the marmots remains are rare and the aim of this note is to analyse morpho-anatomically about 300 specimens coming from two quarries located in Bulgarograsso (Baragiola Quarry, now closed) and in Olgiate Comasco (S. Anna Quarry, still open) together in the Como Province (Lombardy) (Fig. 1) of the Prof. Regazzoni's collection stored in the Museum linked to the Classic High School «A. Volta» in Como (Lombardy).

The examination will point on an osteological description of the fossils, the osteological measures will be effected and the data will be compared to other ones for the Pleistocenic and actual marmots known in literature.

PREVIOUS WORKS

Studies on the fossils of *Marmota marmota* Linnaeus, 1758 developed already by the second half of the past century. One of the first works was effected by CORNALIA (1871), that described some remains discovered in Lombardy and Piedmont regions (Northern Italy). The findings of a great numbers of bones in the morainic deposits about Bulgarograsso and in a quarry of sands in Olgiate, villages located about Como, permitted to MERCALLI (1878), SORDELLI (1878) and REGAZZONI (1879) to advance some palaeoclimatic considerations and to specify the climatic variations which occurred at the end of Pleistocene. In particular in that zone they could confirm, during the last glaciation, the existence of an habitat similar

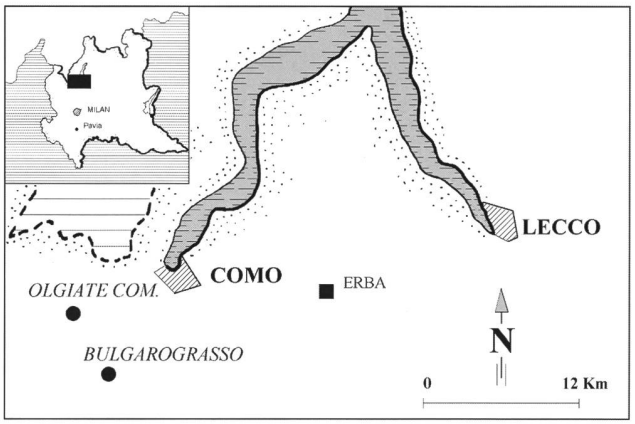


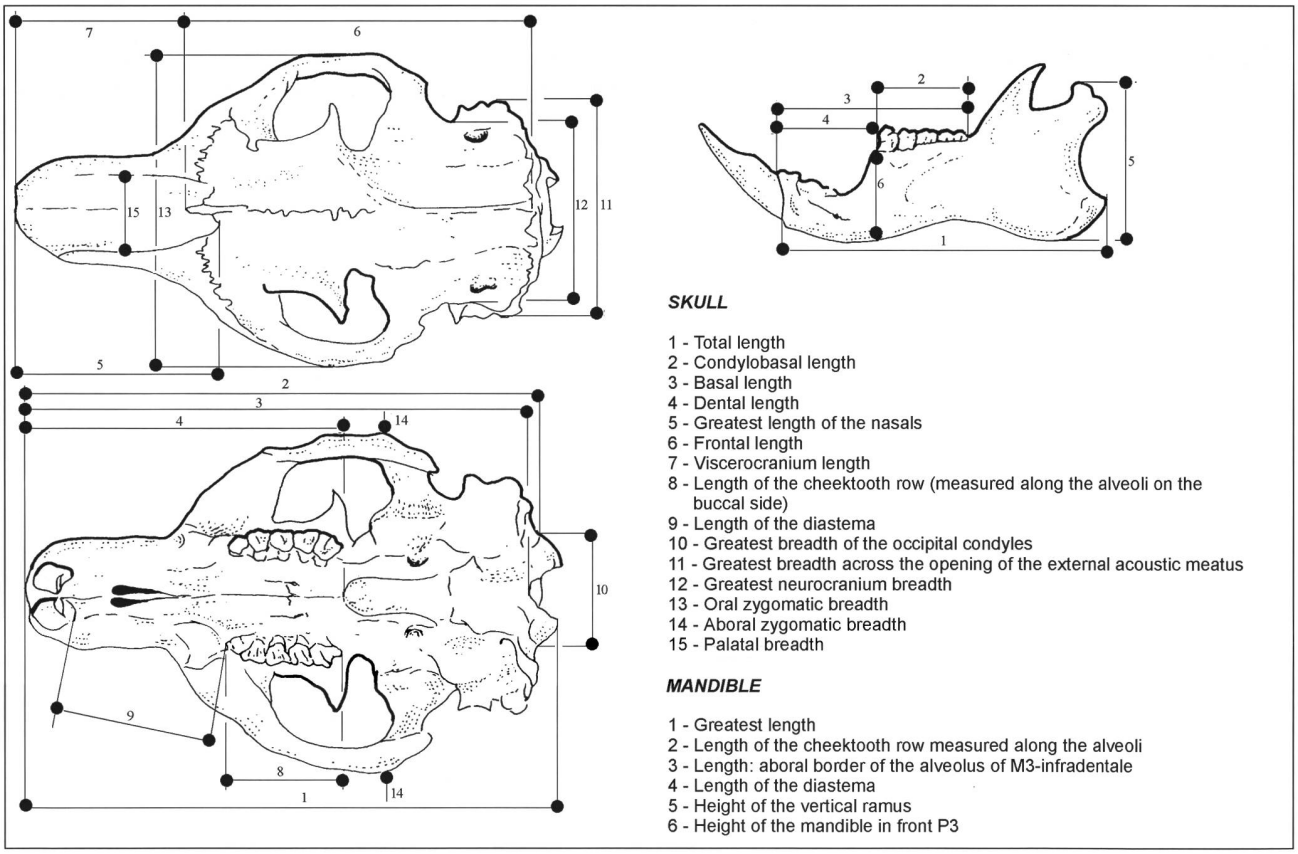
Fig. 1 - Localities position of the findings of the Marmota marmota L., 1758 remains.

to the one actually necessary to the marmot's life and linked to the presence of the cold climatic conditions that permitted the glacial expansion in the Alps. TRABUCCO (1887) in his study about the marmots remains found in Silvano d'Olbia (Alto Monferrato, Piedmont) advanced other paleoclimatic observations. Afterwards, CORTI (1896) referred of a find of a great number of fossil remains of marmot still in morainic deposits near Como, more precisely nearby the Civiglio village. Relatively to the Venetia Region the DAL PIAZ's study (1900) is to remember; in fact he described some bones discovered in the San Donà di Lamon Cave (Belluno Province). FABIANI (1903) referred of a mandible gathered in the S. Bernardino Cave (about Vicenza - Berici Hills - Venetia Region) and GORTANI (1909) of an another discovered in the Velika Jama Cave (Friuli Region). These remains, as those studied by AIRAGHI (1922) coming from Fontana Marella (Varese Province) and other from the Mala Peci Cave (near Cividale del Friuli) (LEONARDI 1933), are of doubtful provenance and in secondary position.

Among the recent works, VENZO (1954) advanced the hypothesis that the findings of some marmot remains in the little caves of Sambughetto Valstrona (near Orta Lake, Piedmont Region), together with the other animals of the same marmot habitat, should show in that zone a withdrawal moment of the glacial front (Interstadium Würm I/II) that permitted to live in the area previously covered by ices. Recently ZORZIN *et al.* (in press) studied the marmot bones remains from Cerè Cave (Verona) and DI CANZIO & PETRONIO (2001) the other ones from Cola Cave (L'Aquila - Abruzzo Region -, Central Italy).
Referring to the possible phylogenetic relationships and to some Pleistocenic deposits descriptions are the GIACOBINI's (1992) and MEIN's (1992) studies, while AIMAR (1992) advanced a morphometric analysis effected on some Pleistocenic and actual marmots remains coming from Parmorari Cave firstly particularly analyzed by RICHARD (1938) (Borgio Verezzi-Savona, Liguria Region) and by the Piedmont one. In the European sphere the most important research have been effected by CHALINE (1972), CHALINE *et al.* (1974) and PATOU (1987) that individuated some prints of the human action on the fossils from the «Grotte de la Passagère» de Méaudré (Vercors, France).

MATERIALS AND METHODS

The collection consists of 273 specimens that compose almost for whole the complete skeleton. They are still in good preservation degree, nearly complete and in general lacking of slaughter traces or the pathologies. The remains come from two localities of the Como Province (Bulgarograsso and Olgiate Comasco) and they are actually kept in the Museum of the Classic High School «A. Volta» in Como. The specimens are labelled with progressive numbers; a morpho-anatomic description and a series of measures following the codified VON DRIESCH's (1976) parameters (Fig. 2) are also effected.



SKULL

1 - Total length
2 - Condylobasal length
3 - Basal length
4 - Dental length
5 - Greatest length of the nasals
6 - Frontal length
7 - Viscerocranium length
8 - Length of the cheektooth row (measured along the alveoli on the buccal side)
9 - Length of the diastema
10 - Greatest breadth of the occipital condyles
11 - Greatest breadth across the opening of the external acoustic meatus
12 - Greatest neurocranium breadth
13 - Oral zygomatic breadth
14 - Aboral zygomatic breadth
15 - Palatal breadth

MANDIBLE

1 - Greatest length
2 - Length of the cheektooth row measured along the alveoli
3 - Length: aboral border of the alveolus of M3-infradentale
4 - Length of the diastema
5 - Height of the vertical ramus
6 - Height of the mandible in front P3

Fig. 2 - Osteolgical parameters of the skull and the mandible of the marmot (by: VON DEN DRIESCH, 1976, mod.).

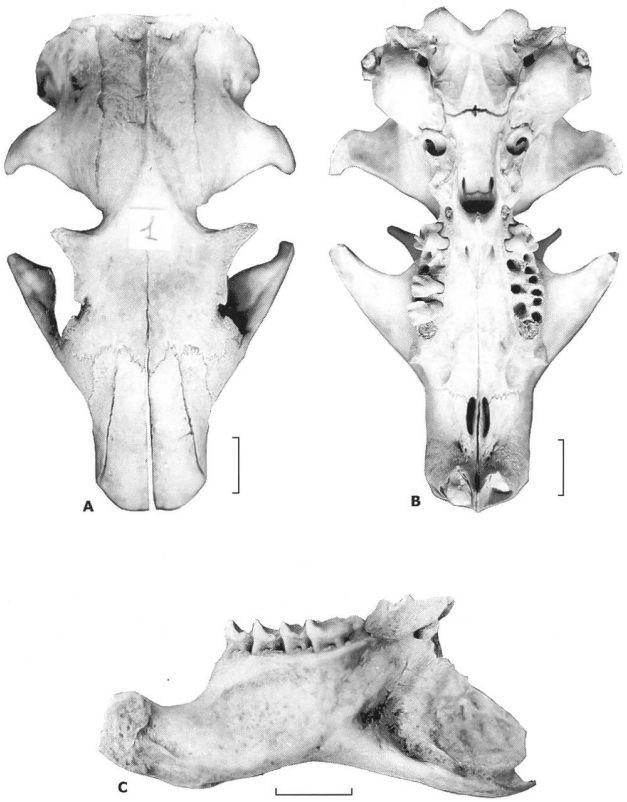


Plate 1 - *Marmota marmota* L., 1758, Bulgarograsso.
Skull. A: dorsal view, B: ventral view.
Right mandible. C: lateral view.
Scale: 1 cm.

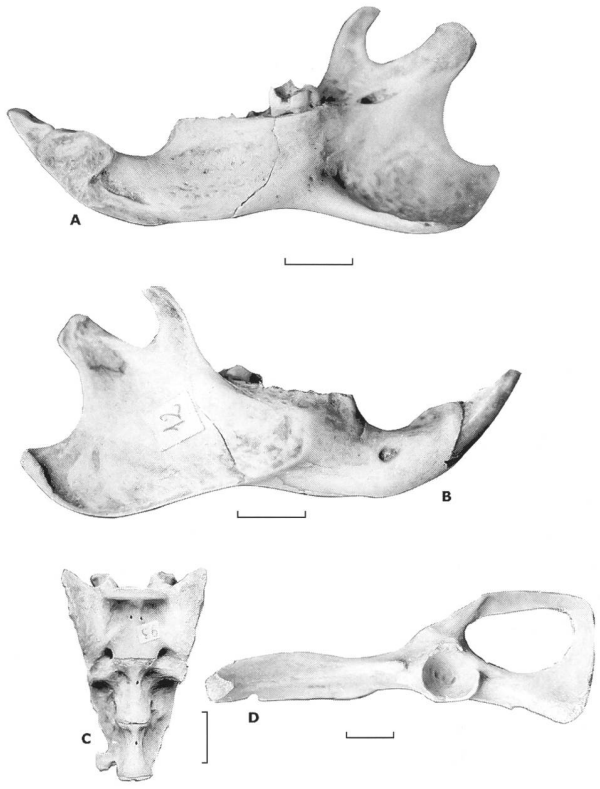


Plate 2 - *Marmota marmota* L., 1758, Bulgarograsso.
Right mandible: A: lateral view, B: medial view.
Sacral. C: ventral view. Right pelvis. D: lateral view.
Scale: 1 cm.

REMAINS DESCRIPTION

SKULL: 10 uncomplete remains (plate 1A, B) – Skull remains are generally well preserved and a different degree of completeness is observed. They have the constant characteristic of the more or less nasals lacking. The erosion has operated in the more brittle zones, as for example, the zygomatic arch, which is rarely integrally preserved. Notwithstanding the specimens brittleness, the occipital area is integrally preserved. Dorsally we observe the crests, particularly the nuchal is very high; towards the anterior skull sector, at the lacking of the nasals corresponds a similar fragmentariness of the caudal zygomatic extension. Besides, we observe the post-orbital apophyses. The ventral sector of the skulls is mostly complete, their components are almost totally present, particularly the palatal process. In the dental rows, typically arched, the teeth rarely still fixed in the alveoli, are preserved. The incisors, with the characteristic orange-brown colouring, aren't complete, but the root part fixed in the alveolus is preserved. The molars are the teeth that are more frequently preserved, more rarely the incisors and premolars. In the occipital sector we observe the jugular process, the auditories bullae ever abraded and the condyles also very rarely, with all the area that comes to the basisphenoid suture. The pterygoid hook is almost ever abraded, while the pterygoid process and the external wing of the pterygoid process are complete.
MANDIBLES: 14 remains (9 right, 5 left) (plate 1C, plate 2A, B) – Mandibles are variably incomplete, but in general they can be considered well preserved. The set of teeth is hardly ever complete; they are characterized by the constant presence of the horizontal branch and by the masseter area. More rarely the temporal and the coronoid process have been preserved, the condyle is integral. Rarely we observe the complete set of teeth P-M_3, besides more constantly we have the molars fixed again in the alveoli. Hardly ever the sector of the symphisis is integrally represented, usually the part of the diastema is lacking, but when it is preserved the presence of the broken incisors still fixed in the alveoli with their typically orange colouring is usually observable.
A study with a scanning microscope on the incisors enamel of the Pleistocenic marmots, has shown the lacking of an interprismatic phase and the prisms are organised in orthogonal columns (AIMAR, 1992).

VERTEBRAE: 44 remains (1 atlas, 2 epistropheus, 1 cervical, 4 thoracic, 22 lumbar, 5 caudal, 5 sacral, 3 vertebral bodies) (plate 2C) – The great quantity of the very diversified vertebral remains permits to re-form almost completely the vertebral column composition.

The atlas is complete notwithstanding the wear shouldn't have deeper damaged the wrinkled lip of the atlas wing and less, the articular caudal surfaces. The epistropheus remains are less complete in comparison to the atlas, in fact the vertebral body is preserved and more rarely the spinous process. These specimens are broken and abraded near the articular caudal process, but notwithstanding the less dimensions, the odontoideus process with the crest that limits the articular cranial surface is preserved. Among the re-

mains, there is also one cervical vertebra with a particular morphology similar to the VI vertebra; it is well preserved and integral with still clear the cotyloid cavity and the articular caudal process.

Also the fossils of the thoracic vertebrae are well preserved with the spinous process almost ever present. Since they are incomplete, it is very difficult to ascribe them to a specific position among the dorsal vertebrae, nevertheless we think to consider three remains as probable III vertebrae and one as probable IV. For these specimens the glenoid cavity, the articular head and the transversus process, are preserved.

Remains of lumbar vertebrae are numerically abundant, incomplete because lacking of the spinous process and transvers process, while the sectors that limit the cotiloid cavity, the articular head and the mamillary process, are only partially preserved. The caudal vertebrae are worse preserved, lacking of the transvers process and the spinous process areas and, less frequently, the cavity of the cotiloid body.

Sacral vertebrae are also incomplete, especially in the sacral spinous and in the wing sectors. On the contrary, the areas characterized by the transverse lines that divide the massif bodies of the three sacral vertebrae are very complete. The cranial articular process is ever preserved, while the transversus process of the last sacral vertebra is constantly lacking. Well defined is the articular head of the first sacral vertebra.

SCAPULAE: 4 remains (3 right, 1 left) – Scapulae remains are rare, generally they are incomplete and not well preserved, abraded and partially broken. The glenoid cavity is the mostly preserved area. The paracromion is preserved with a different degree of preservation, less frequently the supraglenoid tuberculus and the coronoid process, while the scapular blade is constantly absent.

PELVIS: 35 remains (14 right, 13 left, 8 fragments) (plate 2D) – Only one of the specimens of this anatomical part slightly abraded on the ischiatical table is complete. The other remains are more or less decidedly incomplete, broken for a part of them to the neck of the ilium, but in general the fossils are well preserved. The most frequent lacks are observed in the ischium branch and in the ischiatic table. The part of the tuberculus of the cranial rectus of the thigh, upon the acetabulum (almost ever abraded) that arrives to the ilium wing drawing a lightly convex bending with the apex reverse to the back (toward the acetabulum), is almost ever present. Besides, the semilunar facets of the acetabulum, as the caudal gluteal line, are preserved.

HUMERUS: 41 remains (9 right, 21 left, 11 fragments) (plate 3A) – The remains are well preserved notwithstanding the erosion should have acted on the articular head and on the epicondyloid crest. Almost constantly the proximal end of the bone are lacking; the deltoid tuberosity is still present, while in the distal end the condyles are almost ever observed. Among these remains there is a specimen in which the area between the epicondyloid crest till the epicondyl and the epithroclea, is strong ossified. This extreme condition could be linked to the growth of the bony corn or maybe, to the deformity pathology that, in life, acted on the animal (old marmot?).

RADII: 24 remains (12 right, 12 left) (plate 3C) – The specimens are almost ever complete, the proximal end is prevalently lacking, while the distal end is preserved. Besides, the coronoid process and

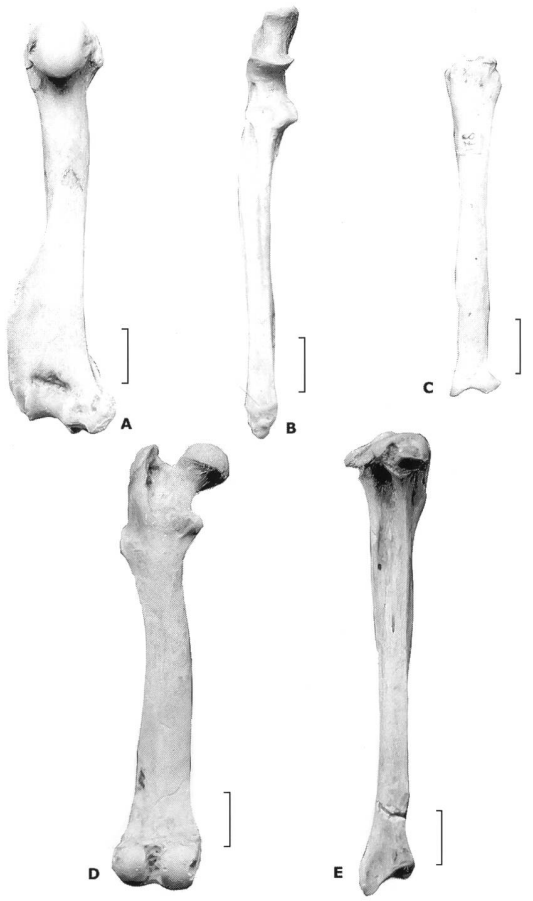


Plate 3 - *Marmota marmota* L., 1758, Bulgarograsso.
Left humerus. A: caudal view.
Right ulna. B: caudal view.
Radius. C: palmar view.
Left femur. D: caudal view.
Right tibia. E: caudal view.
Scale: 1 cm.

styloid radial process are partial, while the great sigmoid incision is constantly present. The dorsal and palmar sides are well preserved, in the bicipital tuberosity feeble erosion traces are observed. In the distal view all the bone components are preserved but they are frequently abraded, deeper in the douche of the obliquous extensor of the carpus zone.

ULNAE: 27 remains (12 right, 6 left, 9 fragments) (plate 3B) – Ulnae are almost ever incomplete, the distal sector characterized by the ulnar styloid process is prevalently lacking. Less frequently we have the lacking in the lower part of bone of the little sygmoid incision. The upper part of the olecranum, the lower border of the great sygmoid incision and the olecranum beak are differently abraded.

FEMURS: 36 remains (12 right, 13 left, 11 fragments) (plate 3D) – The great part of the specimens is well preserved. The distal end is almost ever lacking and less frequently the proximal one lacks more or less completely. In this last sector, the head of the femur, the trochanter, the tertius trochanter and the gluteal tuberosity are feebly mostly abraded; sometimes, for the head of

the femur. The distal end, when is preserved, is integral in all its components (condyle, medial and lateral epicondyles, throclea). The condyles, when are absent, are lacking starting from the intercondyloid line.

TIBIAE: 36 remains (29 right, 16 left) (plate 3E) – Tibiae are almost complete, the part that is frequently absent is the proximal end. The abrasion has in preference acted on the tibial spina zones, of the tibial tuberosity and on the lateral and the medial condyles. The distal end, notwithstanding it should be abraded, is integral. The medial malleolus and the tibial throclea are observed.

METACARPI and PHALANX: 2 left remains – These specimens are well preserved, integral and complete.

DISCUSSION

The data compared with the ones known in literature (particularly for the marmots from Parmorari Cave and actual ones from Piedmont region –AIMAR, 1992) have permitted to advance some considerations. In order to reach a better knowledge, the analysis have been subdivided in several parts relatively to the teeth, the skull, the mandible and the postcranial skeleton. Tab. 1 shows some biometrical data only related to the teeth, skulls and mandibular remains because they are the anatomic parts better studied.

Tab. 1 - Means, standard deviation, minimum and Maximum values for the parameters referring to the teeth, skulls and mandibles of *Marmota marmota* L., 1758.

Teeth- N. 18 Parameters	Mean	St. Dev.	Min	Max
Length M1	4.3	0.9	3	6
Breadth M1	5.56	0.59	5	7
Length M2	4.52	1.09	3.5	6.5
Breadth M2	5.16	0.90	4	7
Length M3	5.5	5.81	4	6.5
Breadth M3	5.81	0.98	4.5	7.5
Skull- N. 9 Parameters	**Mean**	**St. Dev.**	**Min**	**Max**
1	94.5	0.71	94	95
2	90.5	0.71	90	91
3	88.5	0.71	88	89
4	52.5	0.707	52	53
5	43.3	9.55	36.5	50
6	61.5	0.5	61	62
7	33	1.414	32	34
8r	21.56	0.904	20	23
8l	21.56	0.904	20	23
9r	24.7	0.758	24	25.5
9l	24.4	0.894	23.5	25.5
10	19.75	0.655	19	21
11	42.3	1.67	40	44.5
12	33.1	0.99	32	35
13	52.5	0.71	52	53
15	14.5	1.224	13.5	16
Mandible- N. 14 Parameters	**Mean**	**St. Dev.**	**Min**	**Max**
1	53.5	8.03	46	62.5
2	21.29	1.19	20	23
3	34.04	2.91	29	38
4	13.8	2.67	8.5	17.5
5	28.7	5.38	19.5	33
6	13.46	2.55	9.5	16

TEETH – Diagrams of Fig. 3 permit to evidence the existent relations between the molar (upper and lower) dimensions for the marmots of Como collection, for the

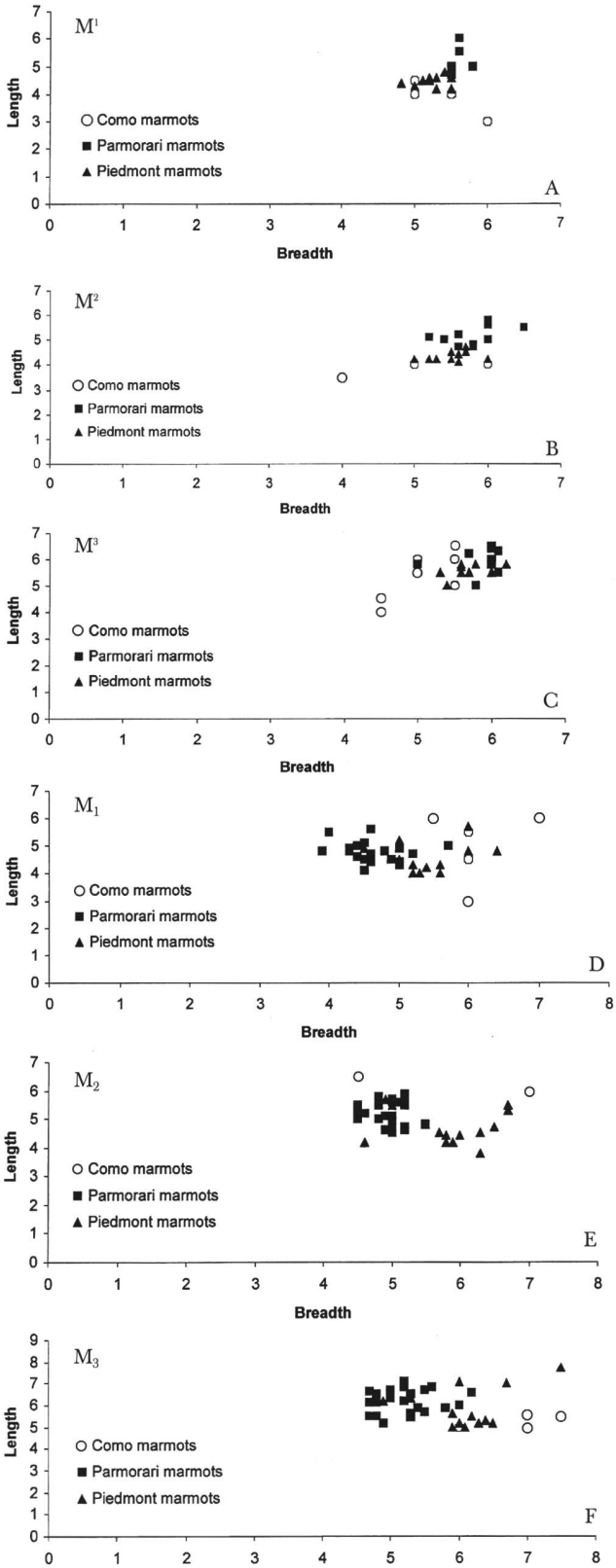


Fig. 3 (A-F) - Diagrams of the relation Length and Breadth of the molars (upper and lower) in the Pleistocenic and recent marmots. Measures are in mm.

Piedmont ones (actual) and for those coming from the Parmorari Cave too. Firstly, the indicative points of the Como marmots fall in the typical existence field of the actual Piedmont marmots. This seems to confirm how much shown by the fossilization degree (not very high) of the specimens.

Secondly, the evidence that the upper molar teeth of the Pleistocenic marmots (mostly ancient) from Parmorari are highest in size in comparison with the more recent ones relatively to the M^1 and M^2, is confirmed. On the contrary, for M^3 it seems that there is an «equivalent dimension» or at least, a not so clear separation between the components of the considered collections. Also AIMAR (1992, fig. 4) noted this aspect, but in our study it is mostly evidenced. The analysis effected on the lower molars confirms the consideration advanced for the upper ones (marmots of the Como collection re-enter very well in the distribution field of the recent alpine ones): perhaps more in particular, there isn't great separation between the dispersion re lative to the Pleistocenic and recent marmots, but a penetration of the distribution fields is again observed. A better fields definition is evidenced in the diagram relative to M_2 where for the Como marmots, we have a scarsity of data in order to advance final conclusions.

The comparison of the diagrams relative to the upper and lower teeth shows an interesting particularity: the field distribution is inverse passing by the upper molars to the lower ones. Morphometrically in the analysed marmots the lower cheektooth are very similar, it is impossible to estimate a clear distinction between the ancient and recent remains.

A sharper observation of the lower cheektooth morphometric analysis evidences that with an equal length, the molar of the recent marmots are largest than the ones of the more ancient specimens.

On these basis, in the purely dimensional point of view, it results very difficult to consider the belongings of an isolated tooth in the Pleistocenic or recent marmots. Perhaps according to the diagrams, only the second molar (upper and lower) and M^1could be considered a probable discriminating element because, even if it isn't very clear, the separation between the fields of the Pleistocenic and recent marmots is more emphasized.

SKULL – A large number of measures has been effected on the skulls and some relations between the parameters are shown in the diagrams of Fig. 4. Different aspects related to the Como collection, the Parmorari and the alpine (Piedmont) ones are shown.

Firstly, a common element that we observe in the diagrams is the bigger size of the Pleistocenic marmots's skulls (Parmorari) in comparison with the other ones. The characteristic points of the Como marmots ever fall in the spectrum drew by the Piedmont ones. Also considering the craniometric data we have an identity with as much as shown by the teeth.

Nevertheless, a sharper analysis shows as the relations between some parameters could be useful in the distinction between the Pleistocenic and actual marmots. In fact,

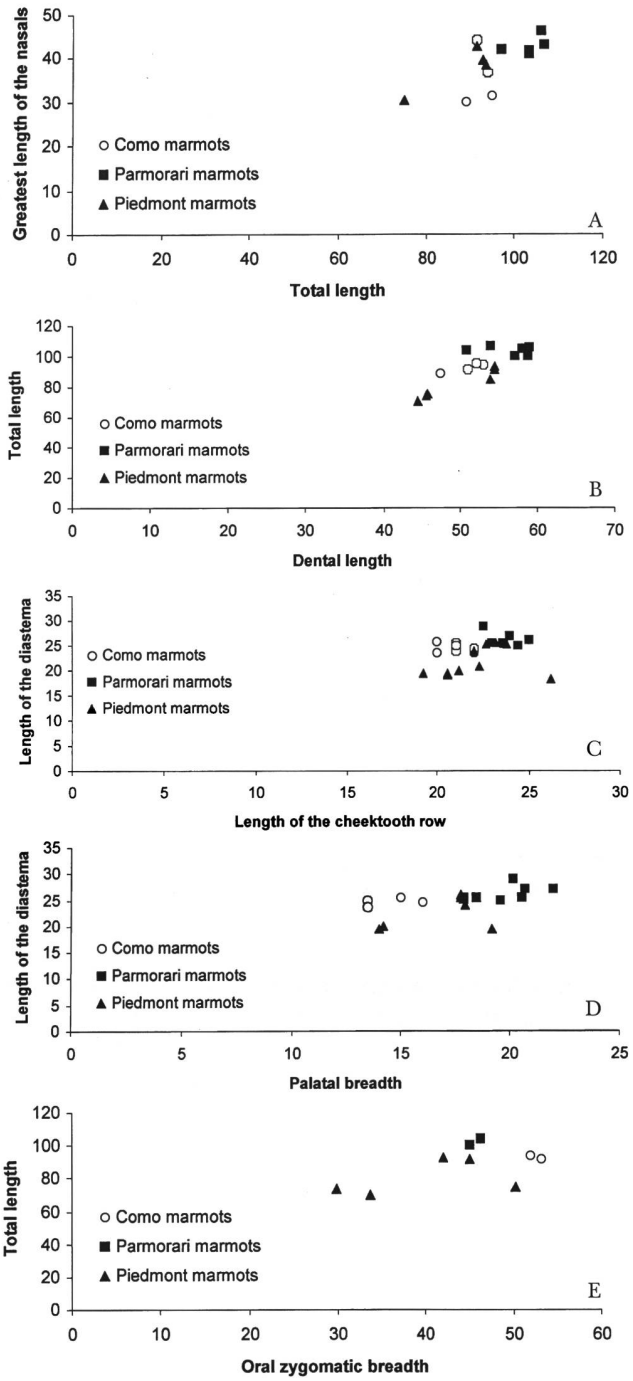


Fig. 4 (A-E) - Diagrams related to the relations mostly meaningful between the parameters of the Pleistocenic and recent marmots skulls. Measures are in mm.

in the diagram relative to the relation between «Total length» and «Greatest length of the nasals» (Fig. 4A) the typical distribution fields of the Pleistocenic and actual marmots seem enough well separated as for the relation «Palatal breadth» and the «Length of the diastema» (Fig. 4D) and, with more uncertainty, for the relation between the «Dental length» and the «Total length» (Fig. 4B). The distribution fields are separated, but not much clearly as on the contrary, it is shown for the previous examined relations. What seems particular is the existing relation between the «Palatal breadth» and the «Length of the dia-

stema» not for a dimensional distinction of the Pleistocenic marmots by the mostly recent ones, but for the modality of distribution of the points of the Como marmots inside the recent specimens field. Having also the same length of the diastema with the Piedmont ones, the Como marmots have a narrower palatal. Not only, but in general, this relation shows as the length of the diastema doesn't hardly change passing by the mostly ancient marmots to the recent ones, too. Then this parameter, if singly taken, shouldn't have a great utility in the distinction between the Pleistocenic remains and recent ones.

For such a distinction, two are the possible explanations:

a) they could be linked to sexual differences,
b) the Como marmots lived in an habitat lightly modified respect to the typical one for those of Piedmont.

It seems difficult to consider valid the first or the second hypotheses.

If we privilege the first interpretation we need to admit that the skulls of the Como collection should be ascribed to the females and the ones of the Piedmont to the males. Only two, whose representative points are mostly separated by the others, could be of the females specimens. On the contrary we can say nothing for the Parmorari ones. On the other hand, if we privilege the second hypothesis, the points distribution should be linked to the different «races», everyone linked to its own habitat, and, even if little, different by the neighbouring ones.

Certainly the few data don't permit the final conclusions. Further data are necessary to choose the first or the other hypotheses.

In order to confirm this, there is the interpretation of the diagram «Length of the cheektooth row» and the «Length of the diastema» (Fig. 4C). In the skulls the diastema dimensions don't change, it is the cheektooth row that changes in length also if, in the diagram, we haven't a so clear passage between the Pleistocenic and recent marmots, but we observe a «transition» in the field.

Also observing the points distribution, utilising the relation «Oral zygomatic breadth» and «Total length» (Fig. 4e), we can still confirm the deduction that the Parmorari marmots have a bigger size in comparison with the other marmots, although in the diagram the fields distinction is a bit confused. Further considerations are impossible to advance for lacking of data.

In conclusion, analysing some cranial relations we observe as the Pleistocenic Parmorari marmots are mostly sized respect to the Como and actual ones, and among the more recent ones, few morphological differences maybe linked to habitat of life should be evidenced.

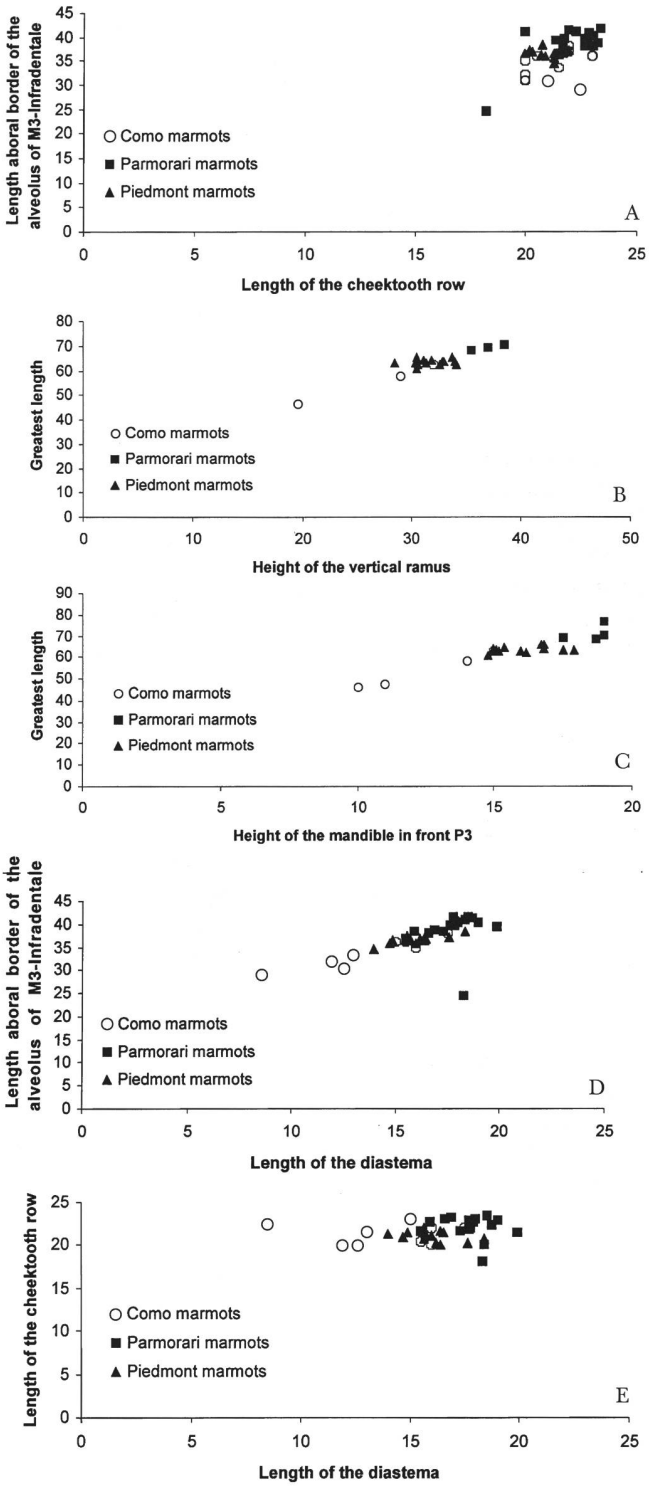


Fig. 5 (A-E) - Diagrams related to the relations mostly meaningful between the parameters of the Pleistocenic and recent marmots mandibles. Measures are in mm.

MANDIBLE – Diagrams of the Fig. 5 show the relations between some parameters related to the mandibles of the Como, the Parmorari and the Piedmont marmots. We can advance some considerations that, in general, are similar to the ones advanced for others components of the skeleton (teeth and skulls), but with further particularities.

Firstly, the distribution fields of the relation between the «Length of the cheektooth row» and the «Length of the aboral border of the alveolus of M_3-Infradentale» (Fig. 5A) practically are very close between them; the Parmorari marmots have less evidently bigger dimensions than the others. The recent marmots field, in which we have the Como specimens, too, is very close to the one of the Pleistocenic marmots. For the Como specimens the data show as these marmots should be smaller in size respect to the ones of the Piedmont. More in particular, if we want to uti-

lize this diagram for a Pleistocenic and recent specimens distinction, we should utilize it with great prudence.

The further diagrams are mostly representatives; they put in relation the «Greatest length» with the «Height of the vertical ramus» (Fig. 5B) and with «Height of the mandible in front P_3» (Fig. 5C). They happen practically equals in their development. It is the mandible height that becomes the main parameter, not the length. So, the mandible of the Pleistocenic marmots is mostly sturdy. Maybe this is linked to a diet type that should request a more power applied by the mandibular muscles.

In these diagrams the distribution fields distinction between the Pleistocenic specimens and actual ones is not very clear: in size the Parmorari mandibles are effectively highest than the others. So, these parameters are particularly useful in order to distinguish the ancient specimens from the recent ones, too.

A last consideration is defined for the diagram that puts in relation the «Length of the diastema» with the «Length of the aboral border to the alveolus of M_3-Infradentale» (Fig. 5D). The points distribution is similar to the ones shown by the relations of length and breadth of the mandibles. There is a difference; an highest progressive dispersion of the representative points of the specimens. This shows as at the increase of the length of the diastema doesn't correspond to a light reduction of the length of the cheektooth row and that the increase of the dimensions of the anterior part of the mandible derives almost exclusively, by the increase of the length of the diastema (compare the diagrams 5A-5D-5E, the points distribution passes by horizontal –D,E- to vertical –A-).

POSTCRANIAL SKELETON – An analysis effected on the measures of the different anatomical parts of the postcranial skeleton has confirmed that the Como marmots have a smaller size respect to the Parmorari ones and that they are very similar to the Piedmont marmots (relatively to the skulls and the mandibles remains). This is perfectly according to how much observed by AIMAR (1992).

CONCLUSIONS

By the morphometric analysis effected on the *Marmota marmota* L., 1758 remains discovered in two localities of the Como Province (Bulgarograsso and Olgiate Comasco), we can advance different conclusions.

First of all, the position of the Como collection remains inside the recent marmots is shown, confirming how much deduced by the lower fossilisation degree of the specimens. Besides, in general view, it is confirmed how much advanced by AIMAR (1992) namely that the Pleistocenic marmots of Parmorari (more ancient respect to others examined), are bigger in size, while inside the recent ones we have observed that the Como collection have a smallest size in comparison to the ones of Piedmont.

Undoubtedly this condition could be the consequence of the different style of life of the Como and Piedmont marmots.

By the compared observation of the diagrams related to the upper and lower molars, a particular element is shown; the points distribution have an opposite development passing by the upper to the lower ones.

The difficulty to assign an age at the isolated remains, if don't discovered together with other morphologically important skeleton parts (for example, the more or less arched disposition of the upper cheektooth row), is emerged. Maybe the size of the second molar (upper and lower) and of M^1, could be discriminating. This difficulty can be shown again utilising some mandibular parameters (for example the «Length of the cheektooth row» or the «Length of the diastema») that, in the optics of the evaluation of the isolated remains, aren't useful for a chronological separation of the ancient and recent specimens.

For the skulls only the relation between the «Total Length» and the «Maximum length of the nasals» could have a chronological separation meaning of the isolated remains.

For the mandibles the great important element is the height of the mandible and not its length, that is practically constant in the analysed specimens. This permits to consider the Parmorari mandibles sturdiest than the recent ones.

At last, the marmots of the Como area don't present great morphological differences respect to the ones of Piedomont, the only one observed could be the consequence of the slightly different habitat.

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