

The Cave of Vecchiuzzo: anthropology, paleopathology and hierarchy of the human group with a statistical overview (Petralia Sottana – Palermo, Italy)

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PAROLE CHIAVE: Preistoria, Sicilia, antropometria, paleodemografia, analisi multivariata, Eneolitico, Età del Bronzo.

RIASSUNTO — Lo scavo della Grotta del Vecchiuzzo fu il primo effettuato nelle Madonie (Sicilia centro-occidentale). Fin dalla sua scoperta avvenuta per mano di Collisani e Carapezza nel 1936, il ritrovamento di manufatti nel vano principale indicò che la grotta era stata abitata. Gli scavi, effettuati a partire dal 1937, indicarono che la grotta era stata adibita ad abitazione o forse a santuario e che era stata abitata intorno al terzo millennio a.C. I resti scheletrici, attribuiti ad almeno quindici individui, sono stati studiati dal punto di vista antropologico, antropometrico e paleopatologico, combinando metodologie tradizionali a quelle più moderne. Sui dati odontometrici raccolti è stata effettuata un'analisi comparativa multivariata con altri undici siti della Sicilia. La tipologia cranica è dolicomorfa. Lo scheletro post-craniale è nella norma o poco robusto, invece la statura femminile (la sola calcolabile) è poco al di sopra della media. L'esame paleopatologico ha evidenziato patologie dentarie, carenziali, traumatiche e degenerative mentre la presenza di entesopatie, esostosi ed eburneazioni, indica uno stile di vita rurale. Infine l'analisi statistica mostra una relazione morfologica tra il sito in esame e gli altri siti Paleo-Mesolitici dell'isola.

KEY WORDS: Prehistory, Sicily, anthropometry, paleodemography, Multivariate Analysis, Eneolithic, Bronze Age.

SUMMARY — The excavation in the “Grotta del Vecchiuzzo” was the first archaeological excavation done in the mountain of Madonie (central-western Sicily, Italy). Since the earliest explorations, made in 1936 by Collisani and Carapezza, the discovery of artifacts, in the main compartment, indicated that the cave has been attended in prehistory. Excavations done, since 1937, indicated that the site has different use during the time as it probably used as inhabitation or as a sanctuary, the prehistoric attendance of the site was around the third millennium B.C. The skeletal remains, at least fifteen individuals, were studied from the anthropological, anthropometric and paleopathological point of view, combining traditional and modern approaches. Finally a comparative Multivariate Analysis with the dental data achieved and other eleven sites in Sicily was done. Skulls were classified as dolicomorphic. Postcranial skeleton is normal or not robust, moreover the stature of women (the only calculable) is slightly above average. The study registered dental, deficiency and traumatic diseases, while enthesopathy, exostosis indicated a rural lifestyle. Finally, the statistical analysis shows a morphological relationship between the studied site and other Paleo-Mesolithic sites of the island.

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THE CAVE OF VECCHIUZZO

The cave is situated approximately one kilometers, as the crow flies, from the current center of Petralia Sottana, near the slopes of Saint Salvatore Mountain, on the eastern side of the Rock of Balate (in the south side of Madonie) in the in the upper valley of the southern Himera river.

The cave research, began in 1934 by the amateur archaeologist Collisani helped by his friend Carapezza.

After numerous attempts and failures, in the mountain in front of Petralia Sottana Town (PA), the research ended two years later, in 1936.

The excavation in the Cave of Vecchiuzzo was the first archaeological excavation done in the mountains of Madonie (central-western Sicily, Italy).

Measurements, taken during the excavations, show that the site has a complex morphology with a range of about 83 meters long and 2.30 meters wide (Fig. 1) (Conte et al., 2008).

Since the earliest explorations, done by Collisani and Carapezza, the discovery of artifacts, in the main compartment, indicated that the cave has been inhabited.

Subsequent excavations done since 1937, indicated that the cave was used as inhabitation or maybe as sanctuary, and that was inhabited around the third millennium. B.C. in a period between the final Eneolithic (4.000 B.C.) and Early Bronze Age (2.000 B.C.), about 5.500 years ago (Bovio-Marconi, 1975).

The prehistoric site in the Cave of Vecchiuzzo is the oldest evidence of concrete human peopling in the area of Madonie. It is possible to hypothesize that the cave in origin had residential use and probably only in the end was used like burial place or worship.

During the excavation in 1937, directed by Paolo Mingazzini, and in 1938, under the guidance of Jole Bovio-Marconi, the method of exavations, primarily used in those years, did not provide the identifications of stratigraphic series and therefore was impossible to define chrono-typological sequences. Recent discussions of the site put in light the inadequacy of the excavation campaigns and the critical lost of

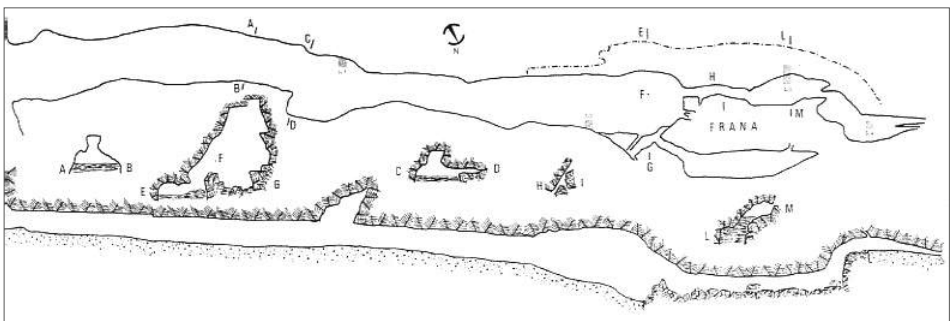


Fig. 1. Plan, sections and prospectus of the Cave of Vecchiuzzo done by Giovanni Mannino (Bovio-Marconi, 1975).

very important stratigraphic information from the site (Conte et al., 2008).

In the 70% of the excavation areas were found human skeletal remains (and animals), not in anatomical connection, including a jar containing human bones.

Although this finding could be interpreted as secondary deposition, part of a complex ritual, the fact that bones were scattered on the whole surface suggest that in the last period, the cave served as little more than a burial chamber, perhaps for a small village located near the cave.

The presence of ash lenses and the lack of burials and funerary materials, argue in favor of the primarily hypothesis of residential use.

Preliminary analysis has identified a small group of bones, consisting in several small bones such as phalanges, carpal, tarsal, vertebral bodies, *patellas* and two small fragments of jaws, with a reddish color in contrast with majority of the bones that are grey-white.

All of these elements recalled “Red Earth Series” are absent in the largest “White Series”, maybe because after an initial burial, in a primary chamber, the skeletal material has been moved to another location (Beker, 1995).

The remains are related to least to fifteen individuals of both sexes and of various age.

MATERIALS AND METHODS

The anthropological analysis was done in the osteological laboratory of Regional Archaeological Museum “Antonino Salinas “, where the collection is located, under the supervision of Dr. Rosaria Di Salvo.

The first phase of the study was to identify skeletal material, followed by a restoration.

Skeletal remains were measured on the base Martin and Saller methods.

Morphometric data of anthropological interest such as stature, strength indices, determination of sex and indicators of functional stress were calculated.

To investigate post-cranial metric data, methods recommended by Trotter and Gleser (1958) for the individual stature were also used.

Although it was possible to calculate only females stature to obtain a comprehensive picture of the human group the average stature was compared with other three Eneolithic sites of western Sicily: Chiusilla, Roccazzello and Piano Vento.

Particular attention was paid in the study of the teeth as teeth are the part of skeleton that are preserved best. The analysis of teeth has a great importance for paleo-pathological research, the type of alimentation and to compare ancient peoples (coeval or different periods), for taxonomic and evolutionary studies.

Moreover for each individual, where was possible, was determined the sex: in addition to the classical methods, by the basin (Lovejoy et al., 1985), was included the morphological analysis of the jaws (Loth et al., 2001) and the use of odontometric data (Vodanovic'et al., 2007).

Odontometric data, these should be compared with the values in tables deducted after the study of numerous samples.

This method permits an easy and cheap identification of sex without the use of complicated software.

(The measures can be taken only if the degree of abrasion is low and can be applied only on permanent theet after their eruption).

The age of death was estimated by the degree of tooth eruption (Ubelaker, 1978), dental attrition (Brothwell, 2000), or by the method of Schmitt (Schmitt, 2005) as regards the basin.

In order to understand the life habits of the population, in addition to the metric data, non-metric indicators of functional stress were detected on postcranial skeleton.

Finally a comparative multivariate analysis based on the odontometric data compared with the data from other eleven sites of central-western Sicily was done.

Comparison data, comes from the following sites: Grotta D'Oriente (GO), Grotta dell'Uzzo (GU), San Teodoro (ST) from the Paleo-Mesolithic Age; Marcita (MA), Polizzello (PO), San Ciro (SC), Stretto (STR) from Early Bronze Age; Tukory (TU) from Punic Age; San Giovanni (SG) IV-V Century A.C. and the Medieval sites of Monte Iato A (MIA) and Monte Iato B (MIB).

The purpose of this analysis was to explore the morphological relations existing between teeth morphology, with the use of multivariate techniques and the calculation of the biological distances.

Multivariate techniques here applied are: principal component analysis (PCA), cluster analysis and multidimensional scaling (MDS).

These methods are used to identify systematic relationships between multiple variables and/or between objects when there aren't (or aren't complete) *a priori* expectations about the nature of the relationships (Pietruszewsky, 2000).

RESULTS

Based on the number of jaws the sample consists of fifteen individuals.

Sex was determined using of one or two combined methods, to improve the accuracy and reduce error; there were eight females (53.33%) and seven males (46.67%).

The majority of individuals were adult (66.7%) and (33.33%) were child.

For adults (20-40 years), the two methods revealed an estimated mortality of twenty-five and thirty-five years old. We did not find youth (13-19 years), mature (41-59 years) or old (over 60) individuals.

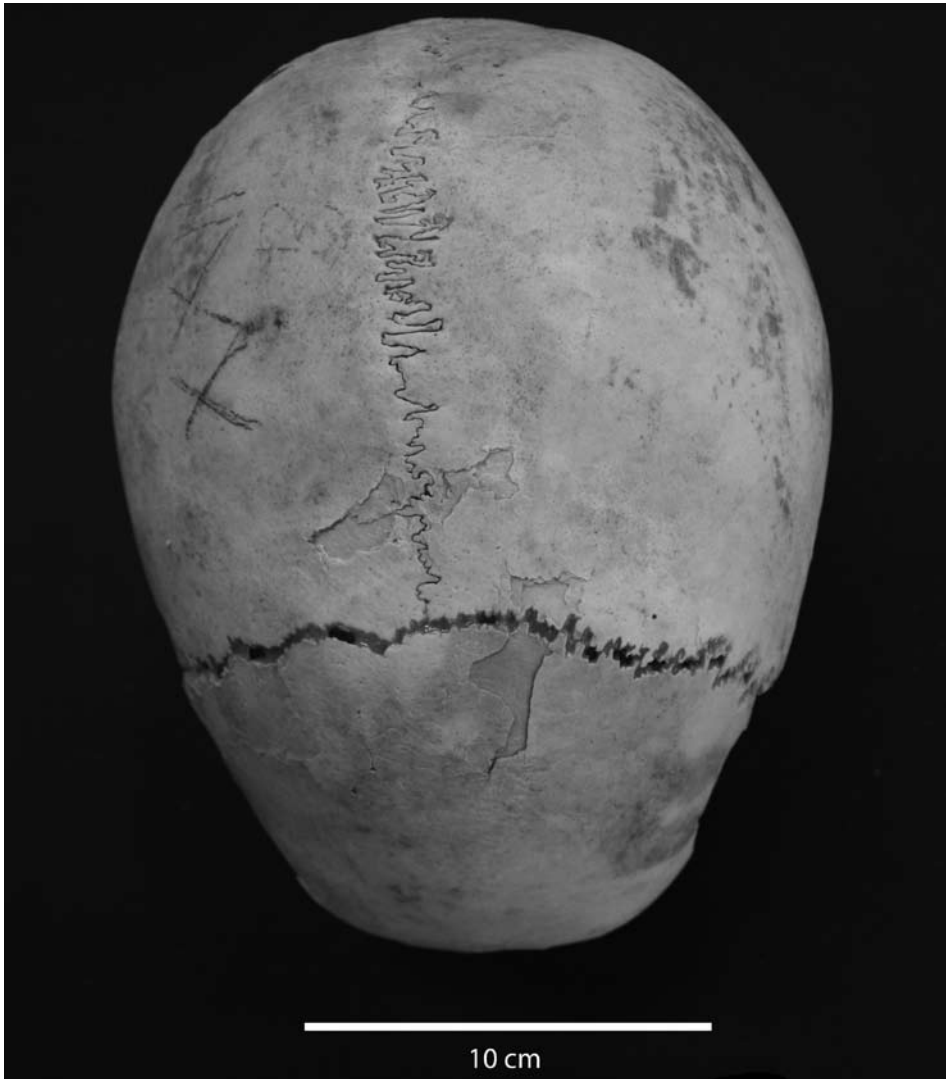


Fig. 2. Skull n°6, one of the twelve skull found in the Cave of Vecchiuzzo. It show a typical dolicomorphic morphotype.

The infant sample is composed for the 40% (13.33% of Tot.) of infants I (0-6 years), the 20% (6.66% of Tot.) of infants II (7-12 years) and finally 40% of individuals for whom we were unable to determine an age estimation, but were between classes I and II. The 100% of adult *calvaria* were classified as dolicomorphic (Fig. 2).

The analysis carried out on the post-cranial skeleton indicate the presence of nine individuals (data based on the bones of pelvic girdle).

The bones are standard or graciles (rarely robust): shoulder have a hold glenoid cavity, the humeri are flattened, radi an tibiae often have diaphyseal indices below the average, only ulne have values within the range.

Female stature varies from 157.25 cm to 154.25 cm, with an arithmetic average of 156 cm.

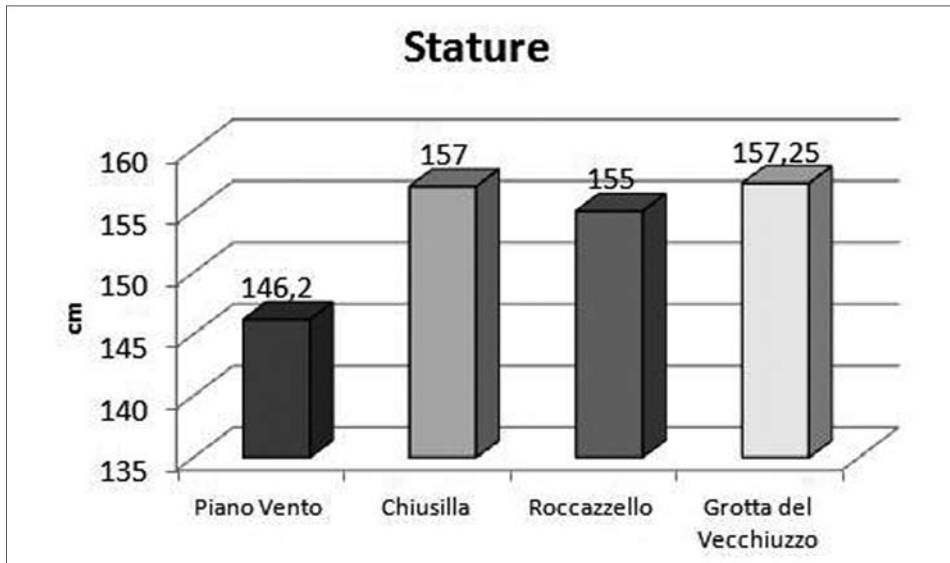
It was not possible to determine the stature of any male.

Comparing the stature with other three Eneolithic sites of western Sicily (Chiusilla, Roccazzello and Piano Vento), the data obtained show that the females stature of the group of Vecchiuzzo is over the average (Bargraph 1)-(Table 1).

Pathological evidence

From the remains it was possible to recognize dental disease and also deficit, traumatic and degenerative diseases.

Slightly more than half of the teeth had dental disease: forty-five out of ninety-two of examined teeth (48.9% of Tot.) were disease free, twenty-six teeth (28.2% of Tot.), have enamel hypoplasia (malnutrition), fifteen teeth (16.30% of



Bargraph 1. Females stature average of GV and other three sites.

Table 1. Stature of four Eneolithic sites of western Sicily

Piano Vento	M	cm 171.8	F	cm 146.2
Chiusilla	M	cm 167.0	F	cm 157.0
Grotta del Fico	M	cm 163.6	F	
Roccazzello	M	cm 162.0	F	cm 155.0
Grotta del Vecchiuzzo	M		F	cm 157.2

Tot.) have evident signs of abrasion and only six (6.6% of Tot.) were decayed (Piechart 1).

Furthermore only three teeth were lost intravivam.

However, all isolated teeth (28.2%), have clear enamel hypoplasia, while the remaining teeth: healthy (48.9%), usury (16.30%) and decayed (6.6%) are still included in the jaws.

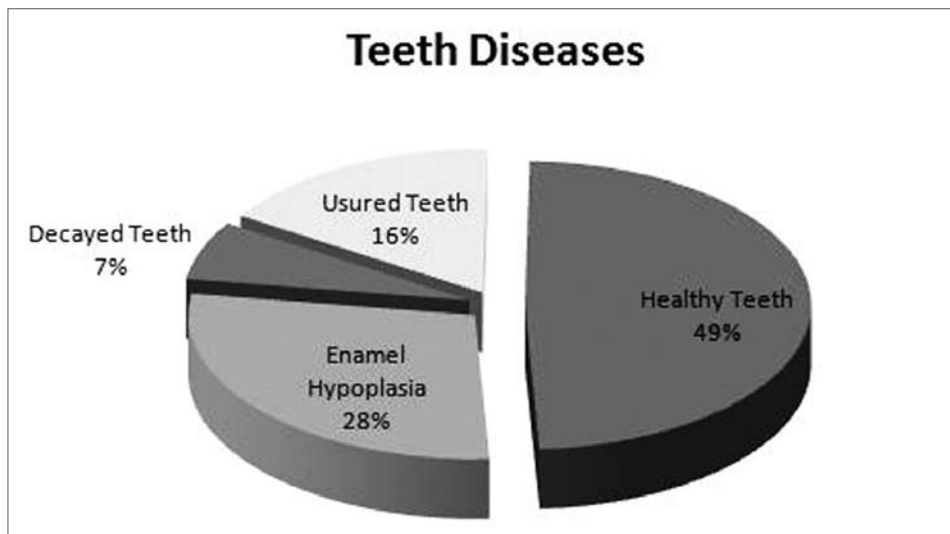
Considering the relatively young age of the sample and the fact that tooth abrasion is localized in the molars, especially the first and second molars, one hypothesis is the pathology was the result of chewing undercooked or not well ground foods.

Enamel hypoplasia, that affects more than a quarter of the teeth, was probably caused by malnutrition, especially deficit of vitamins (probably D vitamin), or by infectious diseases occurred during the childhood.

Orbits cribra was found in 33.33% of the *calvaria* (Fig. 3): 75% of infants and only 8.3% of adults. This disease is the manifestation of skull pore hyperostosis, due to oxygen deficiency in the tissue and is found in congenital or hereditary anemias caused by nutritional deficiency, or in the case of anemic diseases, by intestinal infections and malaria. The presence of *cribra*, in women, could be referred to deficit diseases.

Long bones were affected by diseases. Exostosis was found in one femur (caused by a microtrauma), which is manifested by the presence of a bone spur, and is evident an enthesopathy (an alteration of the muscle-tendon due to an intense daily activity), on the *linea aspera*.

The ulna has one enthesopathy located on round-promoter muscle junction, this disease is also found in two shoulders.



Piechart 1. *Healthy situations of teeth due to a deficit diet.*

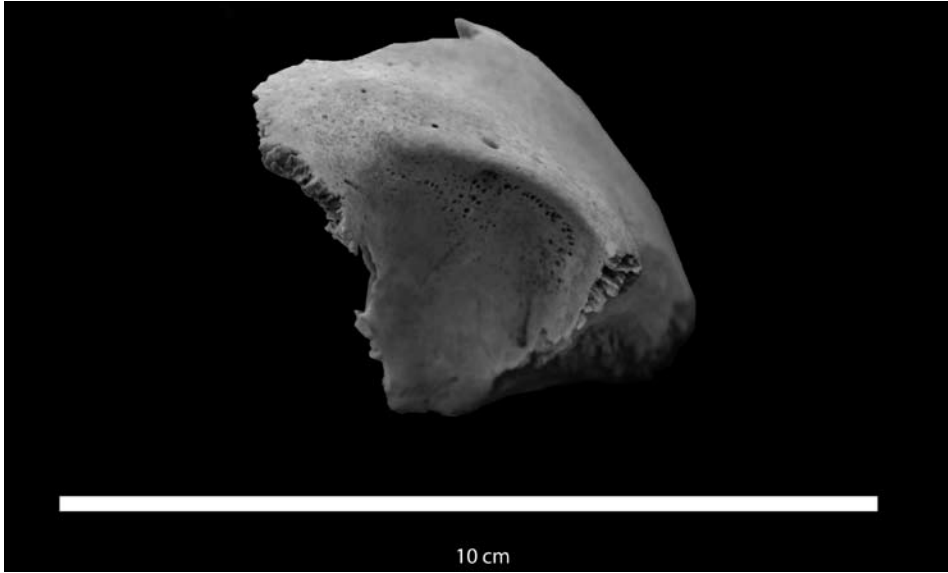


Fig. 3. Skull n°4, one of the twelve skull found in the Cave of Vecchiuzzo. It present orbits cribra due to a diet poor in iron.

Furthermore five humeri have a prominent deltoid-tuberosity caused by another enthesopathy while other three present signs of bone remodeling. Only one humerus has no diseases or bone remodeling.

In one fibula there is an exostosis, where was found a prominent ridge in the attachment site of the peroneal muscle.

In the glenoid cavity of one scapula is possible see an evident cartilage's erosion and the triceps muscle attachment site present an enthesopathy.

Other enthesopathy are also present in other two shoulders, where there is a clear roughness in the attachment of deltoid muscle, and in another shoulder, where the attachment site of the serratus anterior muscle, have a thick ridge wrinkled. Remodeling (due to growth) is present only in one shoulder.

Finally on the vertebrae there aren't particular anomalies; only one vertebra has slight compression fractures.

Multivariate Statistical Analysis

The PCA scatter-plot (Fig. 4), with the first two components, explain 96.3% of the variance (93.4% and 2.9%).

The graph shows the affinity of GV (Cave of Vecchiuzzo) with the Paleo-Mesolithic sites. In fact along the negative side of the first component are collected human groups of ST, GU and GO, while on the positive side we find the prehistoric and historic samples.

According to the second component, there is a separation between ST and GO while GU and GV fall on the negative side.

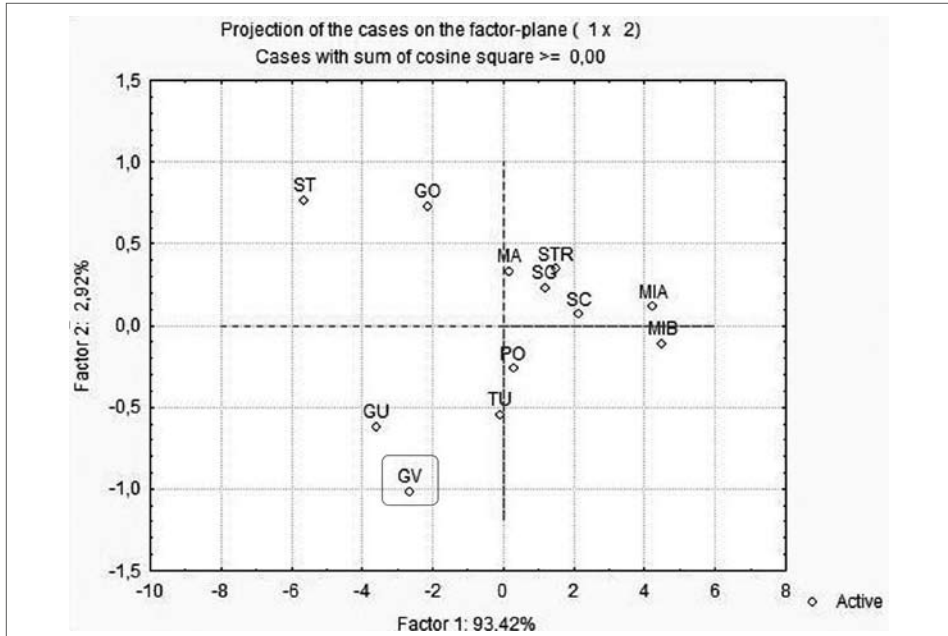


Fig. 4. Scatterplot obtained from the analysis of the main components shows the different axes side positions of GV and the Paleo-Mesolithic sites (GU,ST,GO) from the other prehistoric and historic sites.

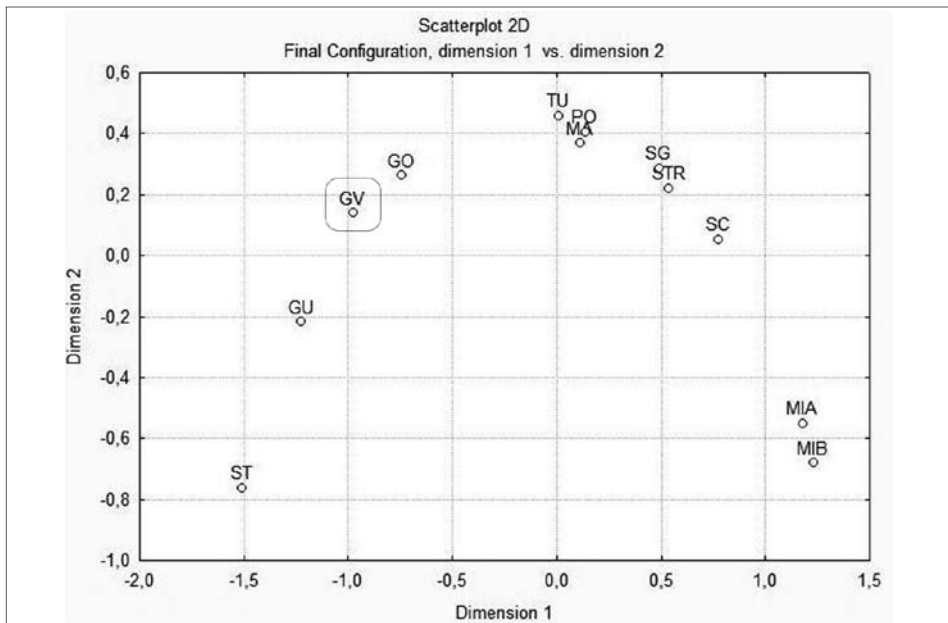


Fig. 5. Scatterplot of Multidimensional Scaling shows the principal axes of shape variation of GV and the other Paleo-Mesolithic sites (GU,ST,GO) from the other prehistoric and historic sites.

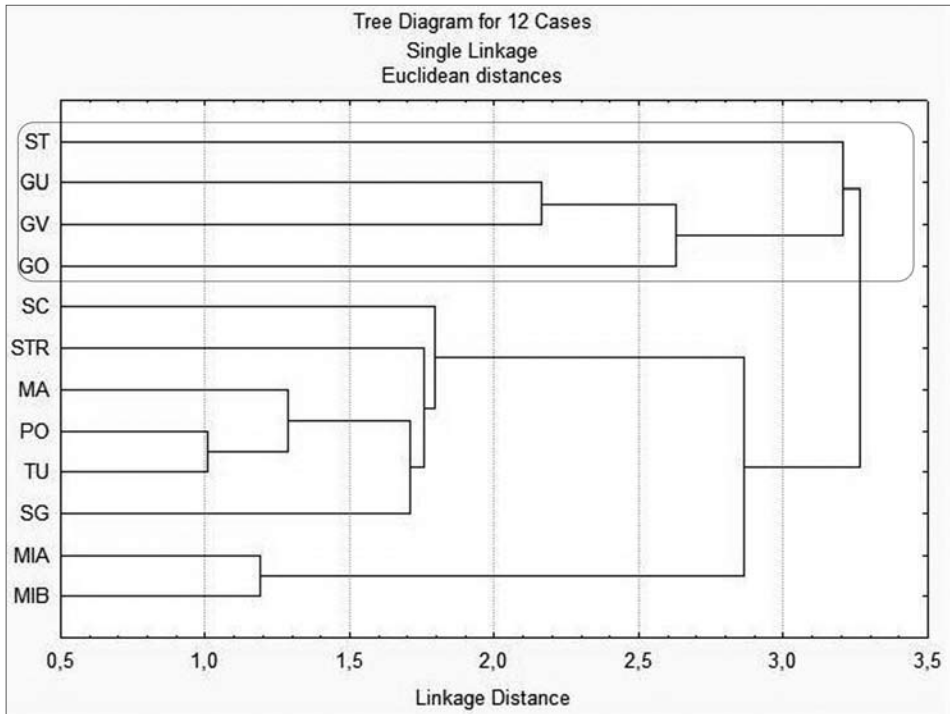


Fig. 6. Cluster Analysis shows the relationship between GV and the Paleo-Mesolithic sites (GU,ST,GO) and the divergence from the other prehistoric and historic sites.

MDS was found from the matrix distance (Fig. 5), with a stress value of 0,01. In this case GV is separated from prehistorical and historical samples, and placed in the Paleo-Mesolithic space, showing a distribution similar to the previous analysis.

The cluster analysis (Fig.6) shows two main groups: in the first Paleo-Mesolithics are connected together and with GV, the second group collects prehistoric and historic samples.

CONCLUSION

In conclusion, the group of Vecchiuzzo is a human group composed by fifteen individuals of both sexes, aged between infans I and adult.

The morphotype is dolicomorphic, post-cranial skeleton is normal or gracile.

Female stature is little over the average.

The study showed dental deficiency, traumatic and degenerative diseases.

Infant mortality is mainly found in infant I. This finding suggests that the most common cause of death was related to the deficit of an inadequate nutritional support, during the development phase. This hypothesis is supported by the high percentage of orbits *cribra* found in younger individuals. The level of dental decay,

enamel hypoplasia and the presence of orbits *cribra*, in a third of the sample, suggest a diet poor in iron, vitamins and sugars, and primarily based on proteins.

In addition, the absent of injuries from blunt blows, exclude the bellicose nature of the population under consideration.

However, the analysis of the insertion muscles areas, highlighted the presence of enthesopathy and exostosis, indicate that the population had a rural life style, that required an intense, daily, physical activities.

Finally, using multivariate techniques was done a comparative analysis between the group of Vecchiuzzo and eleven human groups in the central-western Sicily.

All the statistical analysis showed a clear morphological relationship between the Paleo-Mesolithics samples of GO, ST, GU and GV, and the divergence from the other pre-historical and historical samples from the island.

The same outcome produced by this analysis is an evidence that these data were not the result of random or stochastic variations but are deterministic variations because their recurrence under the same initial conditions produces the same results.

The morphological relationship of GV with the oldest Paleo-Mesolithics sites, in general located in the northern coast of Sicily (Tyrrhenian Sea), assumes that GV was one of the first colonization in the Sicilian hinterland.

ACKNOWLEDGMENTS - Authors thank Luca Sineo advice and suggestions. Authors thank Dr. Rosaria Di Salvo of the Regional Archaeological Museum "Antonino Salinas", for providing research material and for comments on this work; Dr. Vittoria Schimmenti for her kind help during this years and at Dr. Francesca Spatafora (Director of Museum "Antonino Salinas") for providing the permission to publish this study.

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