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Recovery and restoration of the fossil vertebrate material from Collecurti (Macerata, Central Italy)

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ABSTRACT – Recovery and restoration of fossil vertebrate material from Collecurti, Colfiorito basin (Umbria-Marche Apennine) were carried out using both consolidated and experimental methodologies. Special attention was paid to use thoroughly reversible materials and non-destructive techniques, in order to permit any possible future operation on the specimens. For this reason no internal metal supports and no epoxy resins or other non-reversible substances were used which might prevent the use of new materials or of innovative methodologies.

RIASSUNTO – [Recupero e restauro del materiale fossile a vertebrati di Collecurti (Macerata, Italia centrale)] – Il recupero ed il restauro del materiale fossile a vertebrati proveniente da Collecurti, Bacino di Colfiorito (Appennino Umbro-Marchigiano) sono stati effettuati utilizzando metodologie già affermate unitamente ad altre in corso di sperimentazione. Particolare attenzione è stata dedicata all'adozione di materiali completamente reversibili e di tecniche non distruttive, per avere la possibilità di lavorare sui reperti anche in momenti successivi. L'uso di nuovi materiali o di metodologie innovative non sarà in questo modo ostacolato dalla presenza di sostegni interni metallici, resine epossidiche e altre sostanze non reversibili.

INTRODUCTION

In 1986 the Departments of Earth Sciences of the Universities of Florence and Camerino and the Soprintendenza Archeologica of Ancona led geopaleontological research in the Colfiorito basin, Umbria-Marche Apennine. Outcrops of fossil vertebrate fragments were found since the first surveys. Two areas appeared particularly promising: San Martino-Collecurti and Cesi, near Serravalle di Chienti, Macerata.

These stimulating results encouraged systematic excavations in the area of Collecurti. Works began in 1987. A rich collection of specimens was recovered. The vertebrate-bearing level was located at only 60 cm from the surface and therefore excavations were greatly eased.

Other excavations followed in the lapse 1988-1990 (Borselli *et al.*, 1988; Ficarelli *et al.*, 1990; Masini & Santini, 1991).

The Soprintendenza Archeologica of Ancona financially supported the 1989-1990 excavations, as well as the restoration of the great amount of specimens.

The Local Fauna from Collecurti is composed of *Hippopotamus antiquus*, *Megaceroides* gr. *verticornis*, *Stephanorhinus hundsheimensis*, *Leptobos etruscus*, *Pseudodama nestii*, *Archidiskodon* sp., *Ursus etruscus*, *Canis arnensis*, *Canis falconeri* and *Microtus (Allophaiomys) ruffoi*.

At the present state of knowledge, this assemblage appears somewhat more progressed than the others which begin the Villafranchian-Galerian faunal turnover. The Collecurti Local Fauna therefore has become an important reference for the studies of the Quaternary faunal evolution. It is also an important chronological reference for the studies of the tectonics of the Umbria-Marche Apennine.

THE RECOVERY OF THE MATERIAL

The recovery of the fossil material was accomplished using the «plaster casing» method (Kummel & Raup, 1965; Andreani *et al.*, 1980; Borselli, 1985). In order to ease the cutting of the plaster case in the laboratory, in some instances rubber bands were placed between the specimen and the plaster-soaked jute bands (Text-fig. 1). Hardeners were sometimes indispensable before the recovery. Vinyl and hardly reversible ciano-acrylic adhesive were used at first, but later on acetone-diluted Mowilith 50 (Pacciani, 1985) was preferred. This reversible hardener was chosen because it proved to remain fairly elastic through time; on the contrary Paraloid B72 hardens, assumes a glassy appearance and becomes very brittle. In the field, attention was paid not to apply Mowilith 50 on the imperfectly cleaned surfaces of the specimens; rather, it was injected, very diluted, with syringes in accurately cleaned fractures, cavities and spongy parts of the bones. Mowilith 50 worked



Text-fig. 1 - Rubber bands, placed between the specimen and the plaster casing, ease the removal of the latter.

well also on damp specimens. Undesired drawbacks were that the needle of the syringe may possibly be shot off by the pressure of the hardener, or that the sediment or bone chips may obstruct the duct of the needle. In order to prevent these inconveniences, a small aluminium band was applied to hold the needle firmly and the point of the needle was modified according to need (Text-figs. 2, 3).

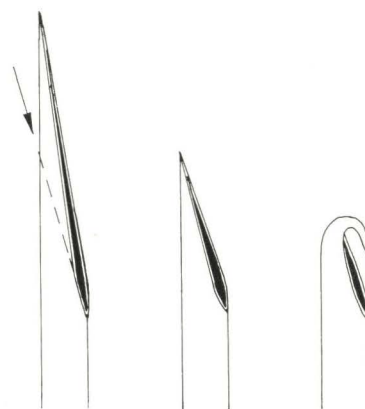
When the bones were badly crushed and shattered, after being preliminarily consolidated, gauze bands soaked in organic glues were applied. These bands can be easily removed and replaced by more up-to-date products, such as water solutions of alcoholpolyvinyl resins (Giusberti & Martinelli, 1983).

RESTORATION

The first laboratory procedure consists in cleaning accurately the exposed surface of the

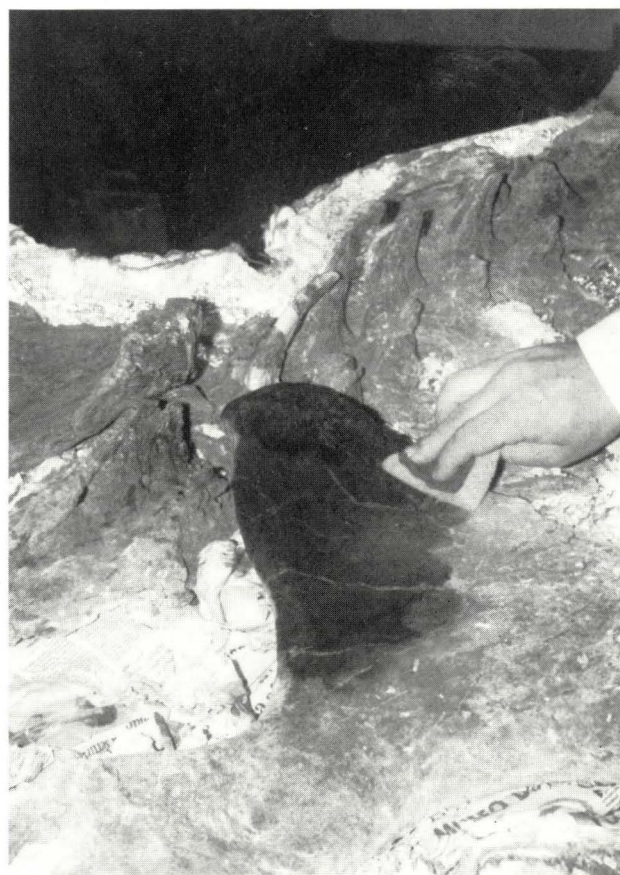


Text-fig. 2 - The small aluminium band prevents the ejection of the needle due to the pressure of the hardener.



Text-fig. 3 - The point of the needle is cut and folded to prevent obstruction by sediments present in the fractures.

specimen; then the plaster casing is partly removed. The fractures are carefully cleaned with dentist's probes; hardener is applied to loose fragments. Once the solvent has evaporated, the specimen is cleaned with 10-15 volume hydrogen peroxide, using sponges, brushes, small brushes, spatulas and probes (Text-figs. 4,5).



Text-fig. 4 - Specimen cleaned with hydrogen peroxide.



Text-fig. 5 - Specimen cleaned with hydrogen peroxide.

So prepared, the bone is then consolidated injecting acetone-diluted Mowilith 50 in the fractures, foramina and spongy areas. The density of the hardener is progressively increased at every application, until it reaches a consistency similar to that of an adhesive. Very dense Mowilith 50 was also used as an adhesive (Cozzini, pers. comm.), while Paraloid B72 was successfully used to glue polyamide sheets in superimposed layers, which formed a rigid inner support to large fractures. Inner metal supports, epoxy resins, mastic or other non-reversible material were always avoided.

In many cases a new application of large amounts of solvents weakens the specimens; the opening of fractures by gravity should be prevented using paper tape or gauze soaked in organic glue (Text-fig. 6). The best of these adhesives is flour glue, since it is so dense that it does not penetrate the specimen and it does not alter adding sodium chloride or alum (Piva, 1964).



Text-fig. 6 - A plaster-soaked hydrophile gauze was applied to prevent the opening of the fractures.

For overturning very large specimens, moulds made of plaster-or fiberglass-soaked bands were prepared.

Before applying a last coating of Mowilith 50 diluted in acetone and alcohol, sediment and adhesive residues in the fractures were removed with an acetone-soaked brush and with a probe.

Table 1 lists the specimens restored with the method described.

Species	Specimens	Number of specimens
<i>Hippopotamus antiquus</i>	Cranium	1
	Mandible	2
	Teeth	9
	Vertebrae	23
	Scapula	4
	Rib	12
	Humerus	5
	Radius-ulna	3
	Femur	5
	Patella	4
	Tibia	7
	Fibula	4
	Carpal, Metacarpal	
	Tarsal, metatarsal	78
	Phalanx	
	Sesamoid	4
<i>Archidiskodon</i> sp.	Pelvis	2
	Sacrum	2
	Teeth	1
	Vertebrae	3
	Rib	3
<i>Leptobos etruscus</i>	Humerus	1
	Femur	1
	Vertebrae	1
	Tarsal, metatarsal	
{ <i>Megacerooides</i> gr. <i>verticornis</i> <i>Pseudodama nestii</i>	Phalanx	3
	Antler, Fragments	10
	Scapula	2
	Carpal, Metacarpal	
	Tarsal, Metatarsal	5
<i>Stephanorhinus hundsheimensis</i>	Phalanx	
	Teeth	2
	Humerus	1

Tab. 1 - List of the restored specimens.

CONCLUSIONS

Notions of art restoration were used in the restoration of the fossils from Collecureti. As a matter of fact the specimens were considered worthy of full respect and care, since they are «documents» which bear evidence of their transition through time (Brandi, 1963; Riccio, 1984).

Hence the restoration should not alter these deformations, which provide invaluable information on the history of the specimen, avoiding tentative, and often subjective, reconstructions.

Therefore, rather than an arbitrary reconstruction, the restoration of a fossil bone should consist primarily, or better exclusively, in a consolidation warranting the preservation for present, and, most of all, for future generations. As a matter of fact technical and scientific knowledge and methodologies will certainly progress: we should allow the restorers of tomorrow to re-operate on the specimens, and studies and analyses with new techniques only if we reduce our interventions to the least and if we use reversible hardeners and adhesive. At present, attempts to reconstruct badly crushed specimens are made using x-ray photographs and casts, without any need to work directly on the fossils (Mangione *et al.*, in preparation); this is possible only if the integrity of the specimens is fully respected.

A century ago Anatole France, writing about the restoration methods of Eugène Viollet-le-Duc, stated that he who arrogates to himself the definitive judgement and intervention is wrong, because «ours is the historical sense of today, that of posterity will be different» (La Monica, 1985).

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