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# The Middle Paleolithic sequence of Cova de l'Estret de Tragó (Lleida, Pre-Pyrenees)

Cova de l'Estret de Tragó was discovered during surveys in the Noguera Ribagorçana river, conducted in 1990 by the IEI-Diputació de Lleida (see Fig. 1A in the article Roca dels Bous). This rockshelterhas a surface of 14 x 10 m and is part of karst limestone Fm. Bona (X = 301856 Y = 4644190 UTMH31N ETRS89) to 390 m (Fig. 1A). This position in the first Prepyrenees of Lleida, plays a key association between the Ebro Basin and the Pyrenees (Martínez-Moreno *et al.*, 2004; Casanova *et al., 2009)*.

## Geographical Context and Chronostratigraphic

Eight archaeological units from Middle Paleolithic are identified in Tragó. They are interbedded with sterile sediments allowing individualized analysis. The archeostratigraphy of the deposit is

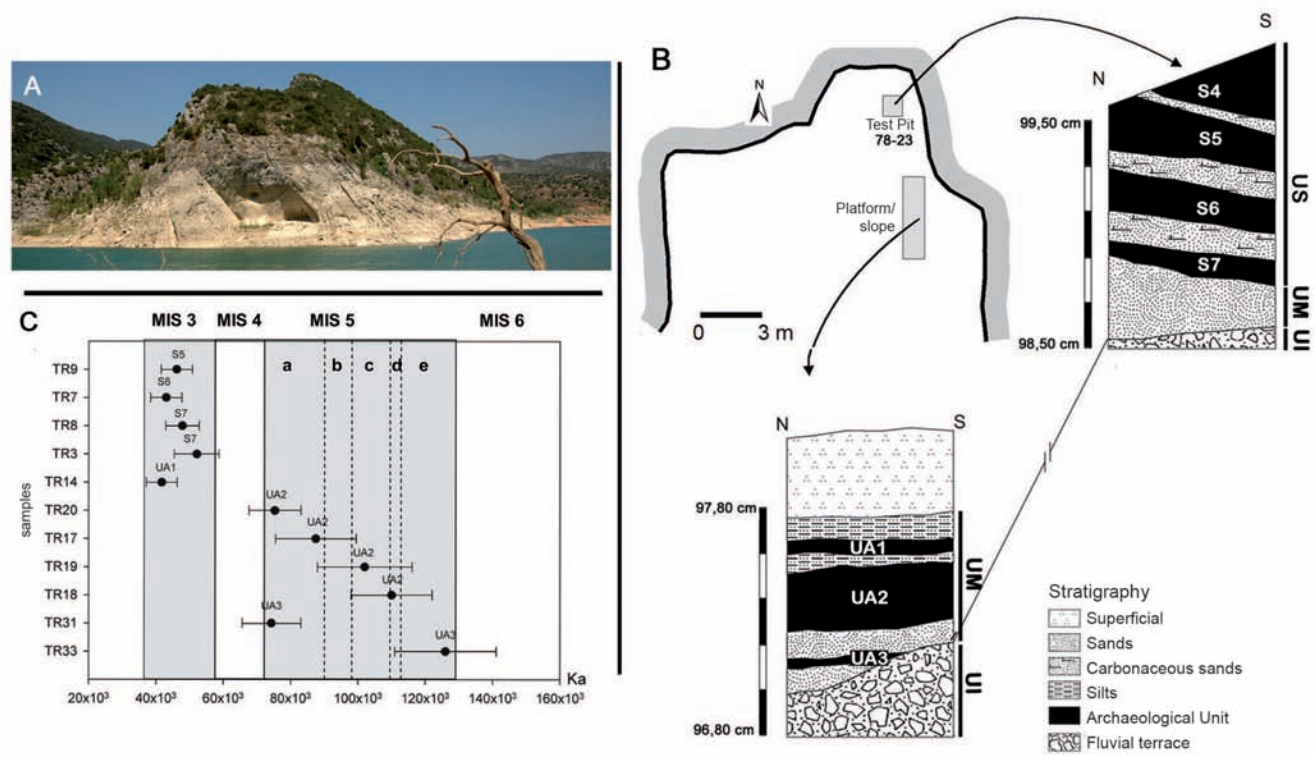


**Figure 1.** A) Cova del Estret de Tragó currently flooded by the Santa Anna marsh. B) Sequences of the inner rock shelter (78-23 survey) and the excavated area on the deposit platform. The *Upper Unit* (UU), *Middle Unit* (MU) and *Lower Unit* (LU) are positioned. C) Thermoluminescence series sequence.

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established from the sequences obtained in the survey on the square78-23 and the excavated area (25 $m^2$) and it can be defined in three units (Martínez-Moreno *et al., 2004;* Casanova *et al.*, 2009) (Fig. 1B):

- *Lower unit* (LU): high energy of fluvial deposit from Ribagorçana Noguerariver; containing medium and large size cobbles within a carbonated sandy matrix. This terrace constitutes the base of the site.
- *Middle unit* (MU): low to medium energy environment composed of clayey sand and silt resulting from the alternation of flooding, causing vertical migration of carbonates that precipitate on archaeological material. At this level of 1.5 m thickness, archaeological units UA3, UA1 and UA2 are excavated.
- *Upper unit* (UU): residual breccia fixed to the shelter wall dismantled in the rest of the deposit. In this survey, 1 $m^2$ and 1.10 m deep, S4, S5, S6 and S7 levels follow.

It has not been possible to correlate the archaeological levels of the *Middle unit* with the *Upper unit* (Fig. 1C). Eleven Thermoluminescence (TL) dates are available, generating chronometric ranges that frame the occupation of the settlement. The S5, S6 and S7 from the *Upper unit* levels are assigned to MIS 3 (between 43 ± 4.6 and 52.1 ± 6.7 ky). The date of UA1 (41.7 ± 4.5 ky) suggests this *Middle unit* level may be related to the *Upper unit*. The four dates obtained from UA2 are staggered in the range 75.3 ± 7.8 –110 ± 12 ky, indicating this level of 60 cm thickness is formed on the MIS 5. The UA3 has two dates and we accept the corresponding to MIS 5e stage (126 ± 15 ky). This series makes Tragó a key site to analyze the Upper Pleistocene Mousterian settlement in the northeast of the Iberian Peninsula (Casanova *et al.*, 2009).

## Archaeological record

Levels excavated can be considered low resolution palimpsests with thousands of lithic and bones imbricated without apparent order (Table 1). These accumulations would be the result of repeated visits to the shelter at different time periods, interrupted by abandonment phases. There are not identified hearths, but regular fire use in the entire sequence can be recognized by the presence of abundant charcoal, and burned bone and artefacts.

Bone carbonation and difficult anatomic and/or specific bone identification are not able to calculate indices of their presence. The species identified are *Vulpes vulpes*; *Sus scropha*, *Cervus elaphus, Capreolus capreolus, Bos sp.*, *Capra pyrenaica*, *Equus caballus* and *Equus* cf. *hydruntinus.* This eurythermal association describes an environment that integrates meadows with wooded areas insertedin alow/medium mountainous but sharp landscape. Abundant helical fractures on diaphysis denote intense marrow recovery (Martínez-Moreno *et al.*, 2004).

The lithic assemblage, composed by over 20,000 artifacts, is essential to characterize the

| | Upper Unit | | | | Middle Unit | | |
|---|---|---|---|---|---|---|---|
| | **S4** | **S5** | **S6** | **S7** | **UA1** | **UA2** | **UA3** |
| Surface ($m^2$) | 0,5 | 1 | 1 | 1 | 23 | 35 | 13 |
| Thickness (cm) | 20 | 30 | 15 | 15 | 10 | 60 | 15 |
| Hammers | 0 | 4 | 1 | 1 | 3 | 75 | 38 |
| Cores | 1 | 10 | 14 | 11 | 15 | 423 | 229 |
| Flakes | 33 | 315 | 184 | 152 | 496 | 6564 | 2303 |
| Flakes frag. | 70 | 406 | 502 | 328 | 777 | 7895 | 2275 |
| Chunks | 15 | 76 | 185 | 88 | 73 | 947 | 452 |
| Retouched | 16 | 163 | 140 | 41 | 143 | 791 | 274 |

**Table 1**. The excavated surface and the average thickness of the archaeological levels from the *Upper* and *Middle Unit* with the number of artifacts recovered.

Mousterian in this area. Metamorphic and siliceous rocks proliferate in the environment (see Fig. 1A in the article Roca dels Bous). Flint, present in the Montes de Tragó and Serra Larga (10 km), refers to local sourcing. At diachronic levels, the metamorphic rocks are the most important in lower units UA3 and UA2. This trend is reversed in UA1 and S4, S5, S6, S7 where the flint is the majority (Casanova *et al.*, *2009;* De la Torre *et al.*, 2013).

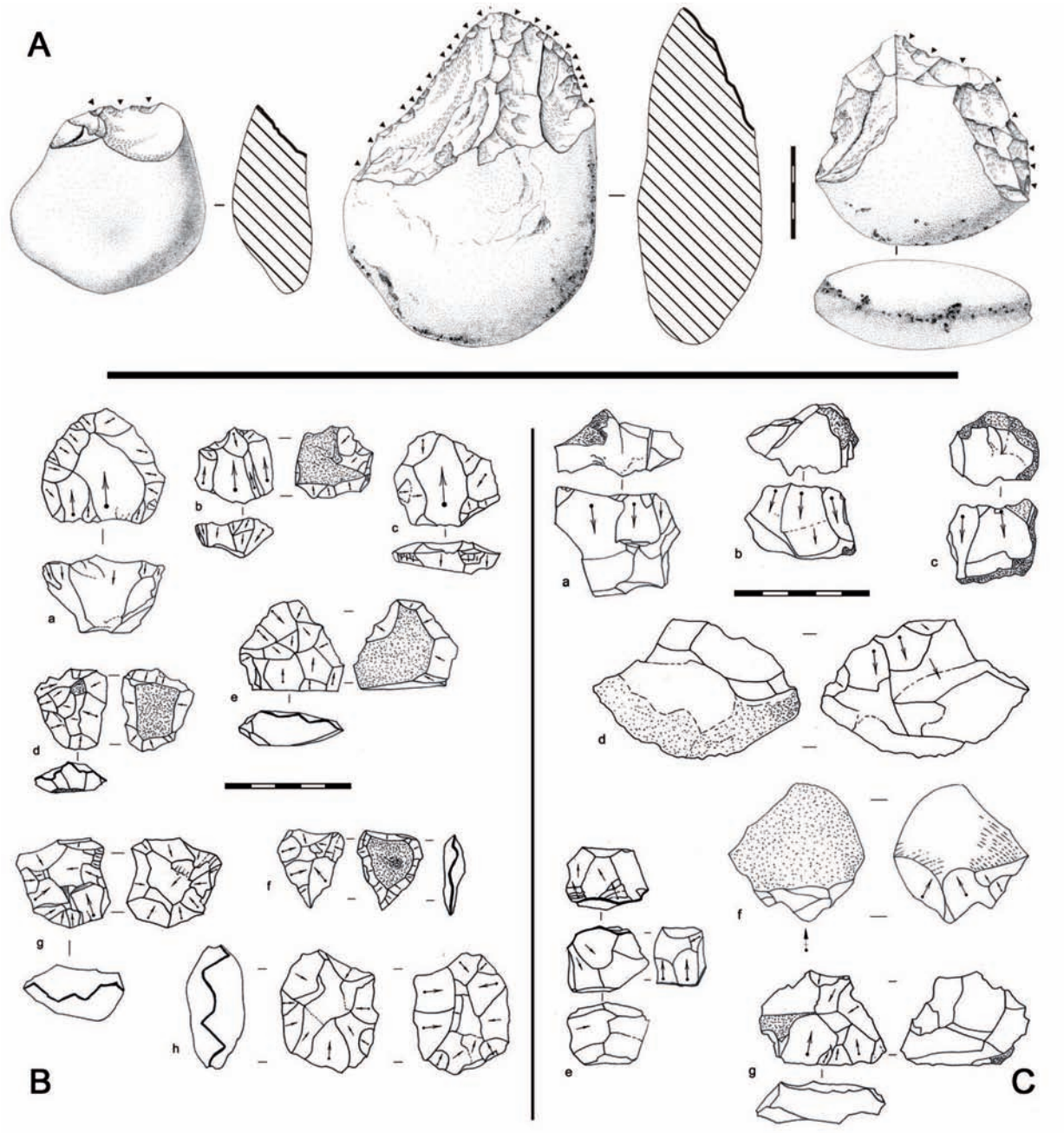


**Figure. 2** A) Macrotools from UA3 related to percussion activities. B) Variability of organized knapping systems showing the configuration of small volumes. C) Expedient cores.

All categories related to knapping, including microdebitage, are represented. The *debitage* is structured from organized expedient technical systems (Fig. 2). Organized systems allow management from schemes referred to as *Levallois* and *discoid* methods. The expedient methods are applied to volumes obtaining few blanks. These strategies, present in each sequence, denote the application of complementary technical behaviors depending on specific needs (Casanova *et al.*, 2014).

The cores usually measure less than five cm and intensive management of consumption it is observed (Fig. 2).This behavior cannot be explained by the lack of raw materials in the environment, we consider it a technical choice focused on elaborating small artifacts (Casanova *et al.*, 2009).The most common blanks are flakes, points and blades are rare. Blanks were obtained with hard hammers, generating accidents like broken pieces, Siret burins and double bulbs.

This continuity in the knapping methods derived several reflections. In the *Middle Unit* levels the expedient methods are mainly against structured methods, a pattern that persisted in the *Upper Unit*. This notion of *technological stasis* denotes a cognitive arrangement in the transmission of technical knowledge that could imply that in this area a stable cultural tradition was developed (Casanova *et al.*, 2009).

In UA3 25 cobbles of metamorphic rocks and granite were knapped by *façonnage* for shaping macrotools artefacts (Fig. 2).In these pieces, modifications over the edges can be seen, relating to percussion activities (Casanova *et al., 2014)*.

In the sequence, the retouched percentage is low (Table 1), selecting the flint to retouch pieces; although in UA3 and UA2 metamorphic rocks are more abundant. The most common blanks are short flakes retouched on a single edge (lateral or transverse); while double retouch edges are scarce. Denticulate and notched pieces with simple or abrupt retouch are more numerous than sidescrapers with continuous retouch. Preponderance of denticulate pieces is constant along the sequence. Although *pseudo-Levallois* retouched elements are identified, most of them are made on regular flakes or fragments.

## Tragó in the Middle Paleolithic Context of Northeast Iberia

The repeated use of this area during the Upper Pleistocene between MIS 5e, MIS 5 and MIS 3 should link with the control available from the settlement on the strait of Noguera-Ribagorçana river and floodplains currently flooded by the Santa Ana reservoir. This strategic point would not be unnoticed by the Neanderthal population. The rock shelter centralizes prey acquisition and their passing through the corridor allowing ambush in the wooded areas around the river. Similarly, displacement to the rocky outcrops adjacent to the settlement can be identified.

Even though the radiometric record is inaccurate, it cannot confirm their occupation in the MIS 4. This gap could be related to climatic crisis causing the abandonment of this environment. The cyclic occupation/abandonment of the area as a result of environmental factors should be retained as a possibility.

The technical continuity from the combination of technical methods, expeditious and organized, present throughout the entire sequence is relevant. We stress the importance of *technological stasis* notion identified in other sites of the Pyrenean foothills. Likewise, we warn that these technical options articulate a cultural tradition extended into the Upper Pleistocene northeastern Iberia. A number of attributes of this entity are the panoply of knapping methods, orientation to obtain small blank, and the denticulate preferred configuration (Casanova *et al., 2009;* de la Torre *et al., 2013)*.

Under this perspective, Cova Estret of Tragó is a relevant settlement to investigate the Neanderthal lifestyle in the Iberian Peninsula.

## Acknowledgments

We dedicate this article to Joel Casanova i Martí. These lines are a demonstration of our respect, affection, and admiration.

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# PLEISTOCENE AND HOLOCENE HUNTER-GATHERERS IN IBERIA AND THE GIBRALTAR STRAIT:

## THE CURRENT ARCHAEOLOGICAL RECORD

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