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Polished walls as indirect evidence of both the use of caves and stone enclosures as livestock folds and dung management strategies: Ethnological and archaeological examples

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ABSTRACT

The polish generated by sheep and goats in the walls of caves and stone-made enclosures is a clear indicator about their use as a livestock folds. The study of the polish distribution and intensity, together with the data revealed by the sedimentary context, or even if it is absent, allows to understand the kind of management carried out with the animal dung. In this way it is possible to identify if the dung has been merely dismissed, if it has been periodically extracted for the field manuring, and also if it has been intensively exploited by the completely emptying of the caves.

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1. Introduction: identifying livestock folds

One of the main aspects in the study of stockbreeding economies is the identification of the places used to house livestock. The recognition of folds makes it possible to determine where animal dung has accumulated, to infer whether any kind of dung management practices have been employed by the shepherds, and, indirectly, to identify possible economic implications for activities such as field manuring.

Folds are usually identified based on the presence of dung in sedimentary layers. Consequently, several techniques have been used to establish the existence of dung in archaeological contexts through direct or indirect evidence: soil chemical analyses (Shahack-Gross et al., 2003), micromorphology (Brochier, 1983; Polo et al., 2014), archaeobotany (Delhon et al., 2008; Cabanes et al., 2009), parasite and spherulite identification, stable isotope analysis and DNA analysis (see Shahack-Gross, 2011). Lancelotti and Madella (2012) published a systematic review of the traditional methods used to identify dung in archaeological contexts and developed a multi-proxy-based approach using data from spherulites, phytoliths and chemical analyses.

Much indirect evidence can be collected from a study of the faunal record. An abundance of ovicaprine deciduous teeth indicates the presence of live animals (Brochier et al., 1992; Helmer et al., 2005). In the same way, the presence of perinatal remains can be used as evidence of folding (Martín-Rodríguez et al., in this volume).

To employ this set of identification techniques and approaches it is imperative that the sediments associated with the stockbreeding activities are preserved. When the original structure or composition of the sediments has been modified it is very difficult to reach reliable conclusions, and it is almost impossible when they have disappeared.

In the absence of these sediments, the longest-lasting evidence of fold use is the polish caused by the animals (particularly sheep and goats) on the rocky walls of the folds, whether they are caves, rock-shelters or any kind of stone enclosures (e.g., milking constructions).

2. Rock-wall polish

Animals intentionally scrape themselves against the coarse and angular surfaces of walls to relieve the stinging caused by parasites or filth (Fig. 1). Also, when many animals are confined in a small area they continually rub against the walls and structure in an accidental fashion. This friction progressively wears down the rocky surfaces, smoothing and polishing certain zones. Repeated rubbing against the same areas is apparent from the occurrence of highly polished and shiny surfaces.

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Fig. 1. Goat rubbing itself against a natural wall.

This kind of wall polish allows livestock folds to be identified even when the sediments are not preserved. In the opposite sense, polished surfaces can indicate sediment extraction when they are visible at heights out of the reach of animals considering the present level of the floor.

3. Polish in relation to animal size

The height of the polished surfaces obviously depends on the ground level and the size of the animals being kept. If the ground level remains constant, the polish will develop as a more or less continuous band along the walls.

Fig. 2 summarises the wither height of some autochthonous sheep and goat breeds making up flocks on the Iberian Peninsula and Balearic and Canary Islands (<http://www.magrama.gob.es/en/ganaderia/temas/zootecnia/>), and Sicily (<http://www.agraria.org/>). This data can be used to show the degree of variability in animal size, and the subsequent variability in polish height.

Overall, this data coincides with that proposed by Brochier et al. (1992) for the Sicilian fold-caves: “Sheep and goats will create a very high polish concentrated in a horizontal strip 40–65 cm above the ground; the observed range varies between 30 and 90 cm” (Brochier et al., 1992, pp. 78–79).

4. Polish formation and dung management

For a high polish to develop, two conditions are necessary: firstly, time for the repeated rubbing and, secondly, a stable ground

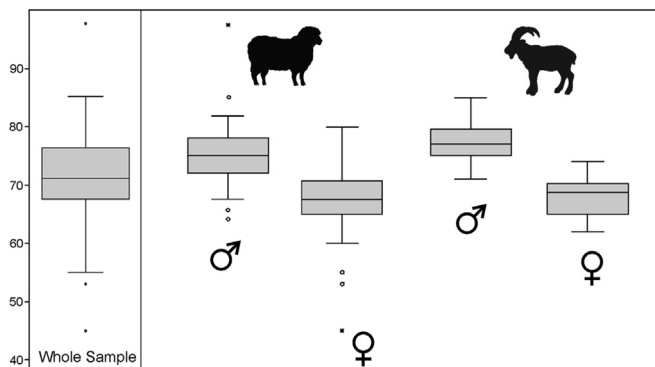


Fig. 2. Boxplot showing the distribution of the wither height for some of the sheep and goats autochthonous breeds of the Iberian Peninsula and Balearic and Canary Islands, and Sicily.

level. The sedimentary rate in a fold is very high due to the rapid dung accumulation caused by the animals. This dung accumulation constantly raises the ground level, and hence progressively displaces the wall surface susceptible to polishing. If the dung is not removed the strongest polishes have no time to develop, and a low-intensity and continuous-height polish would be found on the walls.

Highly polished stripes coinciding with the height of the animals are therefore associated with ground level stabilisation, and probably with dung elimination. Periodic and systematic dung burning is well documented for the Neolithic and Bronze ages (Brochier, 1991, 1993; Brochier et al., 1994; Bergadà, 1997; Boschian and Montagnari-Kokelj, 2000; Carrión et al., 2006; Iaconis and Boschian, 2007; Polo and Fernández, 2008; Angelucci et al., 2009; Polo et al., 2014). This practice significantly reduces the volume of sediment accumulated by the flock and partially stabilises the level of the ground. For burning, the dung is accumulated in piles, generating a very characteristic and easy to recognise lenticular-shaped, multicoloured formation. If these piles are not seen in the archaeological record it is possible to assume that at some time the sediments were removed from the cave, either occasionally or systematically.

5. Sites

In this work we present three different examples of wall polish related to fold use. Two are pens that have been in use since the beginning of the 21st century, one in a cave and the other in a stone structure. The third is an archaeological cave site occupied by farming societies since the 7th millennium cal BP. The information obtained from the three sites allows us to document several dung management activities and their relationship with the location and intensity of wall polishes.

5.1. Corral Roig (Castelló de Farfanya, Lleida, Catalonia)

This enclosure, with an area of about 567 m² (21 × 27 m), of which 108 m² are covered by a roof, is constructed of stone bound with a lime and sand mortar. The stones used are Palaeocene limestone from the Cadí-Alguer Ilerdian formation. It is situated at 418 masl in a contact area between crop fields and a hilly zone with Mediterranean vegetation and an Aleppo pine (*Pinus halepensis*) forest (Fig. 3, right-upper). Their UTM coordinates are: 309.355 E, 4.634.252 N.

This pen is employed seasonally, to keep a sheep flock in during the summer and autumn months. Annually, the dung were completely extracted for use it as manure. At the time of the field survey the pen was abandoned and the dung of the latest occupation was still inside.

The documented polished stripe is clearly demarcated and macroscopically visible at a height of 60–70 cm from ground level. Another more developed polished stripe was observed at a height of 40 cm (Fig. 3, left). It is known that whenever the fold has been in use, the dung has been extracted annually to be used as manure for the adjoining crop fields. In this way, the ground level of the pen is always more or less constant, at least at the beginning of each yearly occupation.

5.2. Riparo da Trabona (Gratteri, Palermo, Italy)

Riparo da Trabona is a small cave located in the Sicilian Mountains of Le Madonie, at 815 masl, 2 km from the littoral crop fields in the northern part of the island. Their UTM coordinates are 412.477 E, 4.203.049 N. The cave, oriented to the SW, is 24 m wide and 10 m high, with maximum depth of 11 m (Fig. 4, right upper).

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