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Agro-pastoralism in upland eastern Spain: the Serra de l'Almirant 1995-96 interim report

I. INTRODUCTION

Easter 1995 marked the second season of ethnographic and archaeological research and survey in the area of the Serra de l'Almirant in eastern coastal Spain (fig.1). The project overall aims to examine patterns of present and past land use and settlement in two distinct and defined upland zones: the first comprises the intermontane valley of La Llacuna set chiefly in the territory of Villalonga; the second comprises the southern mountain plateau and slopes of the Vall de Gallinera. Until relatively recently the two zones had been exploited by both farmers and shepherds, witnessed in a healthy scattering of stone-built farms, corrals, store buildings, cisterns, shelters, enclosures and agricultural terraces. The majority of these buildings are now ruinous –although in some cases abandonment has been fairly recent– with only a few units continuing to function as working farms/corrals. As will be shown, some older terraces in the Vall de Gallinera study zone have been maintained for almond and other cultivation, but these are tended by landowners from the villages of the lower valley itself. In contrast, within the La Llacuna zone, cultivation persists in many of the terraced areas and dolines, with both olive and almond cultivation prominent; here some of the old structures have been revamped or replaced by modern constructions, which are active chiefly at weekends or in the late summer/autumn months. La Llacuna has, however, in the meantime also been 'invaded' by weekend and holiday homes and campers. In these circumstances, and with the progressive laying of tarmac roads within the zones, the old traditional modes of farming, and, in particular, of transhumance, are becoming extremely marginalised. The project thus seeks to obtain as much information as possible about these old practices through interviews with the remaining shepherds and farmers, previous landowners, through map and documentary analysis, through the structural analysis and mapping of extant and ruinous structures and their related field systems, and through field walking of cultivated and other zones in order to gain ceramic indicators of the chronological sequence of land use. Clearly the latter data also provide clues as regards settlement activities previous to the visible archaeological remains and it is hoped that some understanding will thereby be gained of human exploitation of the region through from prehistoric times. Indeed, as noted in the first interim report (Beavitt *et al.* 1995: 239-241), preliminary surface survey has revealed palaeolithic materials, plus traces of Iberian activity. Of vital significance also to the project's aim of mapping the various corrals and related structures is the analysis of the zone's geomorphology, which offers essential information for assessing the human impact on and response to the landscape.

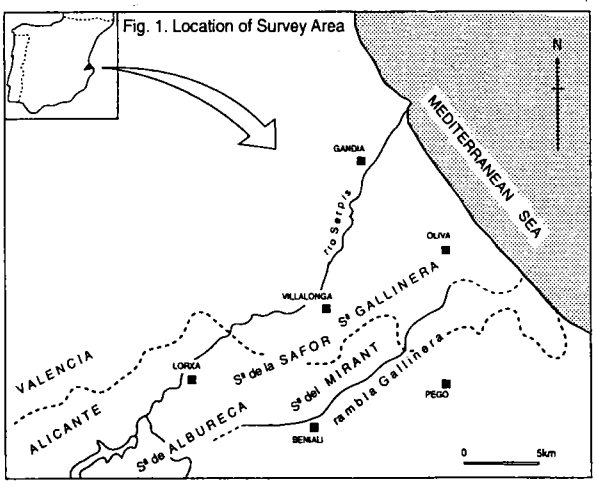

Fig. 1. Location map of Serra de l'Almirant

This report summarises various aspects of the ongoing research in the Serra de l'Almirant: firstly, the geomorphological analysis; secondly, the planning and architectural analysis of selected corrals and structures and their related field systems; thirdly, a study of post-abandonment depositional sequences in corrals and farms in the Famorca zone; and finally the ethnographic survey.

II. GEOMORPHOLOGICAL ANALYSIS *(VG)*

In 1994 a detailed geomorphological study was initiated, designed to increase our understanding of the environment of the Serra, to investigate the surroundings of the various corrals and in particular the methods used to exploit and store surface water. An additional aim was to locate the sources of the differing building materials for the many structures.

(i) Geology

Sited at the boundary of the Valencia and Alicante provinces and integrated within the Beticas mountain range, the Serra de l'Almirant forms part of the foothills of the Prebetico Nororiental. The carbonated materials of the study area (fig.2) belong to the Mesozoic era, specifically from the late Jurassic to the end of the Cretacic period, with a depth of around 663m; Pulido (1979: 94) termed this unit '*Formacion Creu*'. Its stratigraphy is sectioned and only the bottom part of the column outcrops. This aspect occurs throughout the area, indicating that the karst has developed over the base areas with dolomites predominating (Gil Senis 1989: 21). This general structure derived from compression and decompression forces during the Alpine orogeny, with later remodelling in a predominantly wet climate.

The unit of study is an anticline laid down and overlapped in the north and bordered by two inverse faults: one situated in the north (Serpis valley) and the other in the south (Gallinera valley). Of great significance are two normal faults which cross the unit E-W (longitudinally) and which favoured polje genesis. On a smaller scale, a dense net of fractures exist throughout the mountains these had an important bearing on habitat types.

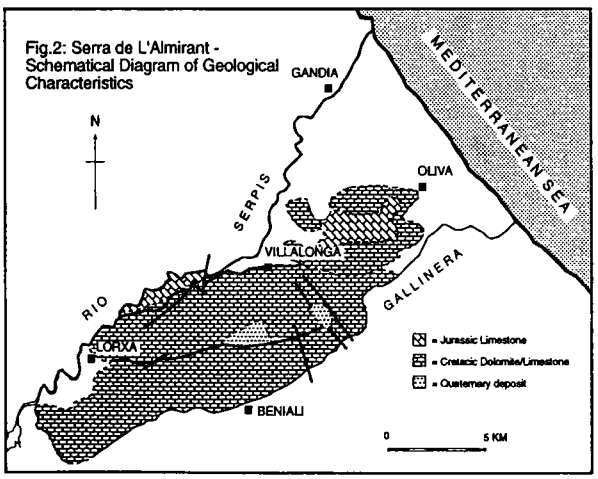

Fig. 2. Serra de l'Almirant: schematical diagram of geological characteristics.

(ii) Climate and Water

This geological character, combined with the Almirant mountain and its environs comprising a distinct orographic unit of NE-SW orientation, has implications when examining climatic actions. For instance, the orientation favours a higher degree of rain because it stops clouds coming from the E-NE; these rains then cause the surface flow and the processes triggered from it. Two kinds of surface water flow can be recognised, namely laminar (diffuse) and turbulent (concentrated), both closely linked to the characteristics and angle of the slope. Independent of trajectory and energy, surface flow could either wash the ground or transport and accumulate material. This flow was undoubtedly assessed at the time of selecting the location for a given farm or corral, either to exploit this surface supply or to avoid its effects.

Furthermore, carbonated rock suffers a process of carbonate dissolution (quimic meteorisation) through rainwater action and this is responsible for the so-called *Karst* rock morphology. The karstic process involves the CO^2 attacking the limestone carbonate (CO^3Ca), causing the carbonate salt to dissolve in the water whilst the insoluble residual material, which is generally clay, remains *in situ* or is taken away by the water flow. The CO^2 can mainly be found dissolved in the rainwater, though CO^2 is also generated by plant roots (the clay itself has a high acid content). As a result of this process, several natural forms occur, with their diversity deriving from the intensity of the process: if the process is intensive and generalised, the result will be a corroded surface; however, if the process is more localised and associated with fractures, it will generate middle-sized forms (dolines); finally, punctuated processes will generate millimetric forms, i.e. dissolution pools (kamenitzas).

Generally the diversity of forms is further related to the human settlement in the study area (Gil Senis 1989: 127). One can also note that the materials used in the construction of the corrals, shelters, wells and cisterns surveyed are of a carbonated nature, and consequently, these structures too will have been affected by the karstic processes (and this has implications regarding modes of roofing).

Accordingly, in attempting to understand the placement and function of the various buildings identified in the study zone, the geomorphological study undertaken sought to clarify the following aspects: 1. the direction of the surface flow and other possible water supplies; 2. structural types and sources of extraction of materials; and 3. the symbiotic structure-environment.

(iii) The Anthropo-Geomorphological Units

The landscape is characterised by a relief of smoothed

and lowered hills, with a few *terra rosa*-filled depressions at the top of ravines. This results from the folding, fractures, lithology and karstic processes which took place. Flat areas also exist, created by the corrosion of the limestone (Gil Senis 1987b: 46). This relief links the main water courses (Serpis and Gallinera) through an intensive network of small ravines (Gil Senis 1987a: 24). The Pla de la Llacuna is a small endorreic valley of tectonic origin which, because of the karstic process, now forms the polje. The area shows traces of early colonisation, with the earliest evidence of human activity of palaeolithic date. Of extant structural remains, of shelters and corrals, the majority are post-medieval, and are spread throughout the Pla de la Llacuna, Plà de Monxo and L'Almirant mountain (Beavitt *et al.* 1995: 232).

In relation to the spatial situation, three anthropo-geomorphical units can be defined: (a) the Lorxa slope; (b) the Vall de Gallinera slope; (c) Pla de la Llacuna:

LORXA SLOPE

Situated in the western area between La Safor and mount Albureca, this faces the village of Lorxa, where the different E-W ravines converge. These ravines form the division of the plain in which lie various surveyed buildings, some of which are considered below.

1. Corral del tio Paco (VG10) (UTM: 7374543059. 596m above sea level)

This lies in a watershed at the head of the Cocons ravine. The landscape here has a very smooth topography, caused by the karstic action which has generated the plain. The corral's well-preserved cistern is situated parallel to the steeper incline slope, with its opening in the eastern flank facing the top of the hill (635m) (Its location is omitted, however, from the 1955 1:25.000 map). The morphometric characteristics of this slope area are 200m in length and 50m wide, making a catchment surface of 7,500m² with a drop of 39m with 19.55% inclination and 11° slope. During rainfall this is the catchment surface, as the water (of diffused flow) will be chanelled towards the cistern. This is achieved by natural water channels or by directing the water by means of small ground barriers or *caballons* (pers. comm. Gallinera mayor).

The limestone rocks used to construct the corral were taken from the surroundings. However, apparent levelling work at the top of a small hill south east of the cistern may signify quarrying for building materials - as occurs at other sites in the vicinity (fig.3). Two possible sources exist for the materials used for the mortar (lime, sand and gravel): Lorxa, where the river Serpis cuts through the village and deposits these materials; or the outcrop situated in the Plà de la Llacuna.

2. Corral de la Serreta de Baix (VG4) (UTM: 7380043023. 643 m above sea level)

Corral VG4 is situated in the drainage basin of one of the small ravines which link the top of the Cocons ravine

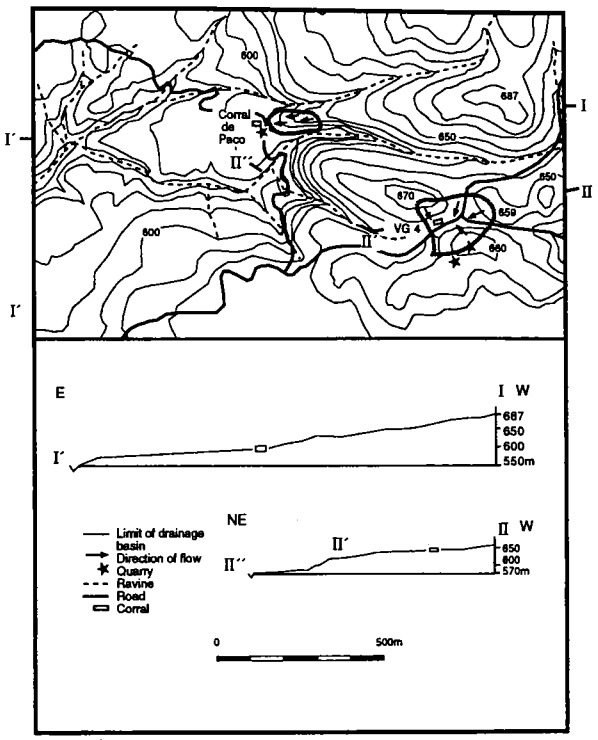

Fig. 3. Corral de Paco (VG10) and Serreta de Baix (VG 4).

Plate 1. General view of Serreta de Baix (VG4) showing corral's location beside road and with areas of terracing to west.

(fig.3; pl.1). Whilst this ravine has a water catchment area of 1.2 km², the area from which the corral draws its water is over 237,500m².

The landscape around the corral shows mainly gently undulating hills. The slope characteristics of the hill on the northern side of the ravine are: 100m length, spot height 670m, 38.5% inclination, 27m drop and 15,1° slope. The hill to the north-east and 150m distant from the corral has a spot height of 659m, 8.4% inclination, 16m drop and 6° slope. That to the south, again 150m from the corral, has a spot height of 660m, 12.1% inclination, 17m drop and 6.4° slope. These characteristics are suitable for a diffuse flow of

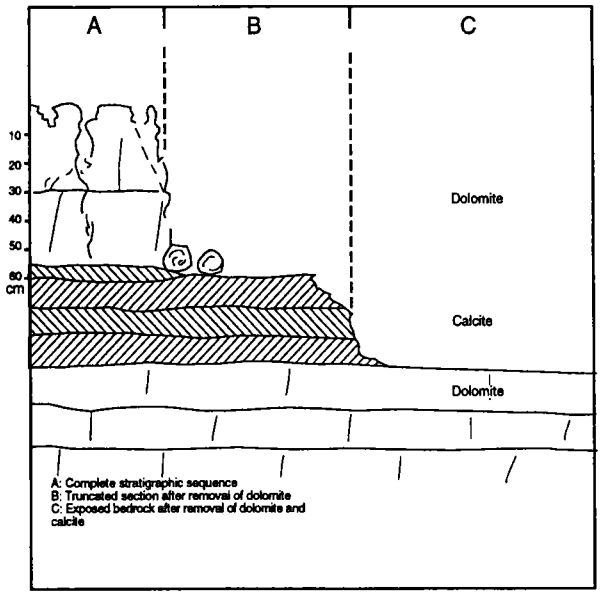

Fig. 4. VG4: schematic stratigraphic cross-section of quarry.

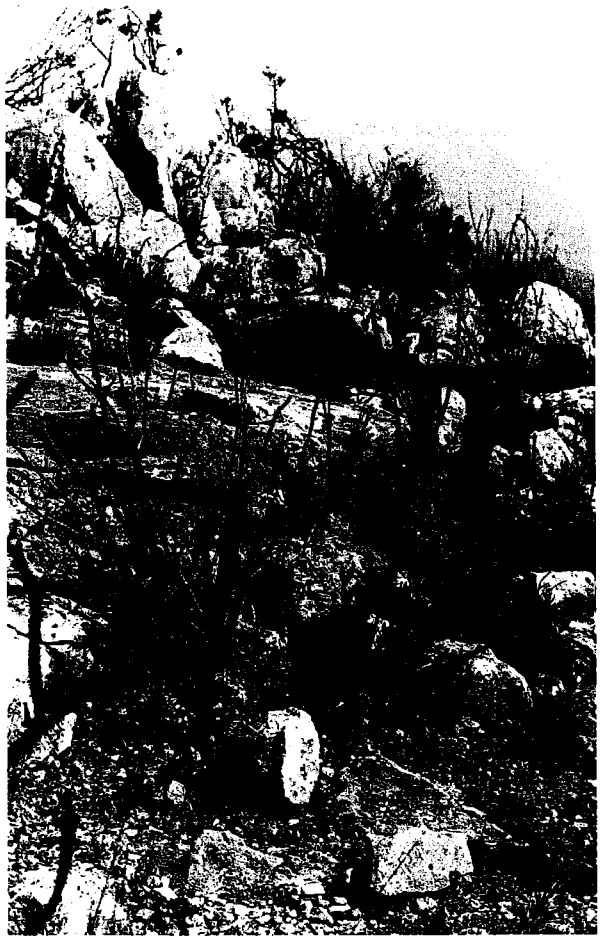

Plate 2. Stone extraction area near VG4.

short volume and speed, although water flows east of the corral will have combined to create a concentrated movement which will then have been channeled along the ravine bed.

The cistern is situated a short distance from the corral in the ravine bed, built just in the drainage line and with the door facing the current; this means that almost all the water flowing at this level of the ravine will be channeled inside. The cistern features an internal step within the entrance as well as a ceiling aperture to allow bucket-drawn water collection.

Corral VG4 was constructed of dolomite blocks. In this regard it was observed that whilst the neighbouring hilltops present a steep topography with dolomite layers offering characteristics typical of the karst process, the 660m hilltop shows clear traces of artificial cutting, creating a flattened morphology. Indeed, roughly 60cm depth of stone had been removed, as confirmed by the existence of morphostructural elements allowing observation of the orignal complete stratigraphy. This comprised a top dolomite stratum of 60cm power, mostly lost; a thin layer of calcite of *c.* 15cm power; and a bottom stratum with an homogenous and flat surface (fig.4; pl.2).

VALL DE GALLINERA SLOPE

Defined by the southern slope of Tossal de Lamp and L'Almirant mountain, there are a succession of peaks and flat areas until the connection with the valley, with the level areas dissected by N-S oriented ravines. The corrals are distributed within these plains, always situated at the edge of the plateau and close to the communication lines with the valley. Corrals VG5 and Casa Blanca, as well as the assemblage VG15, VG16 and VG17, are located on the slope of the Tossal; unit VG1 lies on the south slope of the L'Almirant mountain.

1. Corral VG5 (UTM: 7396543035. 668m above sea level)

VG5 is situated in a plain bounded to the north by the hill known as Tossal de Lamp (720 m), to the east by the top of a ravine and to the south by a small hill 686m in height (fig.5). The drainage basin of the corral is *c.* 56,250m^2. The slope between the corral and the *Tossal* is 315m, with a drop of 52m, 9.4° slope and 16.5% inclination. Here the ravine bed favours the concentration of surface water into a single flux and best usage of this was achieved by building a cistern facing the *Tossal*. The presence of two lateral ravines may indicate a further important water confluence in the area.

The corral was built using dolomite rocks drawn from the surroundings. Whilst the exact origin of these rocks could not be determined, a small abandoned quarry was identified in the ravine, located west of the corral (between the hills of spot height 667 and 684m). This quarry is 3m in length, 8m wide and 1.5m deep. On the hill (684m) southwest of the corral local material has been employed in a dismantled shelter, constructed over a smooth and polished

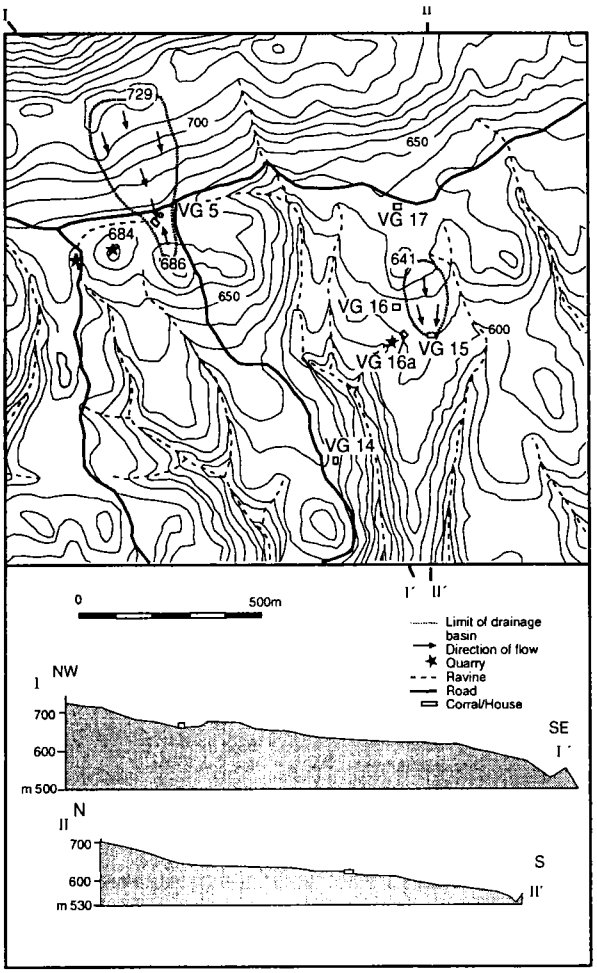

Fig. 5. Tossal de Lamp: drainage basins of corrals VG5, VG17.

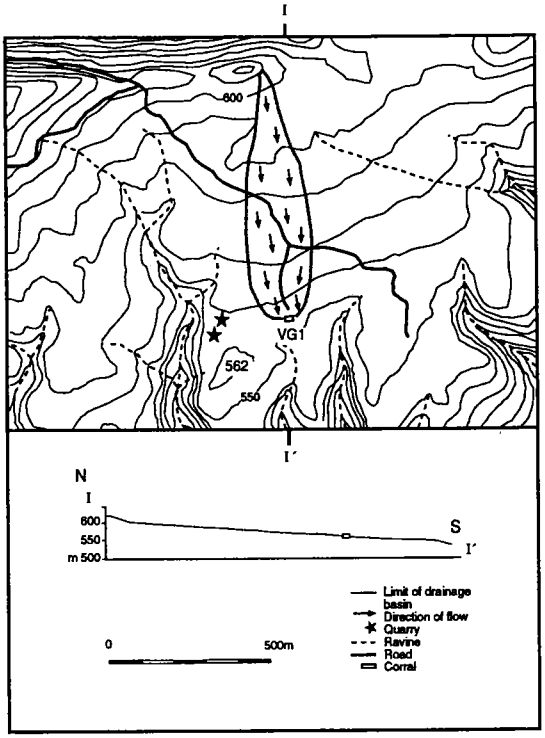

Fig.6. Drainage basin of VG1.

bedrock indicating that the top layers of the hill had been removed to create the structure.

2. *Corrals VG15, VG16, VG17* (UTM: 7404043031. 612m above sea level)

These lie in the watershed on the left slope of the Jeronimo ravine. This is an area of very gentle topography, mostly defined by a smooth and prolonged slope (fig.5). The drainage basin covers 16,250m², with morphometric characteristics of 200m length slope, 20m drop, 5.7° slope, and 10% inclination. These conditions define a laminar surface water flow of slow speed.

Only VG17 has a cistern. This has a north-facing aperture, in which is a flagstone which prevents the inward-flow of all the water and associated debris such as pebbles, wood, etc.; water will enter only through its small hole set 5cm above the ground. Furthermore, the water is directed towards the cistern by means of an artificial stone-lined channel.

Of building material sources, only in the area of VG15 were the remains of a possible quarry identified. This corral lies at the top of a small ravine, and the gully's slopes appear stepped through the extraction of the limestone.

3. *Corral VG1* (UTM: 7424043034. 558 m above sea level)

Located on the south slope of the L'Almirant mountain, VG1 lies in a very smooth terrain, with the drainage basin covering 88,750m² and with morphometric characteristics of 700m length, 13.1% inclination and 7.4° slope. These will generate a laminar surface water flow, full exploitation of which is reflected in the presence of two cisterns on either side of the building (fig.6).

The construction materials probably derived from a source west of VG1, since at 200m distance (UTM: 742243034) a smooth, polished bedrock suggests extraction activity.

PLÀ DE LA LLACUNA

This is a small closed valley roughly 3km in length and 1.5km wide of E-W orientation. It has a structural origin, associated with tectonic movements and karst processes and forms a *polje* where the surface waters leak in the valley through several channels. The hydrology of the area strongly conditions the distribution of settlement, according to the polje's hydrological and hydrogeological behaviour. It may be possible that in periods of heavy rainfall the water supply was higher than the polje floor pothole and sink's absorption and infiltration capacity, leading to flooding in some parts of the basin.

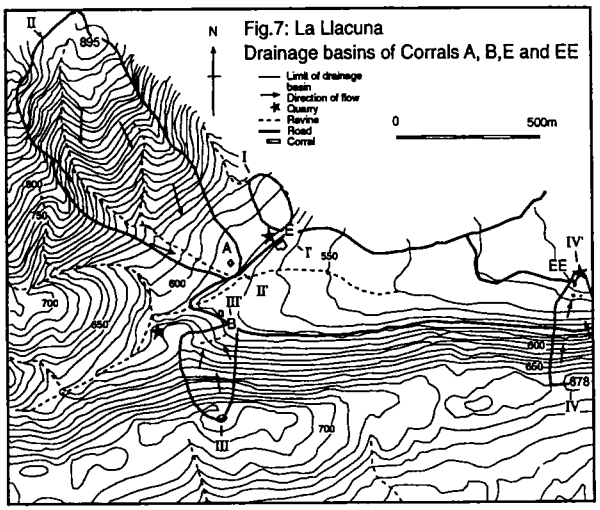

Fig. 7. La Llacuna: drainage basins of Corrals A, B, E and EE.

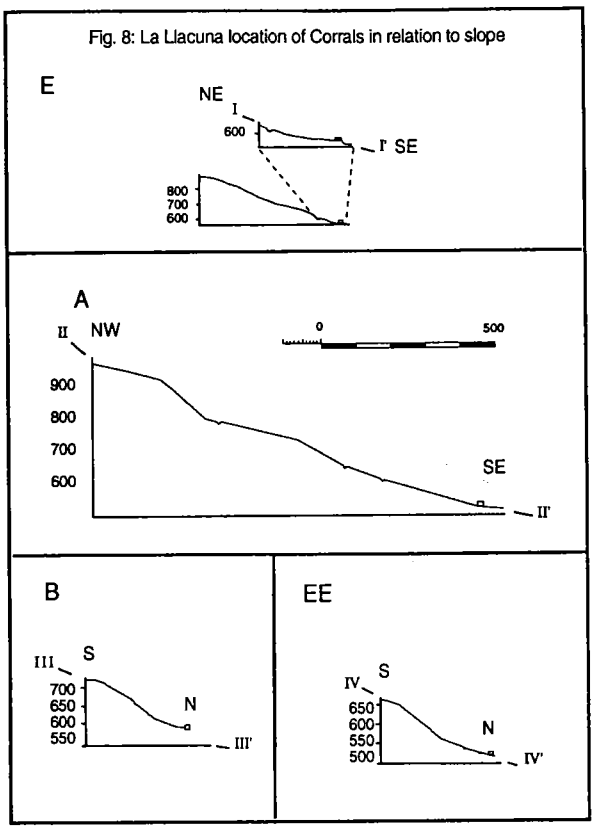

Fig. 8. La Llacuna: location of corrals in relation to slope characteristics.

1. Corral de Manolo (LL E) (UTM: 7400843042. 575m above sea level)

This corral lies alongside the road in the area where the Vidre ravine emerges at the bottom of the hillside. It features a relatively smooth topography due to the accumulation both of materials derived from the hillside and of materials deposited by the water overflow from the ravine. The catchment area for the cistern is *c.* 20,000m²; the slope morphometric characteristics area are 180m length, 25m drop, 7.9° slope and 13.8% inclination. Water flow will be as a thin layer when running over smooth rock surface and as rills or channels when running over/around vegetation or rocks which make the flow more concentrated. The surface flow will, however, always be slow. The cistern features on its northern side a form of platform acting as a receptacle for the water arriving through the channels: water accumulated in this way will become a low energy surface flow facilitating its passage into the cistern (fig.7).

Due to recent deforestation it was not possible to determine the provenance of the building materials, although there were traces of a quarry beside the road and between the corral and cistern. The sand and gravel for the mortar could have come from La Llacuna.

2. Corral de Palop (LL A) (UTM: 7300943042. 575 m above sea level)

Located at the bottom of the Vidre ravine, close to the road, the area comprises a foothill of gentle topography and with morphometric characteristics of 300m length, 74m drop, 13.8° slope and 24.6% inclination. There is no cistern but the proximity of the river bed along with the existence of small artificial walls could signify the presence of a very small water reservoir during the rainy season. The ravine water catchment area is *c.* 310,000m². No related quarries were located (fig.8).

3. Corral del Blanco (LL B) (UTM: 7300943041. 580m above sea level)

This corral lies on the southern edge of La Llacuna at the bottom slope of the Tossal de Lamp. This area forms the exit from the Safor ravine to the Plà. The topography of the environment is relatively complex, consisting of three main elements: El Tossal (727m), ravine (580m) and Plà (580m). The cistern is set at the bottom of a small ravine. Its water catchment area for the corral is *c.* 44,000m², with the morphometric characteristics of 256m length, 143m drop, 56% inclination, and 29° slope. In this case the surface flow runs in rills or channels (figs. 7, 8).

No possible quarries were located. The terrace walls around the corral were built using river boulders.

4. Corral del tio Joaquim (LL EE) (UTM: 741018430428. 520m above sea level)

The corral is located in the southern part of La Llacuna, within a topography which combines the steepest slope of L'Almirant (spot height 678m) with the valley plain (520m). The related drainage basin is *c.* 42,500m₂, with morphometric characteristics of 375m length, 158m drop, 22.8° slope, and 42.13% inclination. The high slope was also exploited for easy water catchment and for snow for the ice house (see below). Although the cistern is ruinous,

its opening most probably faced the slope; modern pipes in fact now gather this slope water for the irrigation of the surrounding fields (figs. 7, 8). The presence of an ice house signifies construction in a colder and wetter climate, in which period the collection of water within La Llacuna in general would have been straightforward. It should be noted that, due to its topography, the northern slope of L'Almirant would probably have been the easiest side from which to collect water.

The building materials used in the corral and ice house are carbonated, comprising limestone and dolomite rocks and calcite minerals; the morphology of the blocks clarifies their origin: some of them are pebbles and boulders, some are angular blocks and some are minerals. The boulders come from the old Safor ravine bed, now silted over and buried in the area close to the building but exposed in one of the profiles of the nearby clay quarry. The angular blocks were probably extracted near the corral, where an artificial terrace can be recognised in the slope. The calcite mineral blocks are the remains of an original stratigraphy now dismantled. Some of these calcite blocks were employed for the door arches and in surrounding terrace walls. The immediate environs will also have provided the lime, sand and gravel for the mortar, since a sand and marl/loam outcrop occurs in the hillside near the lake; the gravel probably derived from the ravine and lime from the lithology of the area itself.

(iv) Structures and Environment

The close analysis of the corrals' landscape characteristics offers the means by which we can reconstruct both how surface water flow was intensively used as a natural resource for supplying the cisterns, and how a close relationship existed between slope water flow and the spatial distribution of the structures. Through this analysis, three different assemblages can be defined:

1. A smooth, prolonged slope (from 5.7° to 11°) will lead to a thin laminar surface water flow with low energy; in these instances the corral lies at the end of the hillside (e.g. Corral de Paco, VG5, VG15, VG16, VG17, VG1, Corral de Manolo - LL E).
2. A short, steep slope (from 22.8° to 29°) will create a surface water flow with higher speed and energy concentrated in channels; the corrals will in this case be situated at the end of the drainage basins (e.g. Corral del Blanco - LL B, Corral de Tio Joaquim - LL EE).
3. A concentrated flow (a flow normally with an important water volume running through the ravine); structures will accordingly be located near or even in the ravine bed (e.g. VG4, Corral de Palop - LL A).

Finally, in terms of the exploitation of the resource of building stone, the natural limestone's geological characteristics facilitated the stone extraction process. Three basic types of extraction process were recognised:

1. Sites at which the strata have been quarried (e.g. VG16, Corral del Tio Joaquim - LL EE).
2. Corrals at which a step needed to be created in order to obtain stone from the stratum near the surface (e.g. Corral de Paco, VG4, VG5, VG1, Corral de Manolo).
3. Simple collection of stones from the ravine beds: these stones tend to be rounded through water action, and do not display of marks of cutting/ extraction such as are evident in the first two types described.

Whilst these observations have greatly enhanced our understanding of the locational strategy of the corrals and their understanding and thus union with the natural landscape around, it is important to stress that more geomorphological study is required to identify the changing nature of this exploitation and symbiosis, most notably in terms of the levels of human and economic activity within the immediate zone which will have directly affected the utilisation and maintenance of many of these corrals). These considerations will have important implications for understanding the sequence and character of usage (e.g. whether permanent or seasonal, whether agricultural or pastoral).

III. STRUCTURAL SURVEY *(NC, PB)*

Alongside the analyses discussed above, further mapping was made of the visible archaeology in the form of farmhouses, corrals, shepherds' shelters, cisterns, and terraces. Many of these ruinous structures, particularly in the Vall de Gallinera zone, are not recorded on available maps and their full plotting in terms of location, height and format is clearly a priority for understanding the full mode of exploitation on the Serra. For each structure a proforma recording sheet was completed and a photographic and sketch record also made. A further stage will be detailed mapping by GIS (Geographical Information Systems), allowing for the overall relationship between structures, topography, communications and water flow to be assessed (cf. fig.9). In total an estimate of *c.* 50 sites can be located in the southern zone, compared with *c.* 30 for La Llacuna, although in terms of dimensions, the former structures are much more variable, with sites in La Llacuna tending to be consistently larger or more complex.

As described above, the initial geomorphological study of La Llacuna would indicate that water flow, i.e. the movement of rain down the slopes and ravines of the zone and the possible periodic collection of water in the basin after the winter period, has notably influenced the distribution of structures, with the southern sectors of the plain revealing clear deep sand and silt deposits. Certainly there is a distinct reduction in the number of structures in the southern portion of the La Llacuna in comparison with the areas around and north of the main track; only in very recent times can colonisation be noted in this southern portion.

To enhance the mapped information, the 1995 season commenced the detailed recording, through structural sur-

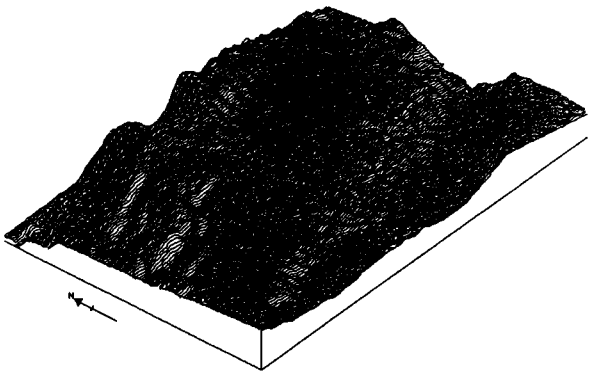

Fig. 9. GIS plot of corrals and other structures in the Vall de Gallinera in relation to topographic context.

vey, elevation drawing, terrace mapping and field walking, of a series of selected individual structures. A cross-section of structural types has been chosen in order to provide a balanced image of the range of structures employed. As stated in the first interim, it is hoped that small scale excavation will occur on some of these sites to provide a clearer chronological guide to their occupation/usage. This detailed analysis should thereby allow us to gain a clearer understanding of construction techniques, location strategy (in terms of water resources, soil availability, communications, etc.), and land use in the study area. Briefly, in most cases the corrals examined exhibit at least two main phases of use/ownership, which may in part reflect changes in local land control and economies; in nearly all cases extensive networks of terracing can be identified, skillfully exploiting the rather minimal seasonal water flow from slopes and down ravines. Relict traces of olive, cherry and cereal cultivation survive, and in some instances farmers from lowland villages still maintain some fields under cultivation. Surface pottery confirms that the key occupational activity relating to these farms and corrals belongs to the seventeenth-twentieht centuries, although there are some hints of a medieval or late medieval presence at certain sites.

Below summaries are offered of the detailed analyses of three selected buildings and their associated agricultural units examined in 1995 in the Vall de Gallinera zone.

(i) VG4

One of the best preserved and studied, the Corral de la Serreta de Baix (VG4) (see Section II above), lies a few metres north of the track/road leading towards Lorxa. The complex overall consists of an abandoned building of dimensions *c.* 12.20 x 21.10m, oriented W-E, with walled enclosure on the south side, an external vaulted subterranean cistern and trough close to the south-west flank of the corral, a threshing floor, plus an extensive network of terraces exploiting the site's wide catchment area, extending down towards and even into the course of the ravine to the north, and with still cultivated terraces to the south-west and west; the northern terraces utilised as their eastern flank a natural line of fractured rockface, clearly a relic of ancient land movement. The ruinous roof to a second cistern (VG4a) lay on these terraced slopes, midway down to the ravine. Smaller, level, cultivation of almond trees lies immediately to the south of the corral, and to its east (figs.3, 10; pl.1).

Detailed elevation drawings and photographic coverage of the corral walls were executed, combined with mortar analysis (by Nigel Jeffries). These studies highlighted a series of phases to the structure of VG4, although it is not easy to discern the time span separating these. The first phase will have comprised a rectangular building, with byre and store over on the western flank, fronting onto the large enclosure; the northern flank was occupied by the residential block with two doors, although animal access into the enclosure must have been through the eastern of the two doors, which communicates directly with a door on the northern side of the enclosure. Mortar analysis and wall construction joints show that the northern block was constructed as the first unit of this phase one plan. Subsequently the northern unit was subdivided as was the enclosure (with no communicating door), probably indicating two separate owners or at least a significant change in function (indeed local informants argued against the corral having two owners). Mortar was generally of a hard sand fabric with carbonite inclusions; later repairs were effected with mortar featuring tile fragments. There were also evident signs of partial and recent reuse of VG4 as a shelter (as indicated by the presence of modern tile); the continued use of certain of the terraces clearly also suggests the corral has seen occasional post-abandonment usage.

(ii) VG1

At VG1 the presence of three cisterns in the immediate vicinity of the corral (at 25m to the east, 31.5m to the north-

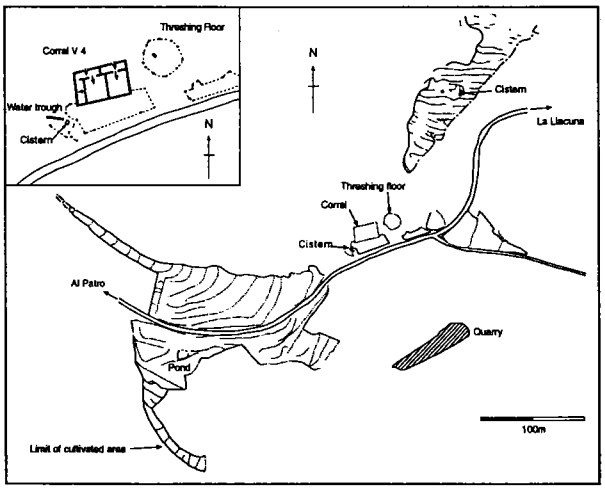

Fig. 10. Plan of corral of Serreta de Baix (VG4) with related features and terrace systems.

Plate 3. VG1 viewed from south-east; note modern breeze-blocks in foreground

Plate 4. VG5: elevation drawing of south facade.

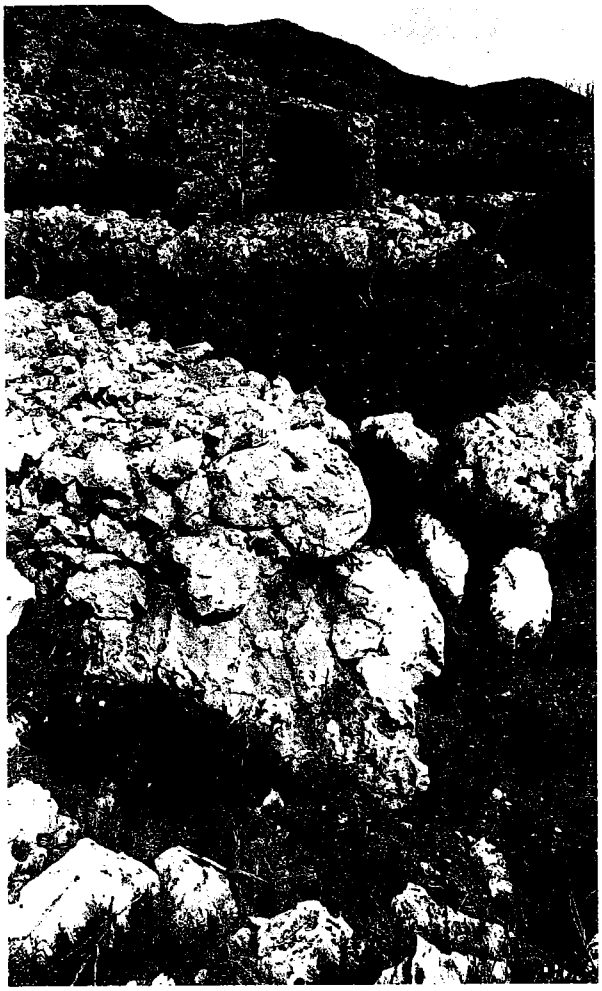

Plate 5. VG13 shelter with surrounding terraces.

Plate 6. Evidence in Famorca Corral of roof collapse and internal build-up of debris.

west and *c.* 60m to the north) suggest more extensive agricultural and animal concerns. This is fully reflected in the sizeable network of terraces and fields, notably to south, with the southern fields still actively cultivated for almonds.

Former, abandoned field traces lay to the north of the building. The area, though with bedrock outcrops, is largely level, sloping away gradually to the south (see Section II above).

The corral itself is now ruinous, although the walls survive for the most part to the roof line (pl.3). In all, three structural phases could be discerned: originally, VG1 consisted of a two-roomed edifice of *c.* 7.10 x 4.75m with pitched roof; subsequently there was an eastern extension of 5.75 x 3.85m with roof sloping southwards; later (recent) brick blocking of the internal door of the original building occurred along with the creation of a brick partition in the extension. However, as no clear built animal enclosure is visible, it seems probable that this site was primarily agricultural in scope and that the house combined residential and storage roles (though without excluding small stock activity).

(iii) VG5

VG5 comprises a small single phase structure, of *c.* 8.40

x 3.95m, built on level ground (pl.4). It is still roofed, but no longer acts as either a residence, farmhouse or store; instead debris (rubbish, firewood) within the building indicates occasional recent usage by shepherds. Internal built features consist of traces of a raised partition in the western part of the house, and of a chimney central against the north wall, immediately opposite the doorway; in the north-east corner is a likely cupboard foundation. Set close to main road, and with a deep rock-cut cistern with built dome *c.* 20m distant, VG5 offers only limited terracing in its vicinity, to both west and south. The terraced area was still under almond cultivation. Clearly here the building was never designed to serve or accommodate animals and its only partially ruined roof might indicate that this is a relatively recent farmhouse for an agriculturalist/farmer who now merely maintains the terraces. Nonetheless, much older terraces, now badly overgrown and disturbed, extend from the road up the hill and to near the summit ridge of Tossal de Lamp, which divides La Gallinera from La Llacuna; these terraces radiate out from the small (store?) and seemingly much older building VG13 (710m) of just *c.* 3.6 x 3.1m (pl.5). The terraces reveal signs also of almond cultivation and the complex perhaps relates to upper slope farming on the part of the former owner of VG5. VG13 has recently been 'decommissioned' in that tiles from its roof were neatly stacked on the west flank of the building (although now slowly becoming obscured by shrub growth).

IV. POST-ABANDONMENT CORRAL SEQUENCES *(JS, OC)*

In conjunction with the Serra de l'Almirant survey work, a related ethnoarchaeological study was undertaken at Easter 1996 of 'abandoned' pastoral sites in the Famorca region, located in the Alcoi mountains in the north of the Alicante province. The aims were two-fold: firstly, to assess the value of studying present-day pastoral abandonment processes as a comparison with site abandonment and formation processes in the archaeological record, and secondly to gain an ethnographic understanding of seasonal environmental exploitation by shepherds in an area still employing traditional practices. Such studies have been pioneered in southern American and Pacific contexts, but are so far largely lacking for the Mediterranean, although a growing corpus of ethnoarchaeological research in Greece (Chang 1992), Italy (Barker & Grant 1991) and now Spain (Beavitt *et al.* 1995; Seguí 1995) provides a valuable starting-point.

The study embodied a multi-stage approach, commencing with the structural recording of all known pastoral sites in the Famorca area and the detailed scrutiny of artifact distributions and compositions in and around each site; a second phase saw EDM planning of a selected 'typical' site, combined with grid-walked artefact collection; the third stage consisted of a structured programme of interviews with members of the local pastoral community, supplying information against which to compare 'archaeological interpretations' of the abandoned sites (for full analysis see Creighton & Seguí, forthcoming).

(i) Landscape and Economy

The southern limits of the Famorca territory are defined by the Serrella mountains, whilst the Alfaro mountains define the northern extent. A number of geological folds oriented SW-NE traverse the study area which is bisected by the W-E running Castell de Castells *rambla* (dry river bed); the landscape is characterised by a profusion of small terraces adapted to the folded topography. The climate is classically Mediterranean, with a summer drought, even winter temperatures and a maximum of precipitation in the autumn.

In socio-economic terms a high rate of rural emigration has ensured fairly recent massive population decline; at present approximately 50 people only live in the village of Famorca, with the summer season heralding a short-term population increase. Agriculture has long been mainly concentrated upon almond and olive oil production, with a gradual abandonment of the least viable terraces. Mechanisation and fertilisers have greatly facilitated increased production, but the unpredictability of the harvest and of the market structure in general has led young people to leave the village in search of more secure employment in the cities. Pastoral activity has consequently declined markedly, especially in terms of those practices managing only a limited number of animals. Indeed, presently there is only one (elderly) participant managing a small flock (of *c.*30 animals).

These dramatic changes have all had an impact on the old structures of pastoralism, the corrals, most of which are now ruinous. The elderly shepherd utilises two corrals on a seasonal basis, but with episodic supplementary usage of additional corrals. During Easter, however, a migrant shepherd with a large flock (over 200 sheep), now comes to the area from some 500km distance in a quest for economically viable pastures; his presence, albeit brief, is nonetheless witnessed in some of the corrals studied. A greater emphasis on olive and almond cultivation meanwhile, combined with mechanisation, has removed the role of many corrals, which were in any case often located so as to avoid areas of cultivation; some corrals have been used by agriculturalists to store some implements, or otherwise as shelters, and for herding activities. Ruinous corrals also now function as cover and shelter for hunters. Hunting retains an important role, for both food and sport. As a normally transient activity, the signals left by hunters fifty years ago were certainly less obvious than today, with the need to re-use cartridges previously ensuring systematic recollection after-use, whereas discarded empty cartridges and cartridge boxes abound at present within and around corrals.

As noted, a key aim of the study was to understand the varied modes of post-abandonment activity at the corrals. These can be summarised as follows:

- Some corrals were abandoned, leaving them entirely unused and, through neglect, ruinous.

- Some abandoned corrals were used, almost immediately after their disuse as herding sites, or as a source for building materials. Tiles and, in some cases, beams, were taken from corral roofs, and re-used in the village; in certain corrals these materials are piled up awaiting collection (Re-use Type 1).
- Some corrals have been partially re-used as storage areas, normally for items of low value that owners would not keep in their houses in the village (Re-use Type 2).
- Some corrals have been converted into garages (Re-use Type 3).

(ii) Tiles and Artefacts

For each pastoral structure recorded, the volume of tile was recorded, respectively in (i) the 'interior' or (previously) roofed area of the site, (ii) the 'enclosure' area of the site (non-roofed areas of the sites bounded by walls), and (iii) the 'environs' of the site (encompassing an area within 20m of the edge of the structures). The collected materials could be further divided into (a) whole tiles, stacked or in storage, (b) whole tiles not stacked, (c) part tiles (the long axis being greater than 20cm), and (d) tile fragments (the long axis being less than 20cm). In addition the number of tiles in these various states still *in situ* on the roof was estimated, as was the original total number of tiles.

Other artefacts were collected in each of the three types of reused corrals and in each of the three differentiated zones within these corrals. The artefacts could be divided into the following categories:

- *'Work' items*, subdivided into items used by shepherds, hunters and agriculturalists. Artefacts classified into these groups were either of industrial or hand-made origin, but originating in one of these areas of activity. Thus, for instance, a hoe was counted as an agricultural item, and a cartridge as a hunting item. In the shepherd's case, items used as fodder, such as olive tree branches or sacks of almonds skin, were also counted.
- *Building materials*. This refers to any building material apart from tiles found on or near the site, comprising pieces of wall, or timbers spread on the floor. This was a difficult item to assess, because in some of the corrals the level of destruction is extremely high.
- *'Other'*, refering to any other item found on the site not related to any of the activities areas cited above - for instance, a cigarette packet or tuna tin.

It has been contended that the study of abandonment behaviour should focus less on the process *per se*, but more on the aspects of that behaviour relating to the composition of the material remains and their spatial patterning (Tomka & Stevenson 1993: 193). In this sense, the process of corral abandonment in the Famorca area is intimately related to the survival of the nucleated village as a settlement in the present landscape. The continuation of settlement at Famorca has played a role in the reception of materials from abandoned corrals, in addition to, conversely, being the source of a proportion of items found in the corrals. Notably, distance appears not to be a significant determinant of the assemblage of materials originating from corrals; thus tiles from corrals a considerable distance from the village were used in its rebuilding. Certainly the presence of pack animals is an important factor, as they could readily reach corrals when good tracks or roads were not available. On the other hand, distance from the village appears to be an influential determinant of the selection of artefacts which emanated from the village found in corrals. Additionally, distance is an important factor influencing the selection of corrals used as stores, or as places to leave unwanted items (although not 'unwanted' enough to be thrown away). Corrals situated near the village dump are correspondingly influenced in terms of their artefact assemblage characteristics, with items either bought intentionally to the corrals by shepherds, or transported by other factors, such as the wind or other people.

(iii) Discussion

The 'abandonment' of corrals in the Famorca region emerges as a complex process. A continuum exists between the complete abandonment of a site in a single phase and the continuation of activity at corrals still in use. Between these two extremes come various modes of activity such as occasional or seasonal re-use of a site for pastoral functions. These processes of semi-abandonment activity are manifested in a number of ways. Although post-abandoment patterns of activity vary, a number of trends emerge: functionally, corrals can become places for the storage of a wide range of items; spatially, the structure of a corral can be altered in line with different modes of activity, often in the contraction of the roofed area; temporally, activity can become concentrated into a small number of days per year when the corral is used. Clearly, in order to understand these processes fully, or more coherently, the abandonment of an individual site must be related to the abandonment/partial abandonment/survival of other sites as well as to any nearby extant settlement(s).

V. ETHNOGRAPHIC SURVEY *(JS, PB)*

The ethnographic fieldwork on the Serra de l'Almirant zone presented here has been carried out primarily by Joan Seguí with help from Ferran Naya. A body of ethnographic data was recorded over five weeks in the Easter and summer of 1994 and over another five weeks in the Easter and summer of 1995. The survey was undertaken by means of interviews with those shepherds still living in the valley, most of whom no longer keep sheep; however, a few continuing active shepherds were also interviewed. The principal aims of the interviews were to define the profiles of the economics of pastoralism through examining the different

types of productive process, the structure of the flocks, the times of mortality and slaughtering, and the forms of land use, and also to obtain information on the material culture utilised by shepherds.

Archaeologically the main goal of the survey was to contribute to the archaeology of pastoralism by examining a particular area in which very little information has previously been gathered. The use of ethnoarchaeological methods has already been exploited to enhance understanding of the physical remains of shepherding activity (Barker & Grant, 1991; Chang 1984, 1992; Chang & Koster 1986). Our research concentrated on three main points: the recording of traditional management strategies from which mortality profiles could be constructed, the analysis of aspects of landuse by the shepherds, and the character of transhumance within the study area. Much current archaeological study concentrates on long-distance transhumance, and yet good evidence exists across the Mediterranean context for different activities in which flock movements are much smaller, utilising the high ground for summer pastures and local areas of lowland shelter during the winter months. Given the lack of any substantial studies of the eastern coast of Spain, it is difficult to know which of the Mediterranean strategies is appropriate for this region.

The details presented below form a summary of the extensive studies by Seguí (1995). In all, 14 shepherds, of an average age of 65, were interviewed. Most of these shepherds are no longer active but provided descriptions of their earlier life. The immediate impression was of fewer shepherds actively working within the region but those who did work tended to have larger flocks than were reported in the past. Hence the 1994 survey work (Beavitt *et al.* 1995: 234-237) had identified two main shepherds with flocks of 170 and 300 animals respectively, whereas newly-collated evidence suggests that previously flocks of between 70 and 100 sheep and even as few as 20-30 animals were common, with some 50-60 flocks in the Gallinera valley alone half a century ago. The main reasons for changes in modern flock size are the great reduction in competition over the pastures with just four flocks now operating in the area, the easy availability of animal feed for the winter months which can nowadays be brought in by lorry, and the abandoned state of the former upland agricultural areas, now given over to pasture.

(i) Management Strategy

Meat has long been the primary objective for animal flock management. Animals are currently killed at three months old, with a weight of 20-25 kg; in the past, 40-50 kg at six months old was more typical. Lambs would often have had their first shearing in September with a view to the Christmas market, and then would have been slaughtered locally - though this is now an illegal practice. Formerly wool had a good market, being used in mattresses and spun for making clothing, but this market is now non-existent.

Two factors affect the value of meat: weight and quality as determined by cultural preference. These two are in conflict given the preference for young animals. In the past, larger quantities of meat per animal could be obtained by castration, whereas the present market demands young animals of lesser weight and the price premium is such as to make it uneconomical to keep many young animals for more than a few months. Present-day flock management decisions frequently concern the relationship between flock size and winter fodder costs or the selection of different breeds for different economic purposes. An important implication of this is that it enables us, in conjunction with other forms of evidence, for example data from the Roman agronomists, to look for ways in which market demands or cultural preferences may have structured the archaeological record in relation to flock management decisions.

Although there are still two small flocks in the study area, goats no longer perform a prominent role: goats are certainly much better adapted to rough terrain, and it seems consistent that this was the main kind of livestock once managed in the steep topography of L'Almirant and Forada mountains. The dominant breed sixty years ago was the *Cabra Valenciana* and its decline is probably largely explained by the process of reforestation which began in this area during the 1940s. The size of *cabra valenciana* flocks comprised around 100 animals, although some smaller flocks existed. Evidence collected in 1994 suggests that one male is required for 12 or so females; the kids are usually born in the autumn and thus avoid the harsh weather conditions of the summer period. Since goat meat rapidly becomes tough the kids are killed at four to six weeks old. There is a strong local preference for milk kids (*xoto de llet*); in the past, as with sheep, animals were kept to five to six months old and sold at 20-30 kg. The preferred breed for milking is the *murciana* and four of the 15 shepherds interviewed had at some time kept *murciana* goats. This notion of variation in animals echoes a comment recorded in 1994 survey by one particular shepherd who indicated that he would, on occasion, sell all of his animals and buy a completely new flock and sometimes even change between sheep and goat husbandry.

(ii) Archaeological Implications: Mortality Profiles

The use of mortality profiles from ethnographic information is not novel (see Grant for the Cicolano in Barker & Grant 1991). Such profiles do not aim to explain wholesale archaeological data but rather seek to give to the archaeozoologist some idea of the form of the bone assemblage created through certain flock management systems. Accordingly, currently, mortality profiles from ethnographic data merely provide a source of hypothetical cross-referencing for testing on excavated bone assemblages.

Two flocks were used for our calculation of mortality profiles: one a flock of 170 sheep which are still grazed in the Vall de Gallinera region and the other a flock of 100 goats (*cabra valenciana*) which were managed 50 years ago. The profile calculated for the present sheep flock (fig.11) was for a one year period (1994) and included the

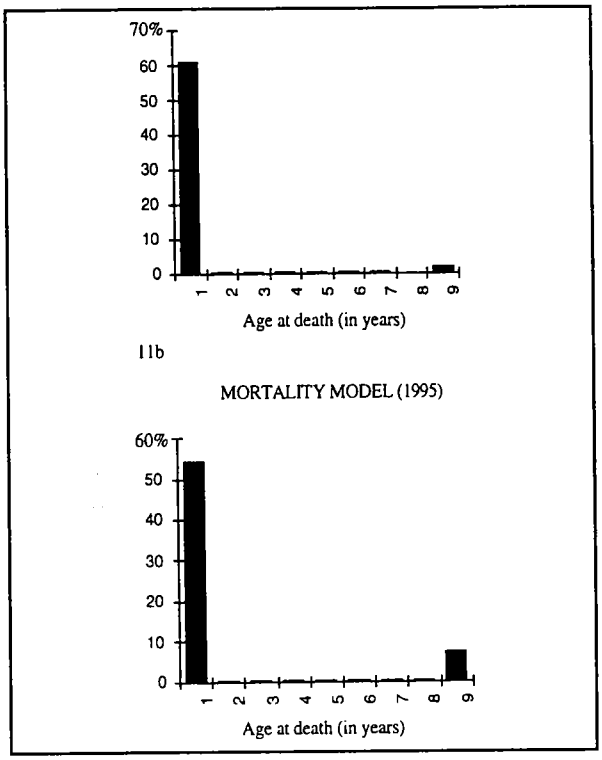

Fig. 11. Mortality profile for flock of 170 sheep in Vall de Gallinera (Seguí 1995: fig.11).

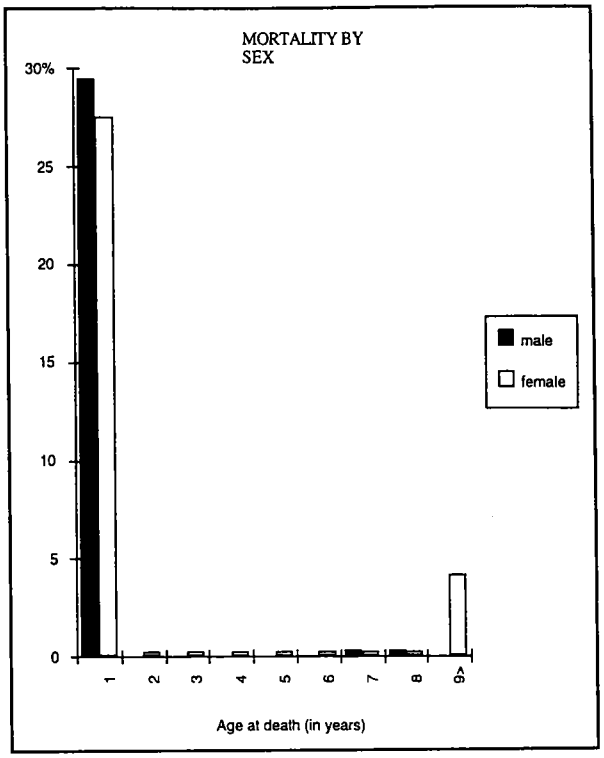

Fig. 12. Mortality by sex diagram for flock of 170 sheep for 1994-95 (Seguí 1995: fig.12)

slaughter of the lambs born within that time period - the size of the flock rises to some 470 animals during a full year. Fertility is calculated at 1.7 lambs per ewe and 88.2% of females were lambing; good present-day availability of fodder frequently allows two lambings per year. Only 18 female lambs were kept, the rest being slaughtered at three to four months. The numbers kept vary quite considerably from year to year depending upon local circumstances, which include flock replacement from culling or mortality from disease, and accidental death from such factors as grazing on land contaminated by pesticides, and animal and insect bites. Mortality for the latter is surprisingly high and can be assumed to have been higher in the past (cf. Ambrosi & Beavitt, in Lloyd *et al.* 1997: 36-39, for data gathered from central-southern Italy). Figure 12 indicates mortality by sex for the years 1994 and 1995. As would be expected from the above discussion, fewer females than males are slaughtered in the first year because of the requirements to replace animals who are too old to reproduce. It can be noted also from the profile that rams are replaced at seven and eight years old, whereas a significant number of ewes will be kept for nine or more years (up to 12 years was suggested by informants).

Figure 13 indicates the mortality profile of the goat flock, whose number rises from 100 to *c.* 200 over the year. Of the kids, 44.2% are killed in the first year of life (compare *c.* 58% for sheep): this low figure reflects the fact that in the past reproduction only took place once per year (fertility rate 0.9 kids per female per year). It can also be noted that goats are culled at a younger age than sheep.

As Grant has already stated (Barker & Grant 1991: 13-19), towns are essential elements within the make up and thus consumption of the products of this mangement system. Even in a traditional and underdeveloped marked economy, a sizeable part of the flock will have been slaughtered and ultimately consumed in the urban context, whereas just a small proportion took place in the valley; very few animals indeed were consumed up in the mountains. Although not of a high number, those animals which died from disease or from animal bites were not eaten, but rather were dumped in ravines or in natural rock holes; for sanitary reasons they were not buried in or near corrals. Thus the absence of sheep or goat bones from shepherd sites is one of the most revealing results, since archaeologists normally require the presence of animal bone remains in order to identify the presence of shepherds.

Modern evidence indicates considerable variation over short periods in terms of species kept. Shepherds may alternate between sheep and goats partly for political reasons (for example the reforestation policies of governments), and partly for economic ones (as with the change in goat species from *cabra valenciana* to *murciana*). Such factors should

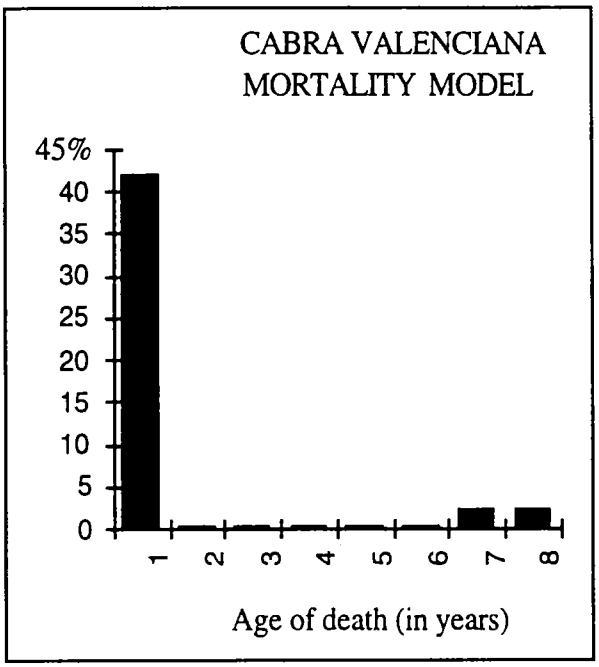

Fig. 13.Goat mortality model (calculated for complete flock) (Seguí 1995: fig.14).

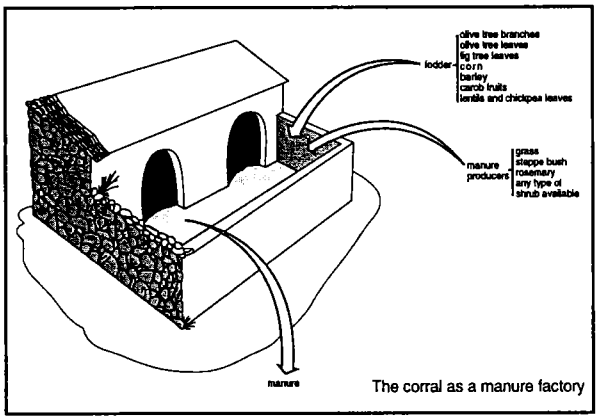

Fig. 14. Diagram of corral manure factory

be taken more in consideration when referring to archaeological data. Indeed, present-day double annual lambing may not be a purely modern phenomenon (for example, the first-century Roman agronomist Columella – quoted in White 1970: 314 – refers to reproduction of goats twice per year, perhaps meaning that it was quite normal to have two kids at a birth).

Our data indicate that there would be a male bias in the proportion of bones of young animals and a female bias in the proportion of bones of older animals; clearly, if the discarded carcasses of mature animals which died while in pasture were ever recoverable archaeologically this too would show a predominance of females. Furthermore, mortality from disease, injury and cultural preference (e.g. the age at slaughter and the choice of the meat of young animals) all have spatial components and will enter the archaeological record in different ways.

(iii) Ethnoarchaeology and Herding Sites

The identification and functional explanation of herding sites is still restricted due to a lack of a proper definition of this essential component of a herding system, although new information derives from recent ethnoarchaeological studies in both the Near East (Bar-Yosef & Khazanov 1992) and Greece (Chang 1984, 1992; Chang & Tourtellotte 1993). In our own initial research we examined the corrals of the study zone, these being traditional local herding sites. Additional sites, notably rock shelters or water places, remain to be studied in depth. Although many corrals are relatively modern constructions (see above, Section III, and Beavitt *et al.* 1995: 237-238), their study can nonetheless help reveal how shepherds conceive their landscape and how they organise the space in herding sites - both aspects viewed by ethnographers as important for understanding the archaeology created by shepherding activity (Chang 1984, 1992).

Martinez (1991:229-237) defines two corral types: 1. *integrated* into a living area, or 2. *isolated* in areas of pasturage. Most of the descriptions in this survey refer to the latter type because their isolation has preserved their features. In terms of structure, however, both are fairly similar in having an open area (*ras*) linked with a roofed section (*nevada* or *cubert*). Martinez also discerned how isolated corrals sometimes offer pitched roofs whilst integrated ones always have roofs with a single slope. The corral is/was not merely a place to keep animals: they are, and were, 'tools' to manage the flock; flocks are usually divided into two main units, one comprising females with lambs and kids, and the other the remainder of the flock (*ramat forro*); these divisions are duly reflected in the corrals where divisions are made using stone, wood or cane to separate nursing mothers *with* their lambs or kids from the rest of the flock, or to separate the mothers *from* their lambs or kids and to allow the mothers to leave the corral to graze.

In attempting to glean more from the structure of the corrals, a comparison was made between corrals in two types of location, namely between corrals situated in a lowland zone (beween 300 and 600 metres above sea level), and those above 600 m and exploited mainly during the summer months by the shepherds. Although the degree of variation in structure found was not extremely high, some differences were found, notably in terms of the general absence of storage facilities in the lowland corrals, probably due to the greater proximity of the village, allowing shepherds to utilise their own houses. The presence of storage space in the upland corrals could reflect fodder requirements, although in fact the indications were more of use for keeping harvested crops. In addition these storage spaces were utilised by overnighting shepherds in the summer.

In effect, even within a small geographical context such as the Gallinera area, a variety of forms exist, creating potential confusion in interpreting functions. Furthermore, new structures were commonly added to the corrals, modifying their role, and farmhouses might be converted into corrals, to be used for storage or for shelter by farmers.

That corrals were significant for manure production is evidenced by the fact that farmers and not shepherds frequently were the corral builders, and by the fact that shepherds are/were allowed to use the corral in exchange for the sheep manure. Accordingly corrals take on a new role, namely as a manure factory, a place needed by the farming community to produce what was always an essential item (fig.14). Two types of manure are distinguished in the Gallinera valley. *Fem* is the faeces and urine of sheep and goats mixed with fodder remains and built up over winter; this mixture, in addition to being trampled by the animals, is hoed and turned over in the spring and left to rot over the summer months, to be ready to dig into the fields in the autumn. The second type, *aixerrit*, is manure produced in the summer from the nights spent in the corrals; this is valued less than the *fem*.

(iv) Transhumance

Shepherds expressed a preference for the quality of the vegetation of the upland pastures and so use them from April/May to October. The sheep are grazed, apart from minor excursions, only within the Gallinera district where shepherds have to pay for pasturage. The lower valley lies at *c.* 300m rising to *c.* 750m at the summit of the L'Almirant mountain and *c.* 900m at the summit of Forada. Since shepherds can reach the good pastures of the maximum altitude in less than half a day, it was possible for village-based shepherds to feed their flocks throughout the typical periods of the summer drought. In the past trees on the upper pastures would have been cleared for firewood and scrub would have been burned to encourage grass growth.

There is every reason to assume that even with a denser population in the past many small flocks could have been kept in the region; indeed their presence would have been fully encouraged by those many earlier farmers needing manure for their extensive network of terraces.

VI. DISCUSSION

The ethnographic research has vastly enhanced our understanding of present and past farming and shepherding practices in the survey zones. Information on flock sizes and forms and slaughter patterns elucidate the major changes that have occurred in the last century alone. Whilst the old patterns of transhumance are threatened, they still persist, reflecting well the rugged upland character of some at least of the local population. The interviews with the shepherds combined with archive study further offer comment on the character, function and ownership patterns of the structures still extant within the survey region; it should be stressed that much of this detail would be absent from the archaeological record.

The shepherds and archives attest a much more active and vital level of usage and exploitation of the Serra de l'Almirant a century ago, and undoubtedly we can extend this picture back further in time. The remains of corrals and other structures and in particular of terraces, some still cultivated, clearly recall this 'busy' past. Certainly extensive expenditure of time and effort is more than evident in the network of such terraces created around various of the larger structural units in the Vall de Gallinera, most strikingly in the system of terraces which have been created down the course of many of the small and larger ravines. These catchment terraces are mostly now abandoned, but still reveal fertility in their soil through greenery unmatched by the surrounding barren stone-strewn slopes. It is at present difficult to determine whether these are primary elements in the agricultural usage of a given area, whether they denote extensions to farming activity beyond the immediate vicinity of the related farm/corral, or whether they relate to the final, desperate stages of farming here, perhaps with drier conditions reducing rainfall take-up on the slopes, forcing the farmers to utilise the ravines themselves which previously would have seen too rapid or destructive a flow of water. Generally such terraces lie near the start of the ravine channels, where the flow of water even in wintertime may not have been strong, but those catchment terraces to the north of VG4, VG7 and VG10 will have been liable to annual destruction if rainfall had ever been substantial in the time of their construction.

Clearly this is only a very tentative working-hypothesis, requiring to be set against documented changes in landowning, economic concerns, population expansion and migration. Hence the need to investigate thoroughly maps, local memory and history, house architecture, terraces, and surface (and subsurface) archaeology and geomorphology in order to create a more valid image of these patterns of change. By analysing these pre-modern farming systems we may hopefully also obtain insights into past systems and sequences which might be tested archaeologically. Most strikingly such evidence highlights how hazy our knowledge can be of even the fairly recent past and how vital it is to assemble, store and analyse the thoughts, memories and records of the last members of the pre-mechanised society before this information too slips away.

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