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The Fauna from La Cueva del Volcán del Faro (Cullera, Valencia). A Preliminary Discussion

A. THE FAUNA

An examination of the animal bones from the first season of excavations at «La Cueva del Volcán del Faro, Cullera» (see e. g. Aparicio & Fletcher, 1970) was undertaken as part of a detailed examination of the economy of the site, and its relationships with other sites in the area. For the purposes of this analysis it was felt that it was most important to consider which were the most abundant food sources.

The deposit divides into two convenient parts, according to the artefacts and according to the condition of the bones. At the top, layers I-IV contain material described as Bronze Age. Layer V is archaeologically sterile, but some bones were found contaminating the deposit. There is no Neolithic artefact material, but in layer VI and below there is no pottery and the artefacts have been described as Magdalenian, and the sequence continues to layer XXVIII at a depth of 11'25 m. Layer XIX contains the first example of a **Bastón de Mando** from Mediterranean Spain. (Fletcher & Aparicio, 1969a and 1969b).

Layer I: Sea-shells, several species. **Ovis** sp. or **Capra** sp.

Layer II-IV: **Ovis** sp. or **Capra** sp., **Cervus** sp., **Sus scrofa**, **Lepus** sp. or **Oryctolagus** sp., **Bos** sp., small Carnivore, Bird, Crustacean, Sea-shell, 2 species of Fish.

Layer VI-XXVIII: **Equus** sp., **Cervus** sp. both abundant. **Lepus** sp. or **Oryctolagus** sp. common. Small numbers of other species; Pig, Cattle, Bird and ?Hedgehog, 2 species of Carnivore.

There was only one bone of **Capra** sp., a complete maxilla in layer XXIII.

B. THE ANIMALS REPRESENTED

Most interest centres on the animals from the palaeolithic layers and their relevance to the relationships that exist between this site and Parpalló (Pericot, 1942), a distance of 21 km. away as the crow flies. Detailed identifications and quantitative assessments are being undertaken and particular emphasis will be placed on the most important food sources; horse and deer.

Stehlin and Graziosi (1935) did not claim any *Equus hydruntinus* south of the Pyrenees, but Wernert (1956) reclassified the *E. cazurroi* of S. Juliá de Ramis, Gerona as *E. hydruntinus* and Boessneck (1968 & 1969) suggests, that it may be present in Granada during the Bronze Age. This animal is common in the Salento peninsula in Italy at similar latitude and in a similar environment to parts of Valencia and at sites contemporary to Parpalló and Volcán. It will be of interest to determine whether it was present this far south in Spain during the late Pleistocene, or whether it is only the previously identified *Equus caballus* which is present (1).

(1) The existence of both large and small equids at Volcán and at Parpalló has now been confirmed. The Table and Graph indicate the extent of the size differences of 1st Phalanx specimens from both sites compared to the published measurements for two French sites (Bonifay, 1963, 162; 1964, 393). At this stage sophisticated statistical treatment is not possible due to the small samples, though Student's *t* Tests suggest that the difference between the measurements of the Width of the Distal Articulation is significant at the 0'02 level.

Equus hydruntinus (sic) has recently been reported from Ciudad Real (Torres, 1971) but the lack of stratigraphy at the site does not exclude the possibility that this is a modern example. Notwithstanding, the published fauna includes *Rhinoceros merckii* and *Alces alces* as well as *Cervus elaphus* and *Equus caballus*. The measurements of the first phalanx of the latter agree well with the above.

Comparison of the Parpalló material with that published from Gerona (Cabrera, 1919) and of both Valencian sites with France confirms Wernert's identification of *Equus (Asinus) hydruntinus* and extends the range of the species during the Pleistocene into Southeast Spain for the first time (26-1-1972).

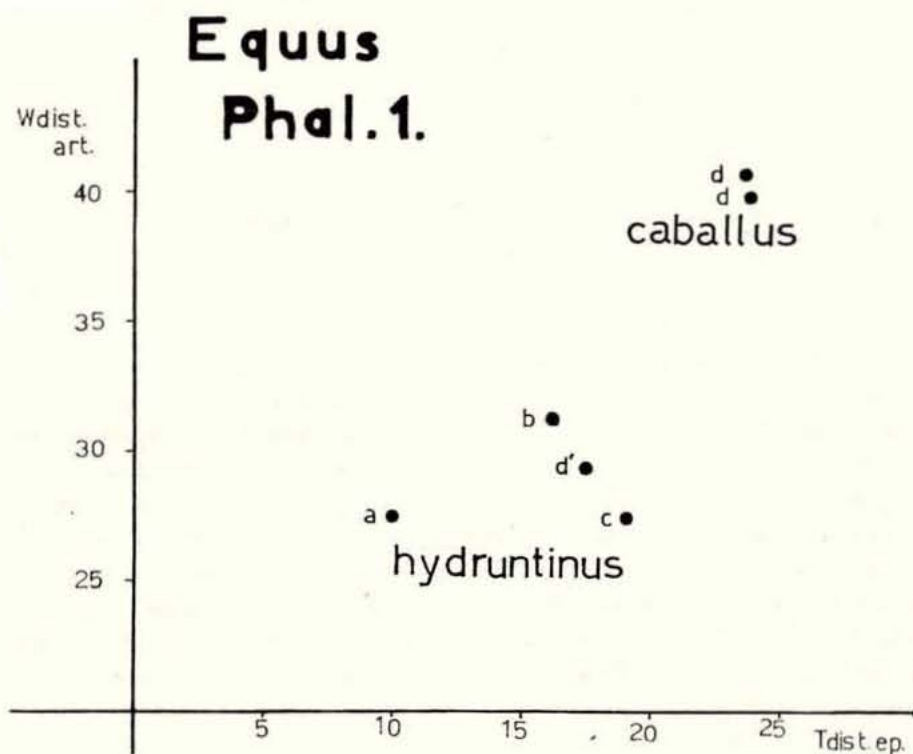
T A B L E

| | | X | Y |
|----|--------------------|------|------|
| d | Parpalló.. | 23'7 | 39'9 |
| d | Parpalló.. | 23'6 | 40'7 |
| d' | Parpalló.. | 17'5 | 29'3 |
| c | Volcán | 19'1 | 27'4 |
| a | Rigabe | 10'0 | 27'5 |
| b | Eaume - Rousse ... | 16'4 | 31'5 |

Table of measurements of *Equus* sp. 1st Phalanx, Distal end. Measurements in millimetres. X - Thickness of Distal Epiphysis. Y - Width of Distal Articulation.

The Deer species is almost certainly Red Deer, *Cervus elaphus*, but the possibility must be considered that there is some *Dama* sp., as this species has been reported from Parpalló. Much more material particularly antlers must be studied before this can be confirmed (2).

The question of the Lagomorphs will also be considered. At Parpalló, Sos y Bainat (1947) writes of hare, *Lepus cuniculus*, while Pericot (1968), writes of rabbit, *Oryctolagus cuniculus*. In recent studies of hares in Spain, Africa and Israel (Petter, 1959, 1961 & 1963; Yom-Tov, 1967), it has been demonstrated that the detailed taxonomy of the *Lepus* species may be unimportant, since size clines exist between species as defined for Mediterranean areas, under the influence of Bergmann's and Allen's Laws. There are



(2) None of the material studied, to the present date, from any of the sites of the province, suggests the presence of more than one species of deer, which is Red Deer, *Cervus elaphus*. In addition, all the teeth so far studied from Parpalló, attributed originally by Sos to other deer species - Roe Deer, *Capreolus capreolus*, or Fallow Deer, *Cervus dama* or *Dama dama* - or to Chamois, *Rupicapra rupicapra*, have been of young animals, with milk dentition, the deer of Red Deer, *Cervus elaphus* and the Chamois of Goat, *Capra* sp. It remains to be seen whether any of the other animals are present at any of the Late Palaeolithic sites of Valencia.

however shades of difference between the environmental requirements of hares and rabbits and it will be important to settle this problem. Pericot (1968), has suggested that rabbits (or whatever species is represented) may have been one the basic foods of the inhabitants of Parpalló. While this possibility must be carefully considered, especially in view of the universality of bones of this animal at Palaeolithic and other sites in Spain, it seems most likely that it was not an important food. Available rabbits may have been eaten, but were not a staple. The food represented by the horse and deer greatly outweighs the importance of rabbit in the diet, and if we make the assumption that the animals drawn and painted in Palaeolithic art are common food sources, then this view is supported by the absence of representations of rabbits on the engraved and painted plaques of Parpalló. The condition of the bones also supports it, for most long bones in particular only show fractures which occur in conditions other than those of human predation. The writer has observed identical fractures in skeletons found in moorland districts of Britain.

Other animals of minor importance in the diet include cattle, pig and possibly hedgehog. Cattle and pig are both scarce at Parpalló, and hedgehog, if the identification is correct, is a species not present there.

A much important difference is the scarcity of **Capra** sp., which at Parpalló was the most abundant animal in all layers (Sos y Bainat, 1947; Pericot, 1942, 268). It was also one of the animals most commonly represented on the engraved plaques there.

Distinction between all caprine species is still difficult from bone morphology alone, despite detailed studies, and for **Capra** sp. drawings are often little better. The species to be considered are **C. ibex** and **C. pyrenaica**, the Spanish ibex, whilst many drawings would not exclude **C. aegragus**, though its presence in Spain is unlikely. (Ellerman & Morrison-Scott, 1966; for drawings, see Pericot, 1942, 121; and figs 149, pág. 159 and 81, pág. 138; but see also fig. 284, pág. 186.) Zeuner (1953, 188), points out that the Gibraltar caprines fall within the range of variation of **C. ibex**. In order to avoid the difficulties involved in this taxonomy, goat is preferred throughout and taken to mean **Capra** sp. Some implications of the economic difference from Parpalló represented by the absence of goats from Volcán will be considered below.

C. THE GOATS (a discussion)

If we are to attribute it to some excavation sampling error, and the size and range of bone recovered suggests that there is no reason to do so, then the absence of goats at Volcán is very important (3). Recent studies (e. g. Isaac, 1967) have emphasised some of the processes involved in the creation of archaeological assemblages, particularly of fauna. These involve non-random processes of accumulation, preservation and excavation so that there may be no predictable relationship between an archaeological fauna assemblage and a faunal association as defined by zoologists. In addition, it is quite common in archaeological reports to discuss fauna with insufficient detail, so that we might stress the presence of goat indicated by the single maxilla, rather than emphasising the more remarkable general absence of goats.

The association of goat, horse and deer in archaeological assemblages is very common in Spain during the Pleistocene, but it is not rare to find sites where one or more of these is absent. It is rare that it is only goat of these three that is missing. The list includes the Mousterian sites at Bellús, Valencia of Cova Negra (layers C and A) and La Pechina, and in the North at Capellades, Barcelona —Abrigo Romani. Late Palaeolithic sites include S. Juliá de Ramis, Gerona.

(3) Thanks to the generous cooperation of D. Domingo Fletcher and D. José Aparicio of the S. I. P. of Valencia it was possible for the writer to be present during the 1971 season of excavations at La Cueva del Volcán and to study the bones as they were excavated. D. Javier Fortea of Salamanca University kindly allowed him to study the bones from a recent season of excavations at Les Mallaetes and work has begun on detailed study of the collection from Professor Pericot's excavations of Parpalló. To all of these people are due sincere thanks. As a result it is possible at this stage to offer some comparisons of numbers of bones, though definitive estimates of the minimum numbers of animals are not yet possible.

Thus of more than 1900 bones so far identified from Parpalló, 460 are of deer, 1,234 of goat, 70 of *Bos* sp. and 129 from both species of *Equus* sp. At Mallaetes, of nearly 700 bones from all levels 100 are of deer, 203 of *Capra* sp. and only 7 of the equids. In contrast more than 1,000 identified bones from Volcán show 104 of deer, no more than 1 of goat and only 6 of horse. It should be pointed out that the first campaign had a higher proportion of horse. The totals are completed in each case by small animals, some carnivores but mostly rabbits. It may be that the proportion of rabbit bones is most accurately represented by the Volcán figures, where they nearly 90 % of the total. An estimate of the minimum number of animals from a sample from the 1971 excavations showed 25 rabbits, 2 deer and 2 equids, about 85 % rabbits. But these figures used to estimate of meat weights, very much in favour of rabbits (large rabbits and small deer and horse) would give 200 kg. of deer and horse meat and only 50 kg. of rabbit, some 20 %. This figure will be estimated more accurately in future studies.

These figures are only presented at this stage to emphasise the scarcity of goats at Volcán, and the possible scarcity of horse at Mallaetes. The figures of minimum numbers of animals and of meat weights are presented to indicate what these bone numbers could mean in a more detailed discussion. These figures should not be taken to mean any more.

T A B L E

| | <u>Capra sp.</u> | <u>Bos sp.</u> | <u>Equus sp.</u> | <u>Cervus sp.</u> |
|--------------------------|------------------|----------------|------------------|-------------------|
| MOUSTERIAN | | | | |
| Gorham's cave | | | | |
| P-K | + | + | + | + |
| J.. | + | + | | |
| H-F... .. | + | + | + | + |
| E.. | + | | | + |
| Cova Negra | | | | |
| E.. | + | | + | + |
| D.. | | | | |
| C.. | | + | + | + |
| B.. | + | + | + | + |
| A.. | | | + | + |
| La Pechina... .. | | | + | + |
| Romaní... .. | | | + | + |
| U. PALAEO LITHIC | | | | |
| Gorham's cave | | | | |
| D-B... .. | + | + | + | + |
| A.. | + | | | + |
| Castillo | + | + | + | + |
| Parpalló... .. | + | + | + | + |
| Romaní | + | | + | + |
| S. Juliá de Ramis | | | + | + |
| Falset | + | | | + |
| MESOLITHIC | | | | |
| La Cocina | + | | + | + |

N. B. This Table does not attempt to include all known sites in Spain.

We may therefore look carefully at the reasons for the absence at Volcán, and work is in progress on the reasons for their absence elsewhere. Three main factors which may prevent the dispersion of goats from Parpalló to Volcán will be considered in outline here:

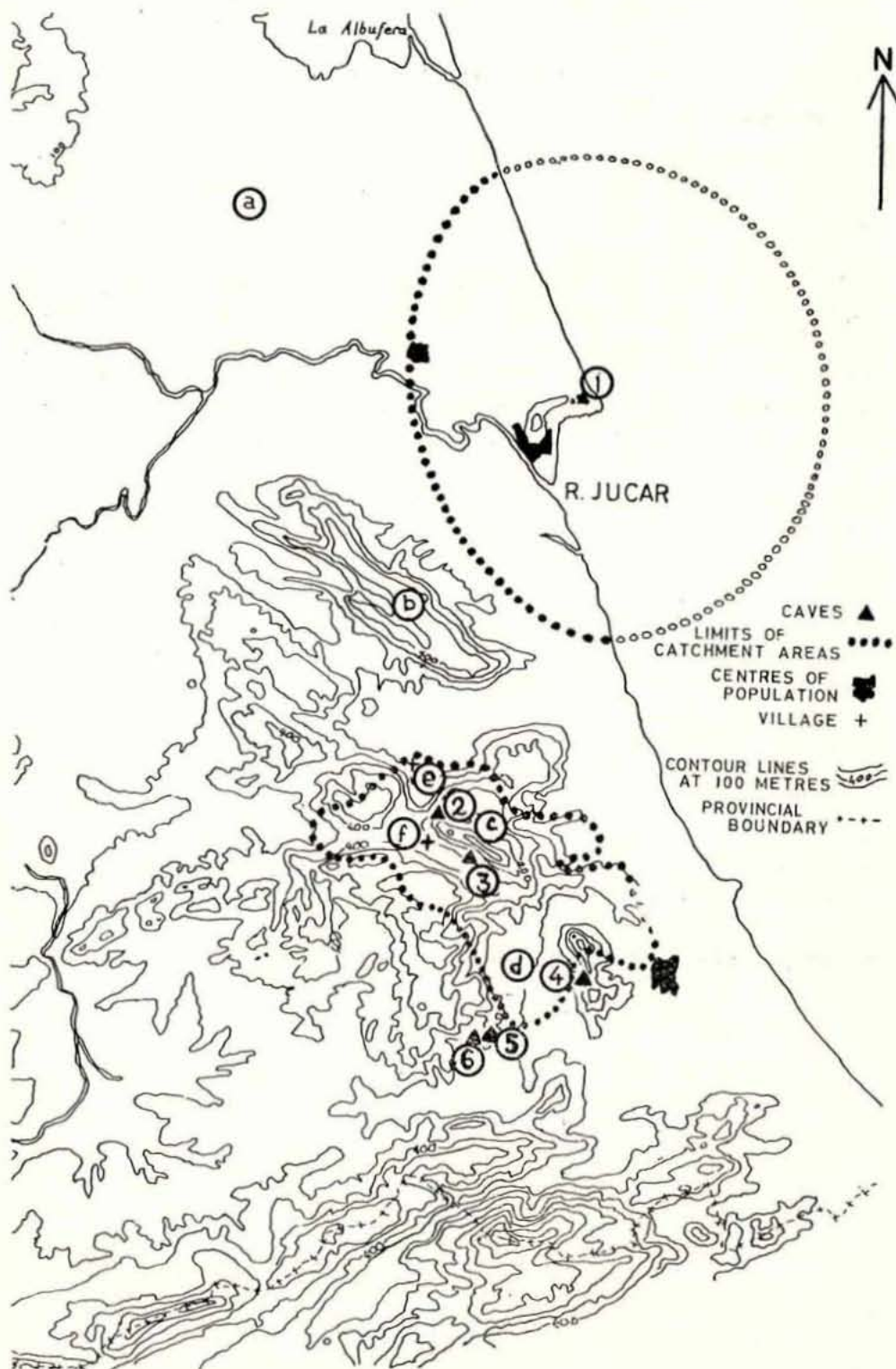
- I. Geography.
- II. Environment and Competition.
- III. Man-Animal Relationships.

I. GEOGRAPHY

It is possible to imagine circumstances in which a geographical barrier prevented the successful dispersion of a species. This seems particularly obvious where there is an island population. Only a small rise of sea-level above the present height, or extension inland of the sea, would completely isolate the limestone hill on which Volcán is situated, and this may be an explanation for the absence of Neolithic at the site. It is claimed that the coast near Valencia has advanced 3 km. since Roman times (Houston, 1959, 170), so that a sea inland from the present shore is at least possible, during the post-glacial period. Much of the present coast line is formed by recent deposition and infilling, and the only indication we have at present on Pleistocene sea-levels is the negative fact that at Volcán the sea was not an important resource until the Bronze Age. Gigout (1959) points to the lack of visible marine features of the Quaternary in the Spanish Levant and concludes that there has been tectonic depression in these areas, and particularly of the hill of Volcán. The occupation of the site of Volcán may not extend back until the date of the high sea-level preceding the maximum cold phase of Würm, but its position close to the present coast could provide important evidence about sea-levels if it does. There is at present no evidence of the isolation of the hill of Volcán. However, if the coastal route were cut off, without isolating the hill, then the only barrier would be the Sierra de las Agujas. This range is exploited today by herds and flocks and karst vegetation may not have been very different during the late Pleistocene, so that a similar animal exploitation could have taken place during the occupation of Volcán and Parpalló. The range is largely unexplored for palaeolithic sites.

II. ENVIRONMENT AND COMPETITION

Site-catchments were estimated for Volcán and Parpalló based on the methods used by Vita-Finzi and Higgs et al. (1970) in Israel (see Map). These served to emphasise the differences between the environments available at the two sites. While Parpalló is within a limestone massif and has several large areas of Terra Rossa and other soil in poljes and dolines as well as in the Marchuquera (Rosselló, 1968), Volcán has a catchment dominated by the present rice fields, **arrozales**, and orange groves **naranjales**, of the Ribera Baja with less than 5 % of the catchment taken up by the limestone hill. (Houston, 1959, 186). Both areas are well watered, Parpalló by numerous springs and Volcán by the River Júcar and the freshwater lake, La Albufera, which formerly extended to within 5 km. of Cullera (de Passa 1844 quoted in Momblanch y González, 1960, 21). The area of the lake has been controlled at least since the 19th century so that while it had



1: Cueva del Volcán. — 2: Les Mallaetes. — 3: El Parpalló. — 4: Maravelles. — 5: Barranc Blanc. — 6: Rates Penaes.

a: Ribera Baja. — b: Sierra de las Agujas. — c: Mondúber. — d: Marchuquera. — e: Simat. — f: Barig.

1: 300.000

area of 14.000 hectares in the 17th century, by 1927 it had stabilized at ca. 3.000 hectares (Casas Torres, 1943; and see Houston op. cit., 183). The lake is formed by restriction of drainage by dune formations, as in other areas of the Valencian coast (Rosselló, 1963 & 1969, I, 24). For a parallel situation in Majorca, Butzer and Cuerda (1962) have stated that the final regression of Würm is characterised by local accumulation of littoral dunes, a process which continued through one or more phases of the Holocene. The Geological Survey (Templado and Meseguer, 1947) put the depth of Quaternary deposit near Valencia at between 100 and 200 metres, while Houston (op. cit., 171), puts it at 16m. near Puzol, and 210m. near Valencia. Vita-Finzi suggests (1969, 69) that much of the deposit is post-glacial, in agreement with other findings in Mediterranean areas, and with Mabesoone (1969) in the Guadalete estuary. The chronology of the deposition is not well studied and we have little detailed information about the past environments of the site for periods relevant to the present study. There are no known palaeoenvironmental studies from the Ribera, and the only local pollen diagram is from Ereta de Pedregal, Navarrés (Menéndez & Florschütz, 1961). If we assume an even rate of soil deposition at that site and extrapolate the two C 14 dates, we might be able to make estimates of palaeoenvironments back to 11.000 BP. The change of soil type from peat, **turba**, to sandy peat, **turba arenosa**, would then be dated to ca. 10.000 BP, around the onset of warmer climate in Northern Europe (Van der Hammen et al, 1967; Dansgaard et al, 1969) and in agreement with pollen data and carbon dates from Padul, Granada (Menéndez and Florschütz, 1964). The differences between the pollen diagrams from Ereta and Padul and between the two diagrams from the same profile at Cueva del Toll, Moyá, Barcelona (Butzer and Freeman, 1968) particularly in the variations shown in the tree pollen counts emphasise how difficult it is to extrapolate pollen results even to similar environments. The problems of dispersion (Tauber, 1965), particularly of tree pollen in areas where there is considerable vertical zonation of vegetation, mean that it is almost impossible to make meaningful estimates of the vegetation changes in the plain surrounding Volcán, from the Ereta diagram.

The recent work of Butzer and Freeman (1968) discusses the problems of reconciling pollen and faunal data, as attempted by Donner and Kurtén (1958). Furthermore we have no quantitative data, at present, on fauna from any palaeolithic site in Valencia province. Donner and Kurtén emphasise that deer are a woodland species, while horse prefer open country. It is difficult, at present, to say which is the commoner at Volcán. In sites in S. Italy deer and horses are often present in inverse proportions (von Löwenstern, 1969 & 1970), a feature which is commonly explained by prefer-

ence for different environments, available within the catchment of the site (e. g. Boessneck, 1968). Fluctuations in climate could alter the available environments (Higgs, 1961). At Volcán there is no indication of non-uniformity of environment, with the exception of 500 hectares in the immediate environs of the site, which may be too small to support a population of large mammals (e. g. goats, horses, deer) either all year, or without competing for the grazing on the plain. We must conclude therefore that both deer and horse were exploiting similar environments, or that there were environmental variations due, either to edaphic factors at present unknown, or to grazing and browsing by herbivores. Odum (1969, 239) indicates how the reduction of natural predation on a deer population at Kaibab, Arizona caused massive reduction of the forest cover. It may be that the environment around Cullera was wooded with some open areas. Zeuner (1963, 130) and others (e. g. Donner and Kurtén, 1958; Rodríguez, 1960 and Pfeffer, 1967) emphasise that wild goats are adapted to steep rocky environments, particularly alpine or beyond the tree line. They browse shrubs, rather than trees or grass, but can be driven to eating most plants. They are particularly vulnerable to predation in other environments due to their adaptation to escape by agility rather than speed. They would not prefer a wooded plain but may exploit it (e. g. under control by man) and certainly descended to near sea-level at Gorham's Cave, Gibraltar (Zeuner, 1953). The ease with which goats are herded from Barig, in the vicinity of Parpalló, today, may indicate that even that environment was not a favourable one for **wild** goats and that the consistent exploitation of them during the Late Palaeolithic indicates a close man-animal relationship, perhaps herding.

III. MAN-ANIMAL RELATIONSHIPS

The conventional picture of the economy of Palaeolithic times is of groups of hunters killing unsystematically, (e. g. San Valero, 1955; Almagro, 1947, 330). This is being increasingly challenged as new approaches are tried, in many areas (Higgs & Jarman, 1969; Jones, 1970; Carter, 1970; Jarman, 1971; Isaac, 1971; Harriss, 1971, 52). Predator-prey relationships are rarely unsystematic exploitations (Elton, 1950, 29; Kruuk & Turner, 1967; Schaller & Lowther, 1969; Eaton, 1969). Exploitation of the seasonal movements of animal populations is suggested as an important element of the late Palaeolithic economy in Epirus (Higgs et al, 1966), where the species concerned are Deer and Horse, so that we must consider the implications of such studies for the situation in Spain.

The evidence for seasonal movement of peoples in recent times in Spain is abundant (Fribourg, 1910; Klein, 1920; Vilá Valenti, 1950; Fon-

tavella, 1951). Cabo Alonso (1960) estimates that 1/5 of all sheep in Spain are transhumant. But modern transhumance patterns can only be used as a model for prehistory by careful examination of the reasons for the movement. It is well documented (Klein, 1920) on the Meseta that elaborate legislation has often been necessary to preserve seasonal grazing patterns. Other legislation can restrict the dispersion of animals. Thus a recent report on the development of agriculture in Spain by the International Bank for Reconstruction and Development (1966) has described how such prohibition by the Patrimonio Forestal has led to the elimination of herds and of groups of herds. They recommend that the Government should «carefully consider any reforestation plans on land which is likely to be only marginally useful for timber production and on which goats are, or might be, pastured under suitable control». Today the area available to the flock of 200 breeding goats from Barig is restricted by plantations, where previously more goats occupied all the hillslopes within the village boundary. Despite this restriction, the goats live on the Monduber massif all year. This may be due to the fact that Barig has no grazing rights in areas more favourable at different seasons, or it may be due to the exceptional nature of the village territory, where today the herd can find suitable pasture to feed young, bred three times each year.

Higgs (et al, 1966) demonstrated in Greece how snow cover made winter occupation of Kastritsa uneconomic and Carter (1970), has shown how vegetation zones may influence patterns of site occupation. Studies of this type are being undertaken in Spain with special emphasis on areas involved in modern transhumance patterns. Thus the Palaeolithic occupation of the Pyrenees was certainly affected by the impossibility of living in the high Pyrenees in winter. In the Valencia region today there are many different types of pastoralism. Many villages have flocks of sheep which graze the rice stubble and the paths between fields and orange groves. This diet may be supplemented in winter by dried oranges. Another common pattern is a short distance movement, as from the village of Simat, at the foot the northern slopes of the Monduber massif. The flock winters on the mountain, near the Palaeolithic site of Les Mallaetes (Fletcher, 1956 a & b), and moves to the shaded walks between orange groves in summer. Long distance migration today is generally assisted by lorries, though it is claimed that the same routes used to be walked. The Mesta (Klein, 1920, 28), demonstrates that flocks will walk at least 300-400 km. in search of pastures. Shepherds move from the southern part of Valencia province to Cuenca and the writer met one independent shepherd who spent the summer in Andorra, and the winter south of Valencia. This remarkable migration may be attributed to market factors rather than to environmental

pressures, seasonal availability of grazing, etc. Spanish prehistory would be transformed if we could establish seasonal movements parallel to this in the Pleistocene.

The sites of Valencia province (Parpalló, Les Mallaetes, Rates Penaes, Barranc Blanc, Maravelles and Volcán), have usually been considered together because of their similarities in artefacts. The new light thrown on man-animal relationships might suggest independant connexions with sites outside this coastal area. Certainly, if we adopt the suggestion that goats would not prefer a plains situation, and that it is only environment which prevents the exploitation of goats at Volcán, then the differences in behaviour indicated suggest that there was not a very close connexion between Parpalló and Volcán. The patterns of exploitation of deer and horse may well serve to stress the relationships between man and these animals, but the site of Parpalló must have been in rather special circumstances, if goat was the most abundant species there. Deer and horse both migrate large distances in search of pasture, but goat do not move so far. An economy based on all three of these animals would involve complex patterns of behaviour as the animals moved in their grazing succession (Bell, 1970) to suitable areas. It is tempting to conclude that Parpalló could have been occupied all year based on goat while parts of the population moved elsewhere possibly to the hills on the edge of the Meseta with deer or horse. More light should be shed on this hypothesis and its implications for the study of goat husbandry in Spain by further study of the faunal collections from Valencia province.

SUMMARY

1. The most important food animals at la Cueva del Volcán del Faro (Cullera), during the Bronze Age were sheep/goat, with some deer and pig. During the whole period of occupation before the appearance of pottery, deer and horse were the most important.

2. The absence of goats in the palaeolithic layers contrasts strongly with the fauna at the nearby site of Parpalló, where they were the most abundant animal in all layers.

3. Reasons for the absence of goats are examined and it is suggested that environmental factors may be most important. The situation suggests a complex relationship between the sites of Valencia province and it is hinted that there may be some evidence for the herding of goats at Parpalló during the Pleistocene. The present study suggests new areas for research.

(Cambridge, 6/7/71)

RESUMEN

1. Los principales animales para la alimentación durante la Edad del Bronce fueron, en la Cueva del Volcán, oveja/cabra (*ovicaprinae*); con algo de ciervo y cerdo o jabalí. Durante todo el período de ocupación, antes de la aparición de la cerámica, fueron el ciervo y el caballo los más importantes.

2. La ausencia de cabra en los niveles paleolíticos contrasta fuertemente con la fauna del vecino yacimiento del Parpalló, donde es el animal más abundante en todos los niveles.

3. Las causas de la ausencia de cabra son examinadas, suponiéndose que los factores ambientales pudieron ser los más importantes. La ubicación sugiere una compleja relación entre los yacimientos de la provincia de Valencia, y se insinúa que pudo haber rebaños de cabras en el Parpalló durante el Pleistoceno. El presente estudio plantea nuevos problemas para investigar en posteriores trabajos.

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