

ANEXO

**THE ANIMALS FOUND IN THE CAVE OF SON BORONAT
(MALLORCA) AND SOME PRELIMINARY NOTES ON
POSSIBLE CHANGES IN THE SUBRECENT RODENT
POPULATIONS OF MALLORCA**

I.) A sample of the animal bones, found in the archaeological level of the cave of Son Boronat, contained remains of different species of Rodents and a few bones of a medium sized bird.

The Rodent material could be indentified on morphological aspects and appeared to belong to the following three species:

Eliomys quercinus (Linné), the Garden Dormouse, represented by at least 14 animals.

Apodemus sylvaticus (Linné), the Wood Mouse, represented by at least 32 animals.

Mus musculus (Linné), the House Mouse, represented by at least one animal.

These remains were found in intrusive burrows, between the human burials in the cave and should at least be younger than the oldest burials (about 400 y. B. C.), maybe even younger then the last burials (around 150 y. B. C.). At any rate, they were the youngest Rodent remains that the author had at his disposal at the "Museo de Deyá (see section III), possibly even younger than those described by Uerpmann, from the Talayotic settlement of S'Illot (Uerpmann, 1971).

To the question of how these bones came to be in this cave, there seem to be three possible answers: a) We are dealing with remains of animals that actually lived and died here. b) These are remains of the prey of some small burrowing Carnivore, such as *Genetta* or *Mustela*. c) These are remains of the prey of *Eliomys*, not a true Carnivore, but an animal with recorded (see Kahmann y Alcover, Bol. Soc. Hist. Nat. de Baleares, Tomo XIX, 1974, p. 67) carnivorous habits.

The right answer is probably a), or a combination of a) and c), since no remains of such a small Carnivore were found and also other small animals that would have been among its prey, were lacking.

The reason why one should ask this question, is that, if one plans to use remains like these as a sample in a statistical population analysis, the preference of a Carnivore, for example for young or small animals, could have biased the sample.

Also the techniques used during the excavation and separation of the animal remains could bias a sample seriously. In the opinion of the author, this sample from Son Boronat qualified as an unbiased sample, this and its size made comparison with other such samples from Mallorca and Menorca possible.

II.) It should be mentioned here, that the author is of the opinion that the animals mentioned in section I and many other elements of the recent and subrecent fauna of Mallorca and Menorca, have been introduced by Man; intentionally or unintentionally. This opinion is based on familiarity with the Holocene and Late Pleistocene animal remains collected in the extremely rich and well dated cave of Son Muleta (Soller / Mallorca) (Waldren 1966, Waldren and Kopper 1968, Waldren 1972).

The older sediment levels of this cave, with Radiocarbon dates older than 15,000 y. B. C., contain no elements of the modern fauna, but are, like younger levels, rich in extinct fauna; *Myotragus*, *Hypnomys* and *Nesiotites* and also various species of lizards and birds. These remains clearly indicate that the cave was accessible to animals of all sizes; the complete absence of *Eliomys*, *Apodemus* and *Mus* in the lower levels makes it very unlikely that these animals were part of the Mallorcan fauna at the time.

Eliomys and *Apodemus* remains in Son Muleta first appear in the levels dated between 10,000 and 15,000 y. B. C., it is very well possible that their presence in these levels could be a result of burrowing and that the remains are actually younger.

Not all authors agree on the relatively recent introduction of these animals; Uerpmann for example believes in the possibility that *Eliomys*, *Apodemus*, *Oryctolagus* (Rabbit) and *Lepus* (Hare) could have been part of the Pleistocene fauna of Mallorca (Uerpmann, 1971, p. 19-22).

The author believes that, if the study of recent and subrecent Rodents from Mallorca and Menorca would reveal any changes, trends or fluctuations, these would be the result of one or more of the following factors:

- a) The adaptation of the species to its relatively new environment.
- b) Climatological changes after its introduction.
- c) The introduction of competing species (the Rat e. g.).
- d) The introduction of a predator.
- e) The continuing introduction of members of the same species, but from different parts of the Mediterranean coast.
- f) The extinction of a competing species (*Hypnomys* e. g.).
- g) Alterations in the environment caused by Man, for example agricultural.

All these factors could cause changes through time, besides these one could think of many reasons why differences in space (between Mallorca and Menorca e. g.) may have existed.

In these preliminary notes, the author wishes to demonstrate that differences do exist between materials from different sites that were available to him. It is still too early to indicate the causes or the complete nature of the differences.

III.) Rodent remains from the following sites, placed in chronological order, were available:

- A) The middle levels (200-300 cms.) of the cave of Son Muleta. These levels were dated between 15,000 and 10,000 y B. C. (see section II), the modern Rodents, *Eliomys* and *Apodemus* (no remains of *Mus* were found), are believed to be younger than that, probably between 5000 and 3000 y B. C. Around 5000 y. B. C. these levels were only 50-150 cms. below the surface of the sediments.
- B) The upper levels (100-150 cms.) of the same cave of Son Muleta. Radiocarbon dates indicate ages between 4000 and 2000 y. B. C. Allowing for burrowing, the age of the remains of the modern Rodents (*Eliomys*, *Apodemus* and *Mus*) should fit between 4000 and 1000 y. B. C.
- C) The shelter of Son Matge (Valldemossa / Mallorca). Rodent remains were found between the stones of the Megalithic wall surrounding this Prehistorical burial site (see Rosselló-Bordoy and Waldren, 1973). The fact that some of the bones had been exposed to fire, indicates that their age should correspond with the Talayotic cremations behind this wall: between 1250 and 800 y. B. C.
- D) The Talayotic settlement of S'Illot (San Lorenzo / Mallorca). From this site no actual sample was available, but a comparison could be made with measurements published by H.-P. Uerpmann in "Studien über frühe Tierknochenfunde von der Iberischen Halbinsel. 2. Die Tierknochenfunde aus der Talayot-Siedlung von S'Illot (San Lorenzo / Mallorca). München, 1971". The age of the Rodent remains should be between 400 and 150 y. B. C. (Uerpmann, 1971, p. 15).
- E) The burial cave of Son Boronat (see above). The age of the Rodent remains is less than 400 y. B. C., maybe less than 150 y. B. C.
- F) A habitation near the Taula of Torralba (Alayor / Menorca). Rodent remains were found between the stones in the wall of this building. Also here some of the bones showed the effect of fire, demonstrating that their age should correspond with a dated layer of charcoal in the building: between 900 and 800 y. B. C.

The letters A, B, C, D, E, F correspond to those used in the diagram, later on in this section.

All the mentioned sites rendered good quantities of bones of *Eliomys* and *Apodemus* and, to a lesser extent, of *Mus*, this last animal was best represented among the materials from Menorca (F).

Three types of bones were used in a survey study: the Femur, Tibia and Humerus. The *maximum length* was measured of all these elements, from the most proximal to the most distal part of the complete (!) bones. Bones that had been damaged at the proximal or the distal end and bones that showed the effect of heat or fire, were not measured. The measurements were taken with an accuracy of 0.1 mm.

On the majority of the bones the distal (Femur) or proximal (Tibia and Humerus) epiphysis was missing. Among most other Mammals this is a sure indication of immaturity, among Rodents also skeletal elements of mature animals easily lose the epiphysis. Bones without epiphysis were also measured, from the most proximal part to the most distal part of the diaphysis (Femur), or from the most proximal part of the diaphysis to the most distal part of the bone (Tibia and Humerus). The measurements on bones without epiphysis were treated separately in the statistical analysis; see the diagram: left without, right with epiphysis.

Unfortunately this means that a number of immature elements will be included were it concerns the statistics of the Tibia and Humerus without epiphysis. The statistics of the Femur will be much less affected by this, since the Femur of a young animal will not only lose the distal epiphysis but also the epiphysis on the Trochanter Major, the most proximal part of the bone, used in the measurement, this makes such a bone immeasurable. The greater reliability of the Femur-statistics is clearly shown in the diagram: the left and right part of it for the Femur are much more congruent than in the other two cases.

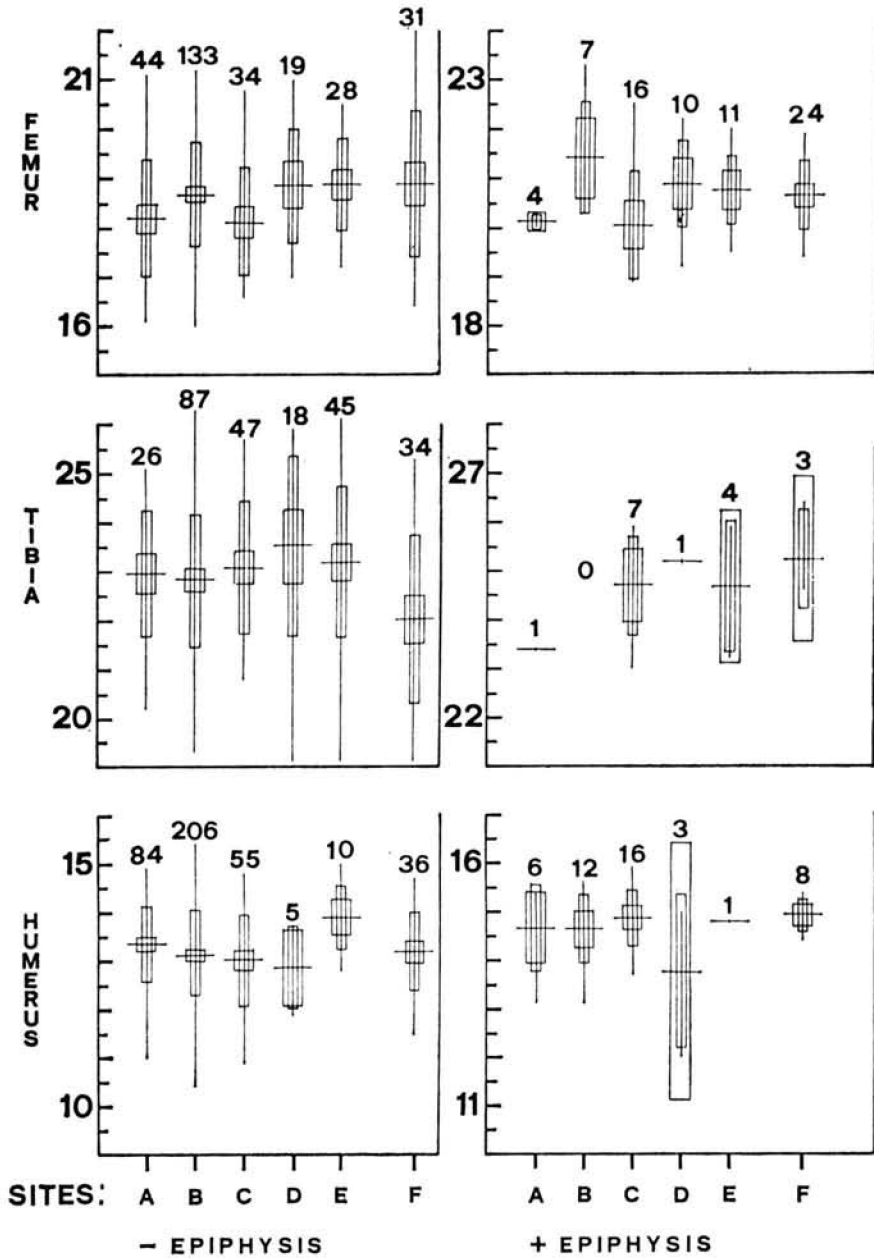
The presence of some immature elements among the Tibia and the Humerus materials should not influence the validity of the information too much, the samples from all the sites are probably approximately equally contaminated.

Explanation of the Diagram

The result of the statistical analysis of the measurements on the bones of *Apodemus sylvaticus* are shown in this diagram.

- 1) The letters A-F refer to the sites described earlier in this section.
- 2) The vertical scales are in millimetres.

APODEMUS SYLVATICUS



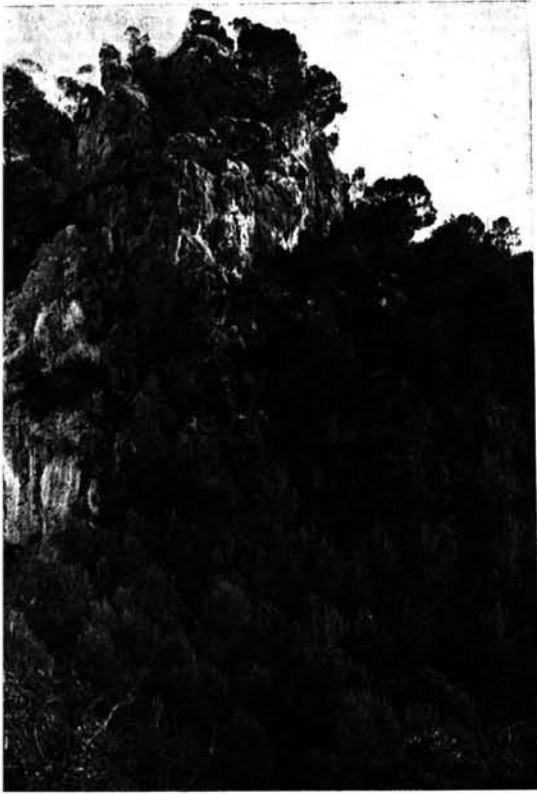
- 3) In each case, the vertical line indicates the total variation of the sample, from the shortest bone at the bottom to the longest bone at the top of the line.
- 4) The short horizontal line indicates the sample mean.
- 5) The narrow rectangle gives one time the standard deviation of the sample (SD) above and one time below the sample mean.
- 6) The wider rectangle indicates the Confidence Interval of the population mean (not the sample mean!), in the sense that it indicates the limits of the interval in which the population mean should lie with a probability of 90 %.
The chance that the actual population mean should be higher than the high limit, should not be more than 5 %, the same chance exists that it should be lower than the low limit.
- 7) The sample size (N) is recorded near the top of the vertical line.

How N and SD affect the confidence interval, the distance between the two confidence limits in other words, is clearly shown if one compares, for instance, (Humerus-epiph. site B) with (Humerus + epiph. site D). In the first case with 206 measured bones, we can say that the population mean almost certainly lies between 13.0 and 13.2 mm., in the second case we can only say that the probable mean value lies somewhere between 11.1 and 16.4 mm.

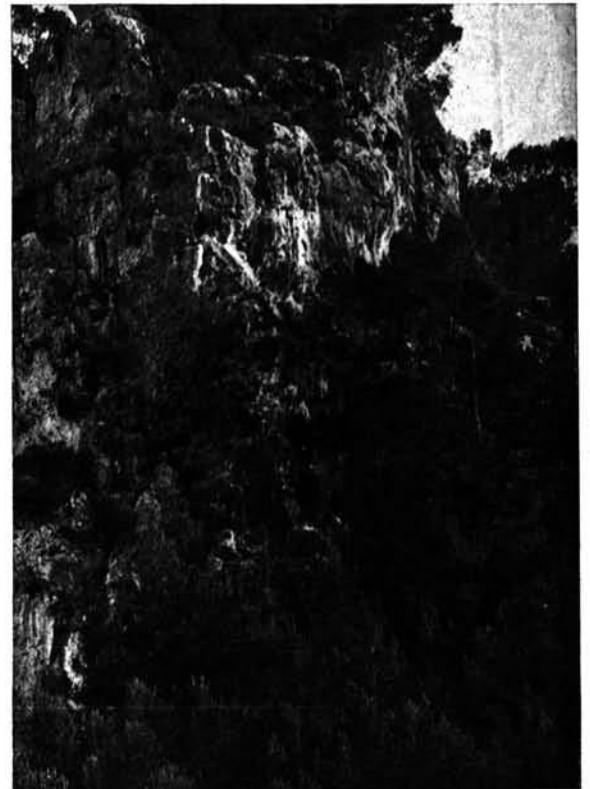
The interested reader could draw his own conclusion after studying the diagram, the author would like to point at a few interesting aspects.

If one compares the statistics of the Femur (with or without epiphysis) from the sites A, B and C, it seems apparent that the population that provided the sample of site B with a 90 % probability had a higher mean value for Femur length than the populations that provided the samples A and C, the chance that these three samples were drawn from populations with the same mean Femural length should be considered less than 10 %.

If next we take a look at the mean Tibia length (— epiphysis) of the same site B, we see no significant difference between this site and any of the other Mallorcan (A-E) sites, as a matter of fact, a population mean Tibia length between 22.8 and 23.1 mm. would fit all these sites. On the other hand, the same value for the Menorcan site (F) seems significantly smaller than any of the Mallorcan sites. The Femur and Humerus population means of Menorca could very well fit those means of the sites on Mallorca, with the exception of the Humerus (— epiphysis) of Son Boronat (E).



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2

1 y 2.—Situación de la cueva.



1.—Entrada desde el exterior.



2.—Entrada desde el interior.



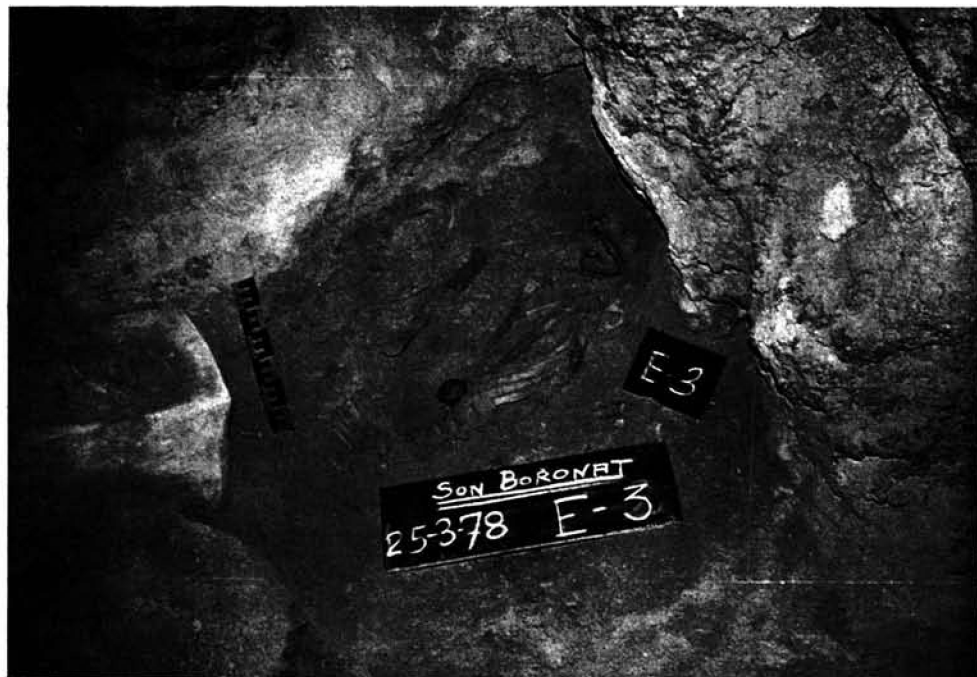
1.—Inhumación n.º 2.
2.—Idem detalle
3.—Urna pitoide con inhumación infantil — B —.



1.—Urna pitoide con inhumación infantil.
2.—Detalle con la base-tapadera.
3.—Detalle.



1 y 2.—Hallazgos de otras urnas con inhumaciones infantiles.



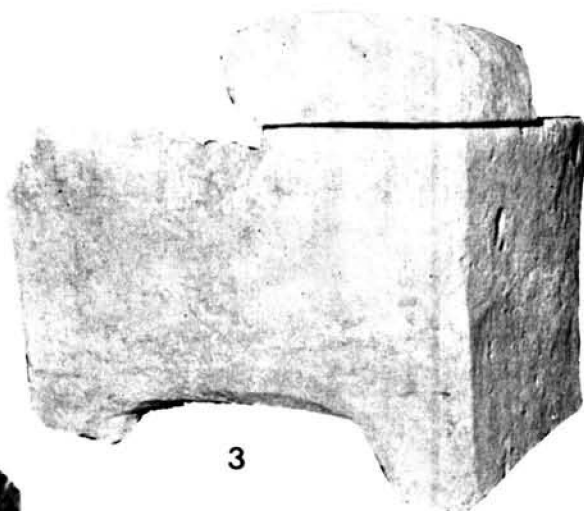
1.—Urna de marés e inhumación de adulto con vasito troncocónico en el regazo.
2.—Detalle de la inhumación de adulto.



1



2



3

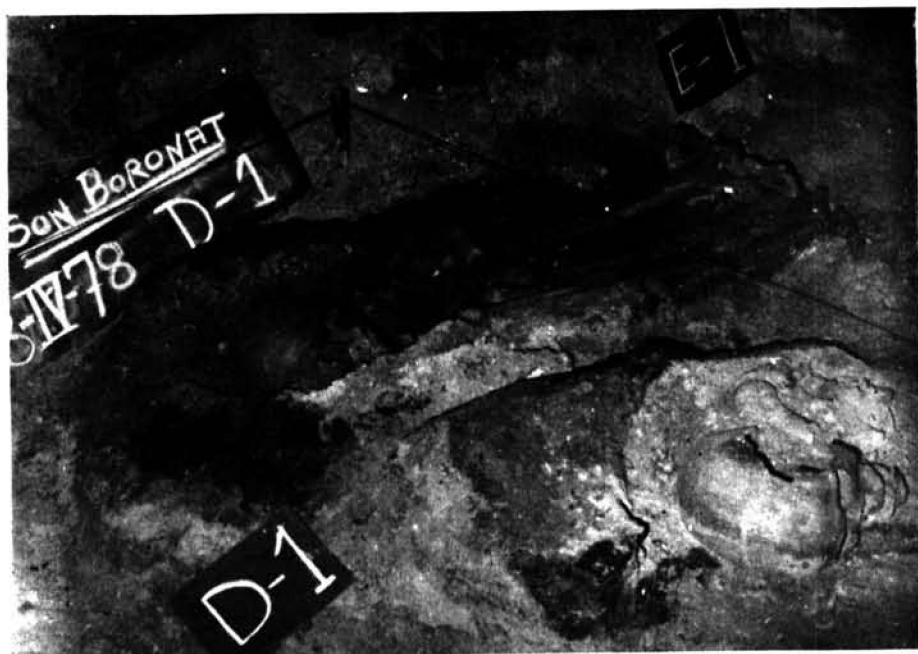


4



5

- 1.—Urna pitoide.
- 2.—Restos de tejidos extraídos del interior de un ataud.
- 3.—Urna de arenisca.
- 4.—Empuñadura de un puñal de antenas.
- 5.—Cuenta de collar de pasta vitrea.



- 1.—Aspecto general de las inhumaciones en sarcófagos de madera.
- 2.—Detalle de las mismas.

In other words, the diagram not only indicates differences in the probable mean values of the length of skeletal elements, it also indicates that differences in body proportions did exist.

A similar study on the bones of *Eliomys quercinus* indicates:

- a) A relatively constant mean value for the Femur, there does not seem to be a significant difference between Mallorca and Menorca.
- b) A slowly increasing mean value for the Tibia, at first the Mallorca values are lower than the Menorcan, later higher.
- c) A slowly decreasing mean value for the Humerus on Mallorca, at first a mean value equal to the Menorcan mean value, then lower.

Again we seem to be dealing with a change in body proportions, comparison with the study of the Cranial skeleton of *Eliomys* (see Kahmann y Alcover, 1974, p. 70), seems to lead to the, maybe somewhat premature, conclusion that this animal on Mallorca underwent reduction of the anterior (Mandibule and Humerus) body elements and growth of at least one of the posterior (Tibia) elements.

The scarcity of *Mus musculus* materials does not permit a very detailed analysis. All the Mallorcan material together gives the impression that the Menorcan *Mus musculus* was slightly bigger in at least the three studied aspects.

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