MALLORCA CHRONOLOGY FOR PREHISTORY BASED ON RADIOCARBON METHOD

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Radiocarbon 14 method has been recently applied in an attempt to formulate a framework for a chronological timetable of absolute dates from the Balearic island of Mallorca. Materials have been systematically collected since 1958 from a score or more archaeological stations throughout the island, stations of different relative chonology varying geographic situation. The results of this series of carbon analysis constitutes the first such structure dedicate to the use of this technique. They are of particular interest in that the results span a time element of over six milleniums between 5,000 B. C. and 1,000 A. D. The structure is composed of dates on materials from natural caves, artificial caves and various megalithic Talayotic monuments. In order to enlarge the latitude of the series, the tests have been carried out on paleontological and anthropological specimens as well as on charcoal.

The value of such a systematic and scientific effort is not in the test results, themselves, but in the knowledge they offer to all the affiliated sciences. When viewed along general lines, the carbon 14 readings do not alter many of the findings made by more traditional means, but contrary, support many of the deductions obtained through the relative chronology set down by the first scientific investigators. Their interest lies in their giving us a clearer picture of geo-paleo-anthropo-archaeological happenings in the Baleares during archaic times. They are also of special interest in the information that they supply concerning the initial phase of prehistory known, here, as the pretalayotic epoch.

The plan behind the chronological framework is designed as a possible tool, applicable to a comparative study of materials from archaeological stations already excavated as well as those under excavation. Another aim of its structure is an investigation into the possible extent and limits of the various periods in Mallorca prehistory.

The framework, itself, as illustrated by the first test in the series of radiocarbon analysis begins with the paleontological record of an endemic species of antelope-gazelle unique to the islands of Ma-

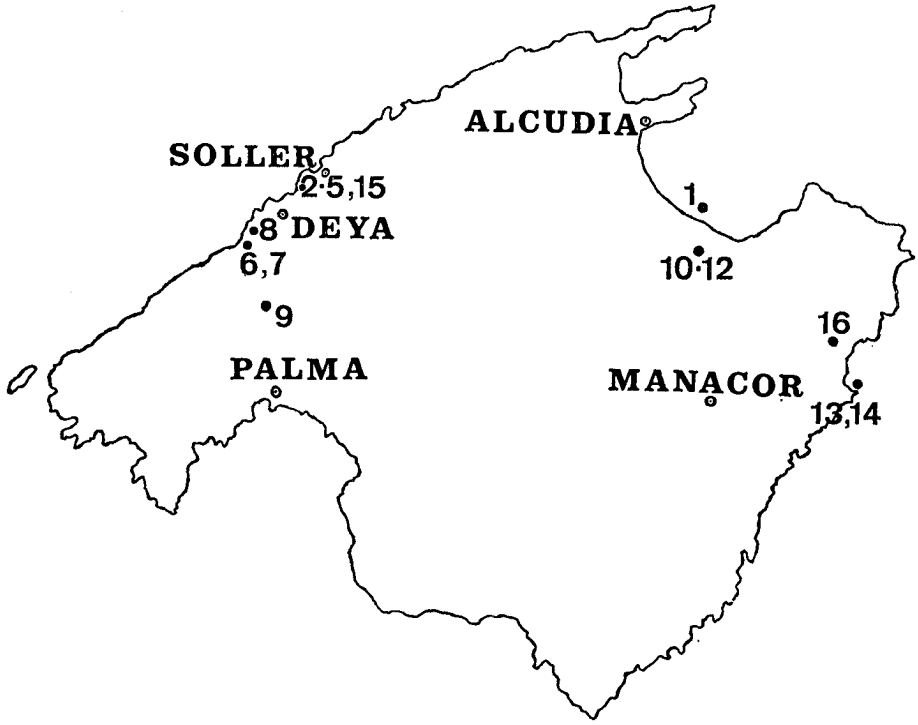

Fig. 1. — Inventory of radiocarbon analysis in order of processing.

1. «Illa dels Porros» (Son Real) (Alcudia). Necropolis.
2. «Cave of Muleta» (Sóller). Natural cave.
3. «Cave of Muleta» (Sóller). Natural cave.
4. «Cave of Muleta» (Sóller). Natural cave.
5. «Cave of Muleta» (Sóller). Rock shelter.
6. «Muertos-Gallard» (Deyá). Rock shelter.
7. «Muertos-Gallard» (Deyá). Rock shelter.
8. «Cave of Son Marroig» (Deyá). Natural cave.
9. «Cave of Son Puig» (Valldemosa). Artificial cave.
10. «Es Figueral de Son Real» (Alcudia). Naveta habitation.
11. «Es Figueral de Son Real» (Alcudia). Naveta habitation.
12. «Es Figueral de Son Real» (Alcudia) Naveta habitation.
13. «S'Illot» (San Lorenzo). Walled village.
14. «S'Illot» (San Lorenzo). Walled village.
15. «Cave of Muleta» (Sóller). Natural cave.
16. «Son Servera» (Manacor). Talayot.

llorca and Minorca, generally accredited to the Quaternary and known as Myotragus balearicus. The recent discovery of a possible relationship existing between primitive man and this extinct fauna (accompanied by a rudimentary industry of flint and bone tools without ceramics) helps to clarify the chronological picture, extending the date

of man's occupation of the island by more than 1,500 years prior to the time assumed as his first arrival. Until the present, the archaeological record has never before warranted the consideration of a pre- ceramic phase to Mallorcean prehistory.

The structure of the chronology continues through a survey of the three divisions of Mallorca prehistory: Pretalayotic, Talayotic, Post-Talayotic. It ends with an analysis which deals with a historically uncertain moment in Moorish history when many of the prehistoric monuments were re-utilized for unknown reasons by the Moors. The results of the radiocarbon tests documents the period accurately and substanciates what is known of the time.

The correlation of the datum supplied by the radiocarbon method is due, basically, to the joint colaboration of the Museum of Mallorca and the Deyá Archaeological Museum. The affiliation and efforts have made it possible to broaden the scope of the project and include a wide range to the variety of archaeological stations under study.

A list of the types of sites included in this chronology is as follows:

A) Natural caves (Burial).
B) Natural caves (Habitational).
C) Natural caves (Anthro-paleontological).
D) Artificial caves (Burial).
E) Talayots (Habitational).
F) Navetas (Absidal Habitational).

One of the difficulties in attempting to form the structure of a chronology based on radiocarbon age determination of materials lies in the selection of archaeological sites that afford suficient stratificational conditions to give us a complete enough control, along with a series of materials worthy of carbon analysis. Large archaeological stations do not often present a clear picture of events. In short, such sites have often undergone periods of disturbance where the levels have been partially or completely destroyed to such lines of study. It has been necessary to select and utilize archaeological areas that have given us sufficient horizons for cross correlation of materials. This chronology is, therefore, dedicated to evidence taken from natural and artificial caves and megalithic monuments where the levels and their materials have been preserved in well stratified deposits and the test specimens could be counted on to produce reliable results.

A clearer understanding of prehistoric events may under certain circumstances be found in insular scientific investigation. There exists

within isolated geographic environments the strong possibility of a latent pattern which can lead to a systematic interpretation of events. It should be understood that the direction and the extent that such a pattern offers us is dependent on the impetus of influences that the geographic area has undergone in its prehistory. Clarification of this aspect is another aim in the formation of such a proyect.

The history of investigations by radiocarbon documentation in Mallorca begins with the publication of absolute dates from the necropolis island of «Illa dels Porros» excavated between 1957 and 1967 by M. Tarradell of the University of Valencia for the William L. Bryant Foundation. These samples were processed in the United States in 1962. They represent the first absolute dates received for Mallorcean prehistory.

As early as 1958 carbon materials were collected for this purpose by the Museum of Mallorca in such excavations as the passaged Talayot of Son Serralta (Puigpunyent), Son Oms, Son Sunyer and Vincle Vell. Unfortunately, economic circumstances did not at the time permit the processing of these materials. Carbon specimens were collected from all of these stations and preserved. Several are at the present time scheduled for processing.

The Italian expedition directed by G. Lilliu collected similar samples during their last season at Ses Paisses (Artá). It was hoped that these samples would produce some of the first absolute dates, but until the present they have not been conducted.

The chronology set forth in this publication is made up mainly of fourteen analysis realized since 1965 by three laboratories: The Yale University Radiocarbon Laboratory, Director: Dr. Minze Stuiver, The University of Pennsylvania Laboratory of Radiocarbon, Director: Dr. Robert Stuckenrath, Kaman Nuclear Radiocarbon Laboratory, Director: Dr. Kay Carver, Colaborator: Dr. Willard Libby. The collection of specimens and the organization in preparation of the processing was carried out by three investigators: W. Waldren, J. S. Kopper and G. Rosselló Bordoy, Directors and co-Director of the Deyá Archaeological Museum and the Museum of Mallorca.

The first two analysis were conducted on Anthro-paleontological specimens and were designed as control tests (specimens weighing 39.5 grams of human bones from the cave of Muleta (Sóller) associated with the endemic ruminant Myotragus balearicus, and 85 grams of animal bones of the Myotragus from the same cave). These two tests produced age determination results sufficiently early to warrant further tests on larger quantities of like materials in order to bring down the margin of statistical error (analysis 1. & 2.). Results on samples 3. & 4. succeeded in lowering the statistical error enough to give abso-

lute dates of extreme interest both anthropologically and paleontologically.

Recent developments in surveys of radiocarbon method have established statistics relating to the dating of bone matter that verify the tendency of analysis on bone to give results which are under certain conditions higher than 10 % younger than the dates shown by the analysis of like materials of charcoal or charred bone. These

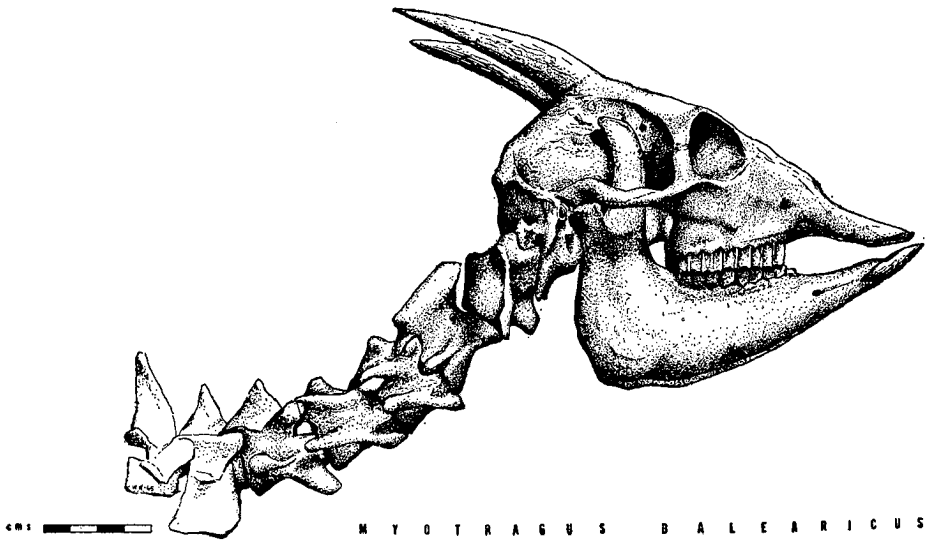

Fig. 2. — Myotragus balearicus C 14, 5.184 B. C. $\pm$ 80 yrs.

recent findings if applied to the datings exemplified in the analysis of sample 3. & 4. could mean that the materials be considered older than the dates shown in the results of the analysis (4,300 B. C. and *5,600 B. C. for the human materials and the *Myotragus specimens). However, until further development of the process allows the adjustment of the differences between analysis of bone and that of carbon, the results must remain as they are at the present.

The possible co-existence of an endemic fauna and primitive man as well as the aspect of a pre-ceramic phase in Mallorcean chronology is of prime interest and value to the future study of the opening moments in the pretalayotic epoch. The structure of the series of analysis gives us dates which represent, for the moment, two limits to the early developments in the prehistory of Mallorca. These limits which existed between approximately 4,000 B. C. and 2,000 B. C. (a two millenium period of which very little is known) are marked, only, by the late survival of the extinct ruminant Myotragus balearicus into

a period hitherto unattested (approaching the initial stages of the first bronze age), and the possible symbiosis it may have shared with early man. These are the lone factors which stand out in this preceramic phase of prehistory. The extent and final development of the relationship is as yet unestablished. Whether or not the arrival of early man on the island of Mallorca was the direct cause responsible for the extinction of this rare, isolated and curiously evolved animal is still unknown. But the history of such relationships and their outcome are commonly known elsewhere.

Evidence of the late survival of the Myotragus on Mallorca has been cropping up in several excavations and natural cave explorations during the last year. The fine ossious preservation of the specimens and their proximity to archaeological materials of early bronze age origin may lead to the future solution to the problems surrounding this relationship.

It will be necessary to conduct many more analysis on reliable specimens of diverse origin before a definate correlation of materials can take place. The structure of the chronology as we have it today is, still, in its skeletal form. In late November of this year the results of two more analysis have been received and can be added to the chronology. These datings are from two distinct levels of the walled village of «S'Illot» (San Lorenzo) (excavated by Dr. O. Hermann Frey and G. Rosselló Bordoy and processed in Germany). In late December another two datings were received from two different stations (Cave of Muleta, habitational level, excavated by W. Waldren and J. S. Kopper and the Talayot of Son Servera (Manacor) excavated by G. Rosselló Bordoy and J. Camps Coll). The addition of these analysis brings up the number of results received to sixteen radiocarbon dates. They form the nucleus of the chronological framework for the island of Mallorca. It is hoped that the scope of the project in the coming year may be able to extend itself to include the island of Minorca. This is indeed necessary if a more general picture of happenings in Balearic prehistory is to be realized.

A description of the radiocarbon analysis received are as follows:

DESCRIPTION OF THE RADIOCARBON ANALYSIS IN CHRONOLOGICAL ORDER

1. «*Cave of Muleta*» (Sóller).

Excavation: Deyá Archaeological Museum.
Direction: W. Waldren - J. S. Kopper.
Level: 150 cms. Sector: «F».
Test materials: Animal bones.
Sample weight: 85 grams.

Type of site: Natural cave, habitation, anthropological and paleontological. Tests based on paleontological materials. Animal bones of Myotragus balearicus. Control tests on 85 grms of bone specimens in order to establish the weight maximum necessary for sample testing of bone.

Laboratory: Kaman Nuclear Radiocarbon Laboratory.
Research scientist: Dr. K. Carver, Dr. Willard Libby.
Dates: 5.498 B. C. ± 1.180 years.

2. «*Cave of Muleta*» (Sóller).

Excavation: Deyá Archaeological Museum.
Direction: W. Waldren - J. S. Kopper.
Level: 175 cms. Sector «O».
Test materials: Human bone.
Sample weight: 39.5 grams.

Type of site: Natural cave, habitation, anthropological and paleontological. Tests were made on human bone found in association with endemic antelope, Myotragus balearicus. Rudimentary signs of industry consisting of flint and bone tools, no ceramics. Due to the value and the quantity of materials available for testing only 39.5 grams of human bone were used as a control test.

Laboratory: Kaman Nuclear Radiocarbon Laboratory.
Research scientist: Dr. K. Carver, Dr. Willard Libby.
Dates: 8.736 B. C. ± 3.517 yrs.

3. «*Cave of Muleta*» (Sóller).

Excavation: Deyá Archaeological Museum.
Direction: W. Waldren - J. S. Kopper.
Level: 175 cms. Sector «O».
Test materials: Animal bones (Myotragus balearicus).
Sample weight: 500 grams.

Type of site: Natural cave, habitation, anthropological and paleontological. Test were made on Myotragus bone, retest based on 500 grams, weight recommended by Dr. Willard Libby in order to assure low statistical error. Test samples were taken from same level as human materials in test 2.

Laboratory: Kaman Nuclear Radiocarbon Laboratory.
Research scientist: Dr. K. Carver, Dr. Willard Libby.
Dates: 5.184 B. C. ± 85 yrs.

4. «*Cave of Muleta*» (Sóller).

Excavation: Deyá Archaeological Museum.
Direction: W. Waldren - J. S. Kopper.
Level: 150 cms. Sector: «O».
Test materials: Human bone.

Sample weight: 500 grams.

Type of site: Natural cave, habitation, anthropological and paleontological materials. Tests run on 500 grams of human bone as recommended by Dr. Willard Libby. Human materials associated with Myotragus balearicus and a rudimentary industry of flint and bone tools, no ceramic.

Laboratory: Kaman Nuclear Radiocarbon Laboratory.

Research scientist: Dr. K. Carver, Dr. Willard Libby.

Dates: 3.984 B. C. ± 109 yrs.

5. «*Cave of Muertos-Gallard*» (Deyá).

Excavation: Deyá Archaeological Museum.

Direction: W. Waldren - J. S. Kopper.

Level: 90 cms. Sector: 6 parapet area.

Type of site: Rock shelter, burial and habitational area. Tests conducted on charcoal from a pretalayotic level which represented fires associated with geometrically incised sherds, skillfully executed and of Beaker Culture origin, globular ceramics with horizontal perforated lugs and bitroncoconic pots indicative of pretalayotic horizon. The cave of Muertos Gallard is of special interest as it afforded a definate stratigraphy. The upper levels were used as a lime pit crematory of Post-Talayotic phases similar to Son Maiol, in which like materials have been excavated by the Museum of Mallorca.

Laboratory: Yale University Radiocarbon Laboratory.

Research Scientist: M. Stuiver.

Dates: 1.840 B. C. ± 80 yrs.

6. «*Cave of son Marroig*». (Deyá).

Excavation: Deyá Archaeological Museum.

Direction: W. Waldren - J. S. Kopper.

Level: 50 cms. Sector: Central.

Test materials: Human bone.

Sample weight: 500 grams.

Type of site: Natural cave, partial burials probably of a secondary nature. Tests conducted on the human bone of pretalayotic origin accompanied by five complete ceramics of simple form. One troncoconic piece, skillfully made with a burnished black surface, was decorated with a kind of fingernail incision technique runing vertically around the relief border of the rim. This ceramic style is frequently found in Mallorcean caves, similar pieces have been found in caves like Sa Canova Ariany and Can Maiol. There are indications in the surfacing and the incisions of a late Beaker origin. Other ceramics found in the cave of Son Marroig consisted of semispherical small drinking cups and larger vessels decorated with breast like lugs. singular or in regular intervals around the rims.

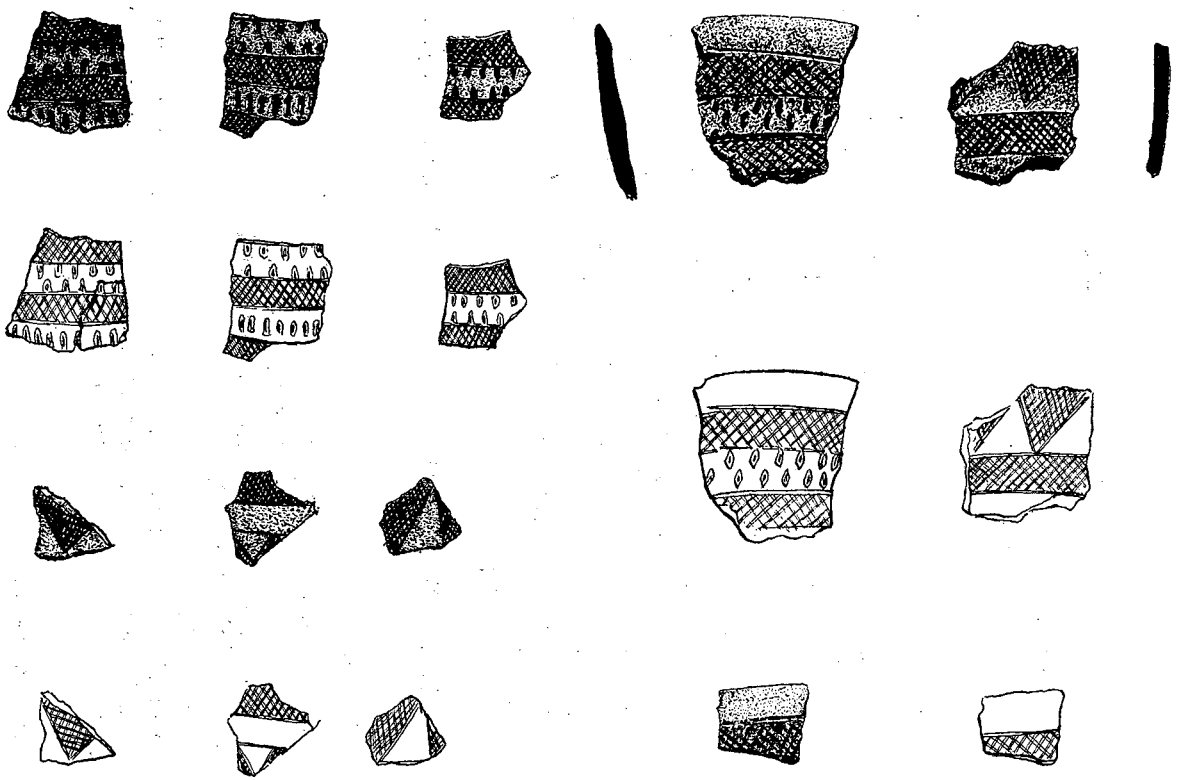

Fig. 3. — Cave of los Muertos, son Gallard. Beaker fragments associated with charchoal dated by C 14, at 1.840 $\pm$ 80 B. C.

Laboratory: Yale University Radiocarbon Laboratory
Research Scientist: M. Stuiver.
Dates: 1.520 B. C. ± 80 yrs.

7 & 8. «*Es figueral de Son Real*» (Santa Margarita).

Excavation: Museum of Mallorca.
Direction: G. Rosselló Bordoy - J. Camps Coll.
Level: Talayotic. Sector: Wall of monument.
Test materials: Charcoal.
Sample weight: 60 grams.
Type of site: Naveta form monument Sample 7. was conducted on charcoal associated with Talayotic ceramic sherds from an area between a posteriorly reconstructed wall and the central fire area of the monument. Sample 8. was carried out on the fire area in the center of the monument and represents charcoal of animal remains of sacrificial or domestic origin. Both samples were run on 60 grms of charcoal and carbon. The construction of the wall within the monument showed signs of reconstruction at a date later than the central occupation of the edifice. It is interesting to note that the litter area where sample 7. originates and sample 8. of the central fire area shows a difference in dating that marks the moment of the abandonment of the monument and the occupancy of the edifice, giving us a probable date for the reconditioning of the wall.
Laboratory: Yale University Radiocarbon Laboratory.
Research Scientist: M. Stuiver.
Dates:
Sample 7, 1.050 B. C. ± 120 yrs. Sample 8, 1.010 B. C. ± 80 yrs.

9. & 10. «*S'Illot*».

Excavation: Museum of Mallorca.
Direction: G. Rosselló Bordoy - O. H. Frey.
Level: Talayotic. Sector: West and Central.
Test materials: Charcoal.
Sample weight: ?
Type of site: Walled village. Materials were associated with ceramics of Talayotic origin. Further particulars are as yet unpublished.
Dates: As yet not for publication.

11. «*Illa dels Porros*» (Santa Margarita).

Excavation: William. Bryant Foundation.
Direction: M. Tarradell.
Level: Inferior. Sector: Cámara B.
Test materials: Charcoal.

Type of site: Necropolis, single and multiple burials with artifacts consisting of personal belongings in the form of rings, bracelets and glass paste beads. Occassional ceramic fragments.

Laboratory: EE. UU.

Research Scientist: ?

Dates: 480 B. C. ± 200 yrs.

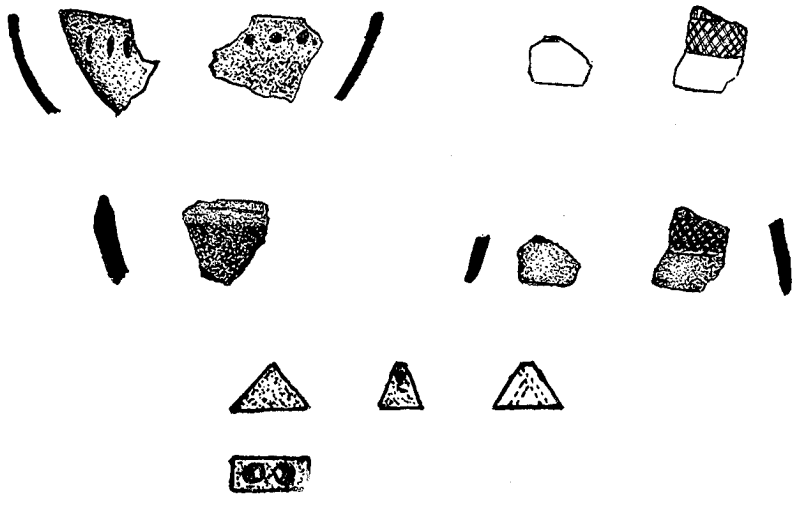

Fig. 4. — Cave of Los Muertos, Son Gallard. Beaker fragments and V perforate Button (1.840 ± 80 B. C.).

12. «*Cave of Muertos-Gallard*».

Excavation: Deyá Archaeological Museum.

Direction: W. Waldren - J. S. Kopper.

Level: 90 cms. Sector: Center rear.

Test materials: Charcoal.

Laboratory: Yale University Radiocarbon Laboratory.

Research Scientist: M. Stuiver.

Type of site: Rock shelter, lime pit burial typical of post-talayotic horizon. Ceramics of a crude technique which shows a degeneration in Talayotic ceramic technology. Forms show in some instances Roman influences. They consist of drinking vessels and cups with handles and scalloped rims, beaker like pitchers with lugs and crescent shape reliefs, all characterist of many other stations of the same chronology such as Illa de Porros, Son Mari, Antigors, etc.

Laboratory: Yale University Radiocarbon Laboratory.

Research Scientist: M. Stuiver.

Dates: 280 B. C. ± 100 yrs.

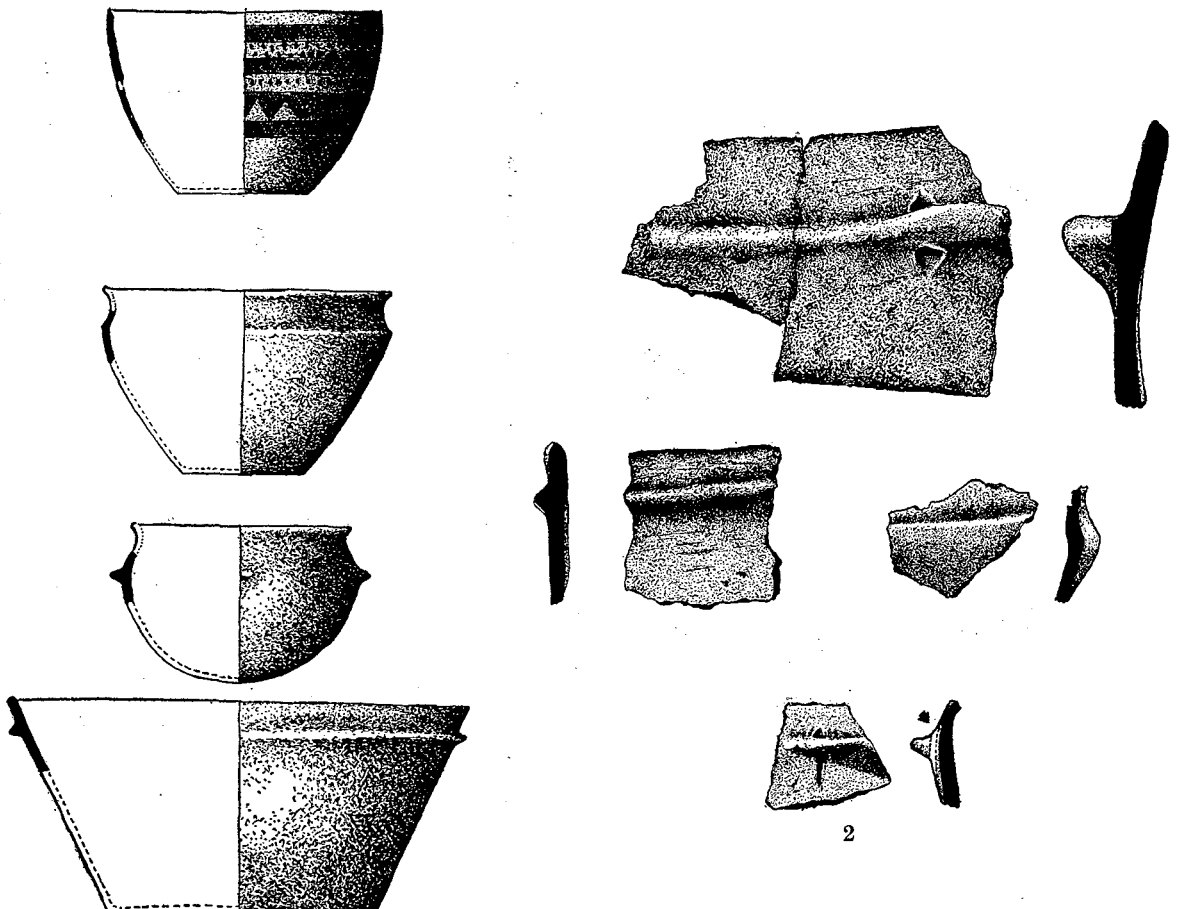

Fig. 5. — Cave of Los Muertos, Son Gallard. 1, Beaker ware and pretalayotic ceramics of same level in excavation (1.840 ± 80 B. C.). 2, Pretalayotic fragments associated with Beaker Sherds.

13. «*Cave of Son Puig*».

Excavation: Deyá Archaeological Museum.
Direction: W. Waldren - J. S. Kopper.
Level: 100 cms. Sector: Central.
Test materials: Humann bones.
Sample weight: 500 grams.

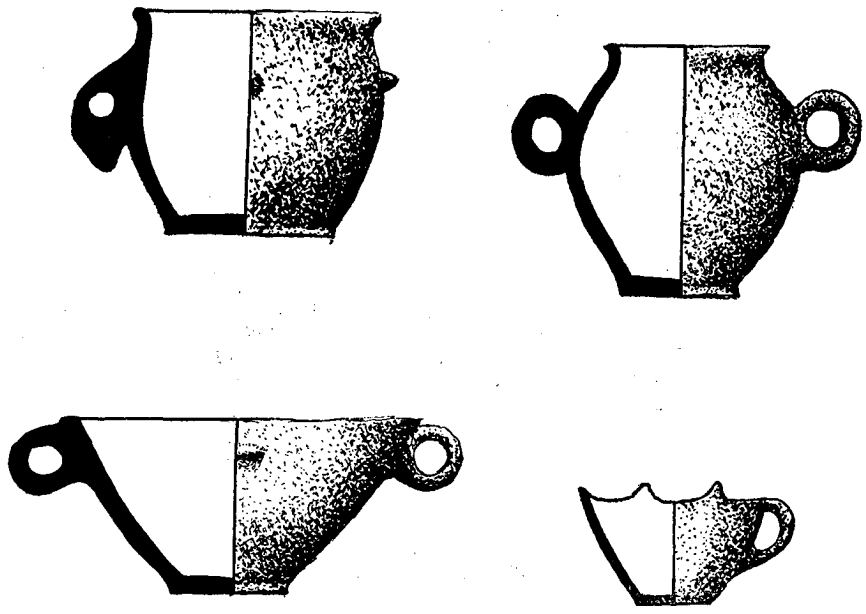

Fig. 6. — Cave of Los Muertos, Son Gallard. Post-talayotic ceramic of pit burial (280 ± 100 B. C.).

Type of site: Artificial cave cut from natural cave. Samples consisted of human bones associated with a globular ceramic form decorated with breast like lugs in groups of up to three or singular. The typology represents a ceramic style usually accredited to the pretalayotic epoch. The analysis results breaks with the traditional concept of the origin of the form. Two conclusions are suggested 1. That the ceramic style may represent the survival of ancient forms and may be only funerary ware and token ceramics. 2. that the cave may have been subject to contamination by filtrating ground water. The characterists of the ceramic pieces collected are extremely bad in their initial firing and their porousity is exceptional and could not possibly been used for cooking. The results of this test are most

unusual in that they indicate the survival of the form as symbolic cave goods and not as ceramics of everyday use.

Laboratory: Yale University Radiocarbon Laboratory.
Research Scientist: M. Stuiver.
Dates: 230 B. C. ± 80 yrs.

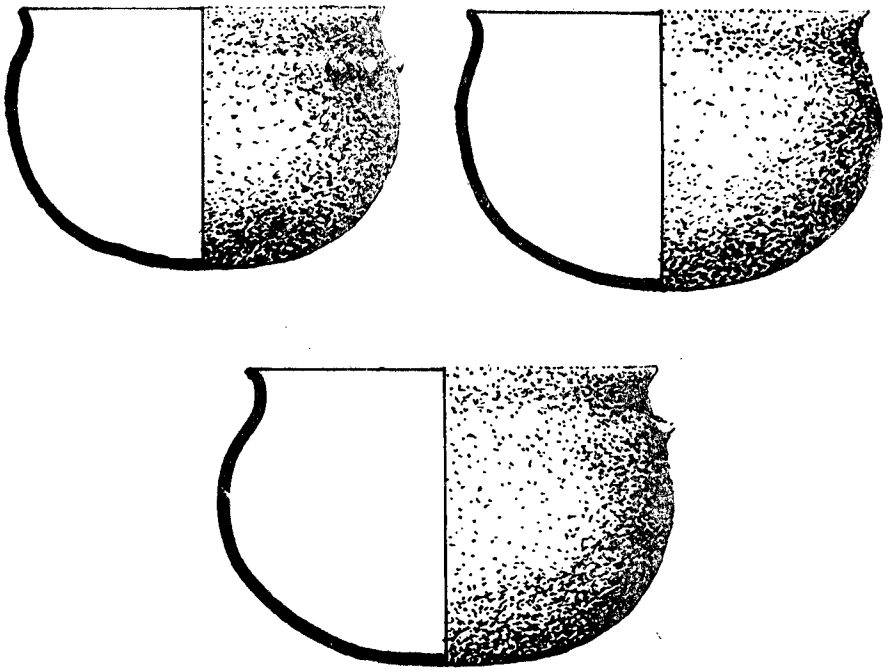

Fig. 7. — Cave of Son Puig. Ceramic style to the pretalayotic epoch, in that they indicate the survival of the form to the post-talayotic (230 ± 80 B. C.).

14. *«Es Figueral Son Real».*

Excavation: Museum of Mallorca.
Direction: G. Rosselló Bordoy - J. Camps Coll.
Level: Surface to 25 cms. Sector: Elevated platform.
Test materials: Charcoal.
Sample weight: 60 grams.

Type of site: Carbon samples mixed with Moorish ceramic sherds. The samples were taken from the complex of a Megalithic monument and are of known ceramic horizon. The analysis was used as an accuracy test. It is interesting to note that the dates correspond to the relative chronolgy of historically recorded times. They also illustrate the common utilization of Megalithic sites during the occupation of the island by the Moors.

Laboratory: Yale University Radiocarbon Laboratory.
Research Scientist: M. Stuiver.
Dates: 960 A. D. ± 80 yrs.

15. «*Cave of Muleta*» (Sóller).

Excavation: Deyá Archaeological Museum.
Direction: W. Waldren - J. S. Kopper.
Level: Pretalyotic. Sector: «C-D».
Test materials: Charcoal and charred bones.
Sample weight: 100 grams.
Type of site: Natural cave, habitational level, kitchen fires associated with bitroncoconic, highly burnished black ceramics, troncoconic and semispherical burnished reddish in color. This level was above the paleontological strata of the cave.
Laboratory: Yale University Radiocarbon Laboratory.
Research scientist: M. Stuiver.
Dates: 1960 B. C. ± 120 yrs.

16. *Talayot of Son Servera* (Manacor).

Excavation: Museum of Mallorca.
Direction: G. Rosselló Bordoy - J. Camps Coll.
Level: Habitation.
Test materials: Charcoal.
Sample weight: 100 grams.
Type of site: Talayot.
Laboratory: University of Pennsylvania Radiocarbon Laboratory.
Research scientist: R. Stuckenrath.
Dates: 1.310 B. C. ± 59 yrs.

The analysis results included in this publication, specially those directly related with comparative archaeological materials, are such that we have been able to establish intervals of 300-400 years between the horizons of the various stations under investigation. The framework is satisfactory as a beginning but it is by no means complete. In order to increase its value as a comparitive tool in the study of Mallorca prehistory, it will be necessary to obtain a score or more other radiocarbon dates from different sites within the context of the various stages. To properly document an area and its periods of prehistory by means of this new method, results must be carried out in great number from stations that have the requirements of stratigraphy as well as artifacts that clearly illustrate the diffferent phases in the development of the individual cultures.

With this in mind, it is the intention of this nucleus of a chronology to serve as the basis which will grow as future analysis and their

Fig. 8. — Cave of Son Puig. Post-talayotic ceramics, dated by C 14 at 230 B. C. ± 80 yrs.

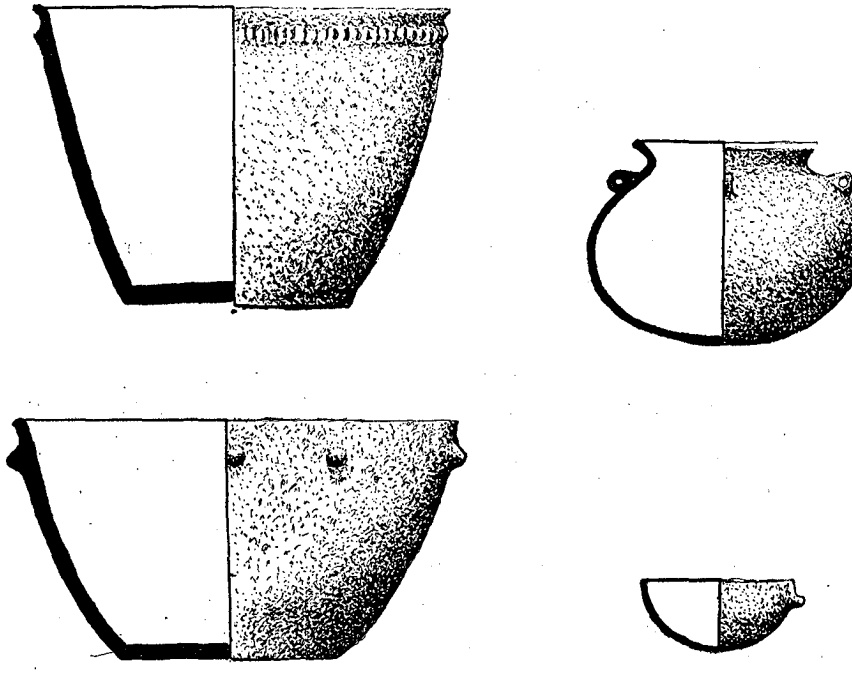

Fig. 9. — Cave of Son Marroig. Typology of pretalayotic ceramics, dated by C 14 at 1520 a. C. ± 80 yrs.

results are received. The value of the final outcome of the project is dependent on the addition of other datings.

It is the plan of the chronology to set before the consideration of Mallorca archaeology and archaeology in general a thoroughly documented insular area by the use of this method of correlation of datings and their materials. The variety and the extent of the archaeological record in the island prehistory of Mallorca requires this effort. As was earlier stated, insular archaeology can in many ways help to clarify some of the problems surrounding the traffic and currents of ancient civilizations that have occurred in this section of the western Mediterranean.

The isolation factor of the geographic location of the islands can work as an advantage in that they lie directly in the lanes of early cultural traffic from any directions. The results of these currents has left their evidence in the archaelogical record here. In many ways the remains of these early cultures are much clearer than in more widely influenced areas. In some cases the isolation factor of the island has allowed the individual development of the people it has housed, and allowed the outside influences that it has received to mix with the local elements, thus developing independent cultural movements.

Equal emphasis in radiocarbon documentation and investigation is called for within the larger limits of time involved in the early paleo-anthropological record. This is more difficult due to the present scarsity of materials. The few datings that we do have, as appear in the chronology, are the first indications of the conditions of the earliest life in the Balearics from the Quaternary until the initial stages of the Bronze Age in Mallorca. The important factor emerges that the paleontological testimony thus far must be re-evaluated. There are strong indications that would support a possible symbiosis having taken place between primitive man and the major form of mammalian life, known as the Myotragus balearicus. Furthermore the evidence suggests that primitive man may have had a hand in its final extinction. In all events it is certain that the animal went into final disappearance shortly before or shortly after the arrival of man.

The late survival of this animal which is found in a great many of the natural caves both on Mallorca and Minorca is absolutely certain. The radiocarbon analysis from Muleta shows that its survival was as late as 5,000 B. C. In more than one instance it has been found closely associated with materials accredited to the local initial stages of prehistory. These finds support the possible relationship having taken place and also leads us to believe that the Myotragus may have survived even later than is indicated in the Muleta deposit.

There is also the ever present possibility that man may have been the direct or indirect cause of its extinction.

With these views in mind, it becomes increasingly necessary that future excavation be on the lookout for signs that will illustrate the extent of this relationship.

As can be seen, the existing chronology by C14 contains a serious gap in the datings of about 1900 years, existing between the Beaker elements of Muertos-Gallard (1840 B. C.) and the anthropological specimens of Muleta (3,984 B. C.). Some help may be forthcoming from two analysis samples now being tested, originating from two levels in the Muleta stratification which represent a habitational level of pretalayotic origin and another true primitive goat level which was found directly below the pretalayotic and over the Myotragus deposit. When these results are received we may be able to fill in part of the 1900 year interval of which nothing is known.

The cave of Muleta has been an excellent example of stratification from which we have been able to draw a separate chronology from a single site. We may well be able to compare it to other single deposits in the future as well as to include it in a classical light within the general chronology of the island. It is hoped that these results will be available within the next few months.

The prospect of a single station chronology within a larger insular chronology will be of some comparative study use to the prehistory of Mallorca. It is certainly important to the overall future of Carbon 14 analysis and its applicable function of supplying absolute dates to a closed area of investigation such as an island, where its monuments and materials have been reasonably safeguarded against destruction during the course of the milleniums. In short the cave of Muleta has given us a chronology which may well offer us the dates required to further assess our chronology as a whole.

Muleta's deposit is not the first positive indication of man's relationship to extinct animal in the Baleares. The first discovery made along these lines appeared in 1962, just prior to the Muleta find and can be accredited to Guillermo Piedrabuena Florit of Minorca. He discovered Myotragus horns which showed signs of having been cut as a possible use for a tool. With these were also found ceramics of a very primitive construction, globular in shape and highly burnished.

As has already been mentioned, the Muleta finds are of a different nature as they consist of human specimens associated with the animal. The rudimentary industry in evidence appears in the form of flint blades and bone tools without ceramics. Unless the test results reasonably prove that there is some connection between the habitational

levels of Muleta (not shown in the stratigraphical evidence of Muleta) and the anthropological evidence, we have to asume that the Muleta inferior levels and their association with Myotragus are A-ceramic with the possibility of being Pre-ceramic.

Further indication of the relationship of man and extinct animal has been appearing in some of the excavations of the Museum of Mallorca under the direction of G. Rosselló Bordoy. He has found well preserved Myotragus remains in close proximity with materials of pretalayotic origin. This has appeared upon two occassions in his excavations. The materials in the form of unfossilized bones comparable to any of the Muleta materials were not however directly associated with pretalayotic materials, unfortunately. Their proximity, nevertheless is strikingly notable in that they relate to the oldest story in the science of archaeology... Primitive man and extinct animal.

We have no direct or positive information as to the cause of the final extinction of the Myotragus. We do, however, have sure evidence of its survival as late as 5,000 B. C. Hitherto, it has been assumed that its disappearance occurred somewhere in the approximity of 20,000 years ago during the post-Wurmian period.

The cave of Muleta and its deposit of over 1,500 examples of Myotragus in a fine state of preservation are testimony enough for its late survival. When viewed with other recent discoveries of a similar stage of conservation in their situation, it is possible to open a few of the vistas of the past and free some of the restricted limits and aspects of Mallorca prehistory. The paleo-anthro-archaeological panorama needs reconsideration if the multiple aspects of insular archaeology are to establish a workable pattern. In turn a discipline involving new techniques and methods which are available to the insular archaeologist, scholar, scientist and excavator must be utilized for the benefit of the science as a whole.

New techniques must undergo a time of probation while their various disciplines take root as well as develop. The present effort is offered with this in mind. Radiocarbon analysis is a new technique as it is a new tool to aid the investigator. Any method envolved in age determination of materials is subject to reservations as well as strict disciplines. Like any other tool it has its limitations, but at the same time, it can aid us in our attempt to comprehend the past.

The continued utilization of the technique of radiocarbon analysis in the realm of relative, correlated typology can help us in a more comprehensive systematic study of prehistoric events.

Any chronology based on absolute datings must employ a definate pattern in order to sustain itself and grow in order to arrive in validity. The present chronology takes into consideration the fo-

llowing divisions. The purpose of which is to introduce into its thinking the listed terms:

1. «Pocket», chronologies. Single stations.
2. «Insular», chronologies. Limited areas.
3. «Continental», chronologies. Open land masses.
4. «Intercontinental», chonologies. Not applied here.

These terms appear as the divisions within the system in order to organize them and make available to insular archaeology the particular type of hypothesis used in its formation.

The stress that is made in this hypothesis and its relationship to the above proposed system for establishing small chronologies to later be incorporated in larger ones, is conveniently adapted as a tool. In this case the tool is the method of radiocarbon analysis. Its purpose is an aid to comparative study of typology as well as exploring the odd placed materials found outside the range of attested evidence.

The published information given, here, in the form of absolute dates, appears simply as a nucleus which for the present remains open. Its realization is owed to University faculty heads whom have seen fit to dedicate time and the use of their specific facilities to the efforts of this particular survey.

The foremost conclusion that can be arrived at in this presented chronology is the accurracy with which the results have supported the forerunning relative timetables set down by the past investigators as well as to ascertain specific aspects of insular happenings outside the assumed limits of its prehistory.

The findings arrived at through the application of the method of radiocarbon age determination have been accurate enough to warrant its continued use. It has also enhanced the prospects of future excavation along with presenting definate aid to continental investigation. This form of scientific survey when applied to insular outside influences and locally developed cultures, their monuments, prehistoric caves and paleo-anthropological deposits, could lead to a definate reference of events. The final criteria of this present survey offers itself as a beginning toward a union of the various elements that have gone into what we know as insular prehistory. Its ultimate objective is the employment of a new method placed at the disposition of science in order to understand the prehistoric happenings here and elsewhere.

RADIOCARBON CHRONOLOGY FOR MALLORCA PREHISTORY

1	2	3	4	5	6	7
5.498 B. C. + or — 1.180	8.736 B. C. + or — 3.517	5.184 B. C. + or — 80	3.984 B. C. + or — 109	1.840 B. C. + or — 80	1.520 B. C. + or — 80	1.050 B. C. + or — 120
85 grms	39,5 grms	500 grms	500 grms	100 grms	500 grms	60 grms
BONE	BONE	BONE	BONE	CHARCOAL	BONE	CHARCOAL
W. Waldren J. Kopper	W. Waldren J. Kopper	W. Waldren J. Kopper	W. Waldren J. Kopper	W. Waldren J. Kopper	W. Waldren J. Kopper	G. R. Bordoy W. Waldren J. Kopper
MULETA	MULETA	MULETA	MULETA	MUERTOS - GALLARD	SON MARROIG	SON REAL - FIGUERAL

8	11	12	13	14	15	16
1.010 B. C. + or — 80	480 B. C. + or — 200	280 B. C. + or — 100	230 B. C. + or — 80	960 A. D. + or — 80	1.960 B. C. + or — 120	1.310 B. C. ± 59
60 grms	?	400 grms	500 grms	60 grms	80 grms	100 grms
CHARCOAL	CHARCOAL	CHARCOAL	BONE	CHARCOAL	CHARCOAL BONE	CHARCOAL
G. R. Bordoy W. Waldren J. Kopper	M. Tarradell	W. Waldren J. Kopper	W. Waldren J. Kopper	G. R. Bordoy W. Waldren J. Kopper	W. Waldren J. S. Kopper	G. R. Bordoy W. Waldren J. Kopper
SON REAL - FIGUERAL	ILLA DELS PORROS	MUERTOS - GALLARD	SON PUIG	SON REAL - FIGUERAL	MULETA	SON SERVERA

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