

The Chronology of Las Palmas Culture: New Radiocarbon Dates on Non-human Terrestrial Materials from William Massey's Cave Burial Sites

Joe D. Stewart, J. Eldon Molto and Paula J. Reimer

Abstract

This paper reports on 13 radiocarbon dates from Las Palmas Culture cave burial sites in the Cape region of Baja California Sur, 12 from three caves excavated by William Massey and one from another cave. These dates are on terrestrial materials associated with bundle burials as wrappings and grave goods. Dates on some human and possibly marine feeding bird samples are excluded from this analysis because of uncertainties regarding marine reservoir effects on the dating of materials containing carbon of marine origin. We plan to include such dates in a future study of reservoir effects. Statistical analysis of the uncalibrated dates reported here defines two statistical groupings and one outlier. The calibrated 2-sigma age ranges for the two groups together suggest a time span for the Las Palmas Culture burial pattern from about A.D. 1200 or older to about A.D. 1700. Two dates possibly extend into the Jesuit period, beginning in A.D. 1720, although the probabilities for these intercepts are low, which is consistent with the lack of mention of the Las Palmas funerary complex in Jesuit records.

Abstracto

Este papel presenta sobre 13 sitios del entierro en las cuevas de la cultura de las Palmas de la forma de las fechas del radiocarbono en la región del cabo de Baja California Sur, 12 a partir de tres cuevas excavadas por William Massey y una de otra cueva. Estas fechas están en los materiales terrestres asociados a entierros del manojito como embalajes y alimentos del sepulcro. Las fechas en algunas muestras de alimentación marinas humanas y posibles del pajarito se excluyen de este análisis debido a incertidumbres con respecto a efectos marinos del depósito sobre fechar de los materiales que contienen el carbón del origen marino. Planeamos incluir tales fechas en un estudio futuro de los efectos del depósito. El análisis estadístico de las fechas sin calibrar señaladas aquí define dos grupos estadísticos y un afloramiento. Los rangos calibrados de la edad 2-sigma para los dos grupos juntos sugieren una duración para el modelo del entierro de la cultura de las Palmas alrededor de A.D. 1200 o más viejo alrededor a A.D. 1700. Dos fechas posibles extienden en el período de las Jesuitas, comenzando en A.D. 1720, aunque las probabilidades para estas interceptaciones son bajas, que es constante con la carencia de la mención del complejo funerario de las Palmas en los expedientes de las Jesuitas.

William Massey (1955, 1966) defined the Las Palmas Culture of the Cape region of Baja California (Fig. 1) on the basis of cave burial data. The data derive mostly from three caves Massey excavated — BC 75 (on Cerro Cuevoso near Cabo Pulmo), BC 111 (in the Cañada de la Huertita near Punta Pescadero) and BC 114 (Piedra Gorda, near Bahía de las Palmas and Buena Vista). This paper addresses the chronology of these sites, using 13 radiocarbon dates

on burial wrappings and grave goods from these caves, plus one sample from a cave not excavated by Massey at Cabo San Lucas (CSL). Massey found no evidence of habitation nor any evidence that any of his excavated caves was used for purposes other than mortuary. Although Massey felt that lithics surface collected from the region's open sites ultimately had a Great Basin origin with considerable antiquity, lithics did not occur in the cave burial contexts, nor were the kinds of objects used as burial goods, other than shells, found in the open sites. Thus, it was not possible to associate the Las Palmas cave burial pattern securely with other archaeological manifestations in the region.

Perhaps the most suggestive evidence of a link between the Las Palmas burial caves and other types of sites comes from Makoto Kowta's (1968) survey of the La Paz Bay area, part of the region that Massey had examined. Kowta found numerous habitation and limited activity sites, mostly open sites but including three small rockshelters. Most of the sites are in the

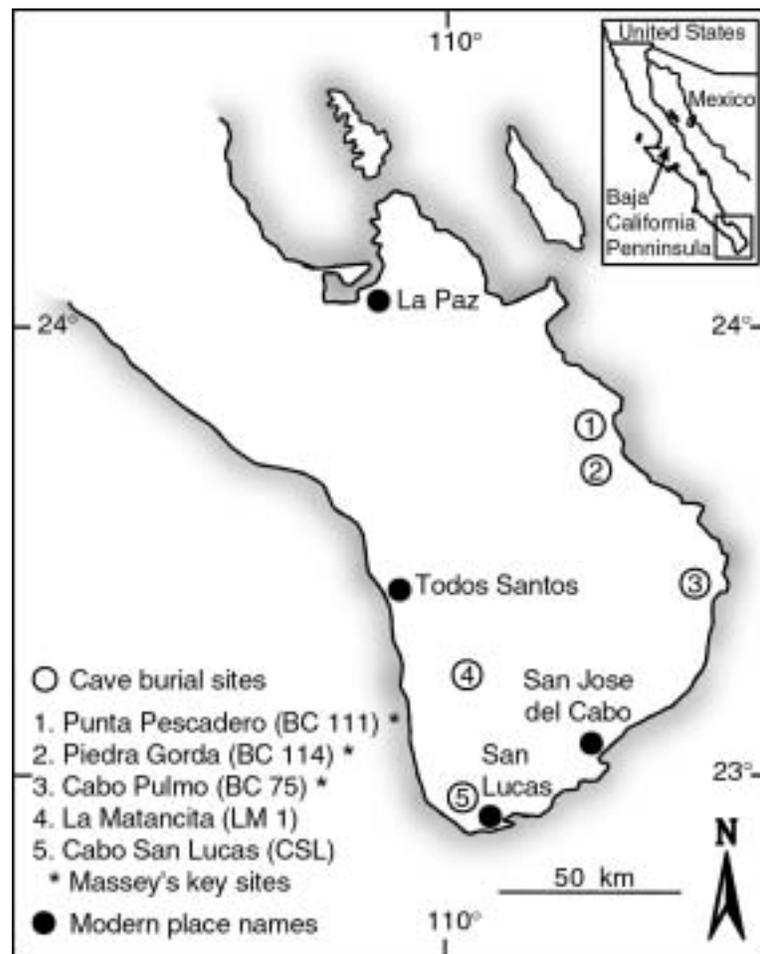


Fig 1. Map showing locations of the five Las Palmas cave burial sites discussed in the text.

coastal zone, including large habitation/shell midden sites at the base of highlands adjacent to sand beaches. Kowta reports:

One of the larger sites associated with a highly eroded sedimentary formation yielded a few pieces of weathered long bones stained red, presumably remnants of a secondary human burial of the type characteristic of the Las Palmas Culture. This was the only non-recent burial encountered during the survey (Kowta 1968:21). Burials are represented by several bone fragments with red ochre stains from a small rockshelter associated with one of the larger coastal middens (Kowta 1968:30).

In more recent work, Fujita (1991, 1993, 1994a, 1994b, 1995a, 1995b, 1997) has registered more than 175 sites in the Cape region of the peninsula, and on nearby Isla Espíritu Santo (Fujita and Poyatos de Paz 1998), mostly coastal shell middens, some with burials. She also reports cave sites, some exclusively funerary, like Massey's caves, but others used for both habitation and burial or for habitation only. Still, it remains difficult to cross-date the Las Palmas mortuary pattern with open sites, especially since some of the shell middens, such as El Conchalito in La Paz, appear to pre-date the time range of the Las Palmas Culture.

Massey posited that the elaborate Las Palmas mortuary pattern was likely intrusive into the Cape region from mainland Mexico, although he did not rule out *in situ* development (Massey 1955:342). The temporal span of this mortuary practice was unknown. The Las Palmas cave burial pattern is characterized by one primary burial at BC 75 (Fig. 2) and BC 111 (Fig. 3) but two at BC 114 (Fig. 4), plus several secondary burials at all three sites (Massey 1955; Carmean and Molto 1991). The following summary descriptions of the burials are based on Massey (1955), while the sex and age estimates are from Carmean and Molto (1991).

A primary burial, as recognized by Massey, typically consisted of an unpainted, well articulated skeleton, flexed and bound with palm fiber braid, although one of the two primaries at BC 114 was extended rather than flexed. The primary at BC 75, a male aged approximately 19 years, was wrapped in a bundle of palm fiber mats tied together and containing a variety of grave goods. At BC 111 the secondary burial of a three year old was interred in the same tied palm bark bundle as the primary five year old and each had its own oyster shell ornaments. Only the skeleton of the primary was tied in flexed attitude. At BC 114, the tied, flexed primary burial of a female approximately 38 years old was laid on a bed of palm fronds and bark but was not bundled. The other primary burial, an unsexed three year old, differed from the pattern in being extended and, instead of palm wrappings, in being covered with two badger skins inside a tied deer skin bundle. Both primaries had a variety of grave goods.

A secondary burial, as recognized by Massey, consisted of disarticulated remains of an individual that had been redeposited from some other unknown context into the location found by Massey. Secondary burials were sometimes bundled similarly to primaries, some had grave

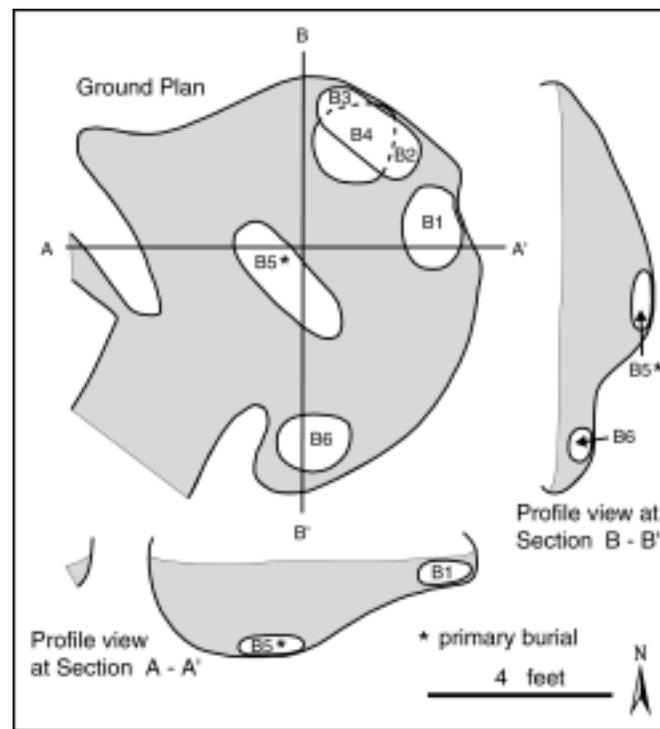


Fig. 2. Plan and profile of site BC 75, showing locations of burials, after Massey (1955), simplified.

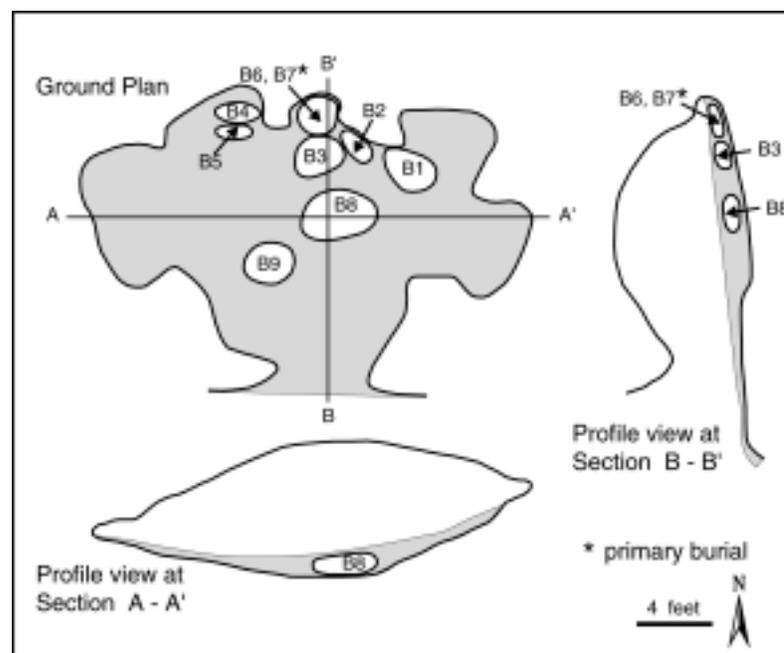


Fig. 3. Plan and profile of site BC 111, showing locations of burials, after Massey (1955), simplified.

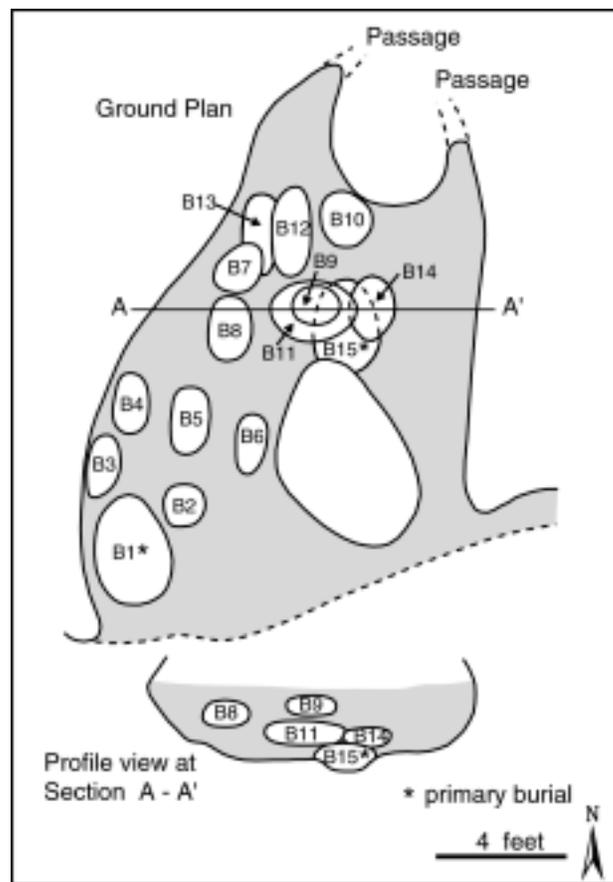


Fig. 4. Plan and profile of site BC 114, showing locations of burials, after Massey (1955), simplified.

goods and some did not, and some were painted with red ochre and some were not. Individuals were of both sexes and various ages.

Grave goods, when present in secondary burials, were less varied or elaborate than with primaries at BC 75 and BC 114, but not at BC 111. Otherwise, there seem to be few, if any, correlations among the variables of sex, age, burial wrappings, or presence/absence of grave goods, either within or between the primary and secondary burial types (Carmean and Molto 1991). Only secondary burials were painted with red ochre but, again, no correlation with other variables is apparent.

The burial caves are small and the burials are often closely spaced, sometimes actually in contact. In some cases, the relative positioning of the burials indicates a sequence of interment, but such sequences might represent a single mortuary event. Stratification was virtually nil, limiting the development of relative chronology. Some secondary burials had either supernumerary or missing bones and, in at least one case at BC 75, this seemed to indicate

some sort of “connection” between two widely separated secondaries (Massey 1955:65). This and other specifics of distributions of bones suggested some degree of disturbance and displacement of bones of some secondary burials. In general, however, the contexts seemed little disturbed, especially at BC 75 and BC 111. BC 114, the cave with the most burials, showed the most evidence of disturbance and displacement, although it was largely undisturbed. Within any given cave, then, Massey had little basis for relative chronology and no chronometric dates, as he did not use radiocarbon dating, then in its infancy. This left open possibilities that the burials in a cave might be anywhere from accretionary over a relatively long time span to brief single mortuary events.

Massey reasoned that the primary burials represented stashed members of Las Palmas society, since these burials generally were accompanied by the most grave goods, including many items of presumed high status. This is illustrated by Massey’s description of Burial 1 (B1), a young adult female from his largest cave site, BC 114.

This was the burial of a single adult individual. The bones lay in the mouth of the cave (Fig. 4) at a depth of two feet (?) below the surface. The burial was tightly flexed, with knees and hands drawn up on a level with the skull. It lay on its right side, oriented north-south, with the skull on the north. Grave size was thirty-eight inches north-south by thirty-six inches east-west. A curious feature of the burial was the position of the skull; it was turned to face east. The possibilities are numerous: the neck may have been broken, or the head may have been face up and have turned to a reverse position with decomposition after death, etc. There were a few infant bones found below and to the east of the pelvis.

There was an unusually rich quantity of artifacts found with this burial. On the skull, in the position of a cap, were two coiled baskets, one within the other (3-12976, a, a). The entire burial had been laid on a layer of palm fronds and bark. There was no evidence that the burial had been covered with mats or fronds. The flexed burial had very clearly been bound tightly around the legs and thorax with three-strand palm-fiber braid (3-12966) of which there were fragments *in situ*. In position in the neck region lay four oyster shell ornaments close together and all with the stringing hole in the direction of the head (3-12971, a-d). Clearly the four had been strung together as a necklace. Beneath the pelvis to the west were several unworked *Pecten*, cowrie, and other shells. On the east edge of the burial area and touching the bones of the burial, lay a large feather artifact (3-12973); two oyster-shell ornaments (3-13019, a, b) lay beneath it on which were some feathers and *Olivella* beads (3-13018, 3-13020).

Scattered among the bones were small fragments of charcoal and some carbon in the dust; a few of the bones were slightly burned. Apparently there had been pre-interment burning of the corpse. If so, it had not been performed in the final burial pit, for the perishable artifacts around and over the bones bore no trace of fire. The bones of this burial were not painted nor stained with ocher (Massey 1955:137-138).

This site (BC 114) is noteworthy as it is the only one of the three cave sites with two primary burials. As with all known Las Palmas sites, the majority of burials were secondary and most (about 70 per cent) were heavily painted with red ochre. Massey felt that the secondary burials were those of recently deceased individuals who were partially desiccated and were stripped of flesh prior to the painting. He suggested that the burials in this site (and other Las Palmas cave sites) were accretionary over time:

Clearly it was one of the favorite burial sites for some nearby group, because burials were numerous and older inhumations were frequently disturbed and parts scattered through the deposit for subsequent burials (Massey 1955:125).

Carmean and Molto (1991) have suggested the alternative possibility that some cave burial episodes may have been singular events triggered by the death of important persons. They suggest that burials of long deceased persons were exhumed, treated with ochre, wrapped in palms and taken to a remote, possibly secret, location for burial with the body of an individual of high status.

Massey did not alter any of his early interpretations of the dating and patterning of the burial cave sites in sequel publications (e.g., Massey 1966) prior to his death in 1976. To our knowledge, he never submitted bone or other organic samples from his three key caves for dating. Tyson (1977) provided the first Las Palmas radiocarbon date from a cave at Cabo San Lucas (CSL in Table 1), which yielded a pre-European contact date. She suggested that the Las Palmas burial custom might have been abandoned prior to European contact, since the ceremonialism was not described in the ethnohistoric documents. Her hypothesis was fueled, in part, by the radiocarbon date and her interpretation of the Las Palmas population as having been in decline in general health and demographics prior to European contact, which led to a breakdown in the ceremonial aspects of their culture. A radiocarbon date of 3120 ± 150 on a shell sample (LJ-596) from La Paz, reported by Moriarty (1968:30), is not included in this study, as it is from a shell midden for which there is no reason to assume belongs to or is contemporaneous with Las Palmas Culture. Moreover, although allegedly associated with artifacts and human skeletons, the sample was not professionally collected and its exact context is unclear.

More recently, three radiocarbon assays on secondary red painted skeletons from BC 114, BC 111 and LM 1 have been reported in the literature (Carmean and Molto 1991; Molto and Kennedy 1991; Molto and Fujita 1995). Molto et al. (1997) used these three dates in a simulation to draw attention to potential problems in dating human bone from the Cape region, due to marine "reservoir effect." We now have several additional human bone collagen dates, as well as dates on associated terrestrial materials, but the results are not fully consistent with our expectations and are difficult to evaluate at this time. Although we discussed these dates in a conference version of the present paper (Stewart and Molto 1998),

Table 1. Las Palmas radiocarbon dates on non-human terrestrial materials from cave burial bundles, calibrated by CALIB 3.0.3c (Stuiver and Reimer 1993a, 1993b), Method B (with probabilities), using the bidecadal atmospheric calibration data set.

Site	Burial No. (Massey's nos. for BC 75, 111, & 114)	Massey catalog number	Lab No.	Sample material	¹⁴ C Age B.P.	1-sigma error	Calendar age(s) A.D.
BC 75	B5 (primary)	12762	TO-6101	palm braid	430	60	1449
BC 75	B5 (primary)	12733	TO-6098	<i>Antigonum leptopus</i> seed	290	60	1644
BC 75	B4	12769	TO-6781	cane	710	120	1290
BC 111	B?	12961	TO-6775	palm braid	720	60	1288
BC 111	B3	12958	TO-6776	palm braid	1250	80	779
BC 111	B4	12962 (a or b?)	TO-6102	(a) palmilla bundle; (b) palm braid	390	60	1478
BC 111	B7 (primary)	no number	TO-6099	palm frond	370	60	1488, 1609, 1611
BC 111	B8	12960	TO-6778	palm braid	490	70	1433
BC 114	B1 (primary)	no number	TO-6100	palm frond	660	60	1302
BC 114	B8	12983	TO-6777	palm braid	760	70	1280
BC 114	B15 (primary)	no number	TO-5336	palmilla frond	260	50	1654
BC 114	B15 (primary)	13010	TO-5335	badger hair	270	90	1651
CSL	—	—	LJ-3572	plant braid: palm? yucca?	530	60	1415

they are not reported here, where our purpose is to give the best interpretation of Las Palmas Culture chronology possible with available data.

These problematic dates are to be included in a future study of reservoir effects. Detailed discussion of reservoir effect is, therefore, beyond the scope of the present paper. Briefly, however, the problem is that “old carbon” that is depleted in ¹⁴C upwells from the deep ocean and becomes incorporated into the marine food chain, theoretically making radiocarbon dates on samples containing carbon of marine origin appear older than their actual age. This has

been demonstrated for shells of documented “pre-bomb” historical and archaeological age (e.g., Berger et al. 1966; Little 1993; Higham and Hogg 1995) and modern marine organisms (Druffel and Williams 1991). Theoretically, this reservoir effect also should be operative in terrestrial tissues that incorporate some carbon of marine origin via the food web. It is possible to obtain a “reservoir corrected age” (Stuiver and Polach 1977:356-357) which takes into account both a global and a local reservoir correction (Stuiver and Braziunas 1993), when calibrating radiocarbon ages of samples containing a known percentage of carbon of marine origin (Stuiver and Reimer 1993a, 1993b). Human bone from the Cape region presents a difficult problem in that the percent marine carbon in the collagen must be extrapolated from an estimate of percent marine carbon ingested as food. Various lines of evidence, including a major paleodietary study in progress, using stable carbon and nitrogen isotope ratios (Schober 1998; Schober et al. 1995), may make this possible eventually. However, it is premature to make such estimates at present.

As well, there are certain theoretical issues, for example, concerning how reservoir effects measured in shells translate into values for the shellfish flesh, which was a major constituent in the Las Palmas human diet. Little work appears to have been done on this (see Hogg, et al. 1998 for two shell/meat ^{14}C activity comparisons for coastal New Zealand). Finally, reservoir effects in shells from the Sea of Cortez, or Gulf of California, and the Pacific Ocean around Baja California, are both highly pronounced and highly variable (Berger et al. 1966; Goodfriend and Flessa 1997). In addition to the shell data, there is evidence from sediments in the central Gulf for a decrease in upwelling and the reservoir effect especially over the last few centuries (DeMaster and Turekian 1987; Juillet-Leclerc and Schrader 1987). For the Santa Barbara Channel, far to the north in California, Kennett et al. (1997) present evidence of significant short and long term variations in reservoir effects during the early to middle Holocene, and they also note that there are seasonal variations (see, also, Druffel and Williams 1991:292, citing Sverdrup et al. 1942:131-132, 724-727). There are no data of this nature for the Cape region of Baja California but these potential complications should be recognized. Given these uncertainties, we feel that interpreting the problematic bone dates (as well as three dates of feathers, possibly from marine feeders) is not wise at this time. Similar puzzling results have been reported from the central desert region of the peninsula (King 1997). Consideration of all these problems leads us, at this juncture, to use only the 13 dates known to be on purely terrestrial samples in interpreting the Las Palmas chronology.

Materials and Methods

The samples of terrestrial materials associated with the burials as wrappings or grave goods were gathered at the Phoebe Hearst Museum (formerly Lowie Museum), Berkeley, California. The human remains had been moved from there to Mexico in the 1960s (Rose Tyson, personal communication 1998). Details regarding the sites and samples are given in Table 1. All radiocarbon samples were assayed, using normal precision, by the AMS method at IsoTrace Laboratory, University of Toronto, except for the decay type date, LJ-3572, run at La Jolla. Statisti-

cal analysis and calibration of the results were carried out with program CALIB Rev. 3.0.3c for DOS, using Method B, that is, with probabilities calculated for samples with multiple cal (calibrated) age range intercepts (Stuiver and Reimer 1993a, 1993b).

The 13 samples are from Las Palmas Culture cave burial sites, 11 from Massey's three main sites (BC 75, BC 111 and BC 114), plus one from La Matancita (LM 1) and another collected from another cave at Cabo San Lucas (CSL) by a local person. The CSL specimen is judged to belong to the Las Palmas Culture on the basis of the presence of palm fronds and red ochre covered bones (Tyson 1977). Samples were chosen to represent a cross-section of the Las Palmas burial practice and include items associated with both primary and secondary interments, unpainted and red ochre painted individuals, single and multiple burials, a range of bundle preparations and grave goods, and individuals of both sexes and various ages.

The design of this dating project rests on certain assumptions and present understandings of the archaeological and ethnohistoric records. (a) From our reading of Massey, the archaeological contexts and associations of the samples have high integrity. (b) The paired burial bones and associated organic items are contemporaneous. Of course, bones in secondary burials are actually older than their burial wrappings and we really have no way of knowing whether such differences would be apparent by radiocarbon dating. We use the T' statistic of Ward and Wilson (1978) as programmed in CALIB in testing for contemporaneous dates in radiocarbon time. By this test, groups of two or more dates that are statistically the same can be identified and statistical outliers excluded.

Results

Testing of the 13 uncalibrated dates on terrestrial materials results in two statistical groupings and a single remotely early outlier (Table 2; Fig. 5). The five samples in Group I include a sample from each of the following: (1) secondary burial B4 at BC 75; (2) secondary burial B? (we are unable to ascertain Massey's burial number) at BC 111; (3) one of the two primaries at BC 114 (B1); (4) secondary B8 at BC 114; and (5) the unnamed cave at Cabo San Lucas (CSL). The five Group I dates range from 760 ± 70 to 530 ± 60 BP, with a pooled mean of 663 ± 31 BP. The seven samples in Group II include two from primary B5 at BC 75, one from primary B7 at BC 111, two from secondaries B4 and B8 at BC 111, and two from B15 which is one of the primaries at BC 114. The seven dates range from 490 ± 70 to 290 ± 60 BP, with a pooled mean of 345 ± 23 BP. The outlier is a palm braid from B3 at BC 111, with a result of 1250 ± 90 BP, for which we have no explanation.

In addition to the T' tests which define the two statistical groups, I and II, Table 2 gives, for each cave, the single date, or the pooled average (A_p), that form(s) the statistical subgroup(s) for that cave. As well, it gives the T' tests and pooled averages of all samples from all caves taken together for each statistical group. For Group II, where all three of Massey's caves are represented by independent subgroups of dates, it is also possible to sum the T statistic for the

Table 2. Statistical groupings I and II of radiocarbon dates on non-human terrestrial materials from Las Palmas cave burial bundles.

Site	Pure Terrestrial Group I	Pure Terrestrial Group II
BC 75	n=1: TO-6781, B4 710 ±120	n=2: TO-6098, B5*; TO-6101, B5* A _p = 359 ± 43 T' 2.66 < χ ² 3.84
BC 111	n=1: TO-6775, B? 720 ± 60	n=3: TO-6102, B4; TO-6099, B7*; TO-6778, B8 A _p = 409 ± 37 T' 1.81 < χ ² 5.99
BC 114	n=2: TO-6100, B1*; TO-6777, B8 A _p = 701 ± 47 T' 1.12 < χ ² 3.84	n=2: TO-5336, B15*; TO-5335, B15* A _p = 264 ± 39 T' 0.02 < χ ² 3.84
CSL (cave at Cabo San Lucas)	n=1: LJ-3572 530 ± 60	n=0
All Sites	n=5 A _p = 663 ± 31 T' 7.48 < χ ² 9.49 cal age(s) AD: 1302 1-sigma cal age range(s) AD: 1293-1311 (.34); 1352-1386 (.66) 2-sigma cal age range(s) AD: 1287-1325 (.38); 1335-1395 (.62)	n=7 A _p = 345 ± 23 T' 12.07 < χ ² 12.60 Σ T' 4.49 < χ ² df4 9.49 cal age(s) AD: 1518, 1580, 1624 1-sigma cal age range(s) AD: 1499-1527 (.27); 1554-1604 (.53); 1614-1633 (.20) 2-sigma cal age range(s) AD: 1485-1636 (1.00)

Statistical groupings are based on the T' statistic, tested against Chi-square (χ²) distribution on n-1 degrees of freedom at the p, 0.05 significance level (Ward and Wilson 1978), as programmed in CALIB 3.0.3c (Stuiver and Reimer 1993a, 1993b). Dates are in radiocarbon years BP. Values for groups consisting of more than one sample are pooled averages (A_p) with standard deviations. B# denotes Massey's (1955) burial number. Asterisks (*) denote primary burials. Calibrations are by CALIB 3.0.3c, using the bidecadal atmospheric calibration data set.

subgroups and to test ΣT' against χ² at the appropriate degrees of freedom (Ward and Wilson 1978:28). In Table 2, the result of this procedure reinforces the overall statistical consistency of Group II. Finally, Table 2 also gives the 1-and 2-sigma cal age ranges of the pooled averages of the two statistical groups. While the latter could be graphed, we think the data are better represented by their ranges, that is, by graphs of the individual cal age ranges, as discussed below.

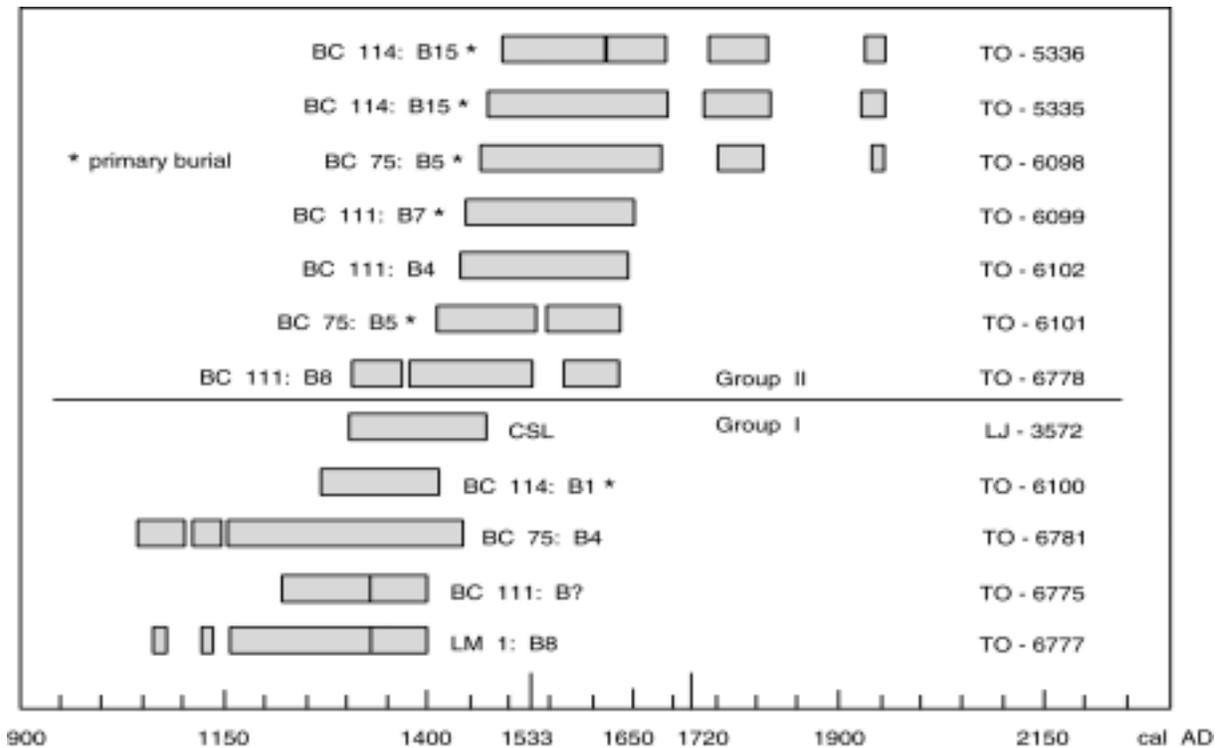


Fig. 5. 2-sigma cal age ranges of 12 radiocarbon dates on terrestrial materials from Las Palmas burial bundles, calibrated by Method B of program CALIB Rev. 3.0.3c, using the bidecadal atmospheric calibration data set. Remote statistical outlier, TO-6776 (see Table 1) is omitted. Horizontal line marks division between statistical Groups I and II, as defined by statistical testing of the radiocarbon ages with 1-sigma errors prior to calibration. Vertical lines indicate first European contact at A.D. 1533 and beginning of the Jesuit period at A.D. 1720.

Discussion

Our results allow for a more informed consideration of the chronology of the Las Palmas Culture and funerary pattern than was possible prior to the availability of radiocarbon dates. The graphed 2-sigma cal age ranges (Fig. 5) indicate that the Las Palmas cave sites traversed the pre-contact and historic periods. Group I entirely predates earliest European contact in A.D. 1533. Group II spans pre-contact and pre-Jesuit historic time, with a relatively small probability of extending into the Jesuit period (for probabilities associated with multiple intercepts, see Table 1). The fact that the late primary burial B15 at BC 114 was extended rather than flexed may be an anomaly for Las Palmas Culture or may be due to European missionary influence, as this is the only known extended Las Palmas cave burial. However, extended burials do occur in prehistoric open shell midden sites in the Cape region, including, for example, Burial 8 at the El Conchalito site excavated by the Las Palmas Bioarchaeological Project in 1995. The low probability intercepts in the A.D. 1900s are historically impossible.

What is the meaning of the statistical separation of Groups I and II? We suspect that it reflects limited sampling rather than some sort of temporal hiatus, for the following reasons. (1) Our analysis represents a conservative approach, in that the statistical testing of the uncalibrated dates is based on means and 1-sigma errors (Table 2), while our evaluation of individual dates is based on 2-sigma cal age ranges, which overlap between the two groupings (Fig. 5). (2) All three of Massey's caves are represented in both groupings, and BC 114 dates bracket virtually the entire time span of the two groupings. (3) There is no evidence of any break in the Las Palmas burial pattern over the entire time span.

Excluding the early statistical outlier from BC 111, the dates presented here suggest an inception of the Las Palmas mortuary pattern by ca. A.D. 1300 and possibly as early as ca. A.D. 1050, and lasting until ca. A.D. 1650 and possibly until the late A.D. 1700s. Thus, Massey (1955) appears to have been partially correct in suggesting that the Las Palmas mortuary pattern was a late pre-contact mortuary custom of the Cape region. How he developed this interpretation in the absence of chronometric dating is unknown. However, the mortuary pattern may have more time depth than Massey thought. Tuohy and Van Wormer have suggested that "It hardly seems likely that the shallow time depth presently perceived for the Las Palmas Culture will be sustained as more archaeological work is carried out in the Cape region" (Tuohy and Van Wormer 1995:90).

Can these dates be used to address the question of whether the cave sites represent single or accretionary mortuary events? This involves several difficult considerations. For example, first, there is the problem of little to no stratification, as noted earlier. Second, what is the relationship between primary and secondary burials? Were secondary burials ever made for their own sake, or was the purpose of secondary burial always that of accompanying a primary? The latter seems to make more intuitive sense but, if true, what span of time is represented by the deaths of all the individuals involved? Is it long enough to be temporally differentiated by normal precision radiocarbon dating (two to three centuries, according to Taylor 1987:141)?

Massey's interpretation of BC 114 as being an accretionary site is supported by the radiocarbon dating and in part by the contextual evidence and spatial patterning (Fig. 4). There is only a probability of .01 that the 2-sigma cal age ranges for the palm frond from early primary burial, B1, overlaps that of the later primary, B15, suggesting a prolonged use of this burial cave. Primary B1 and several secondaries (B2, B3, B4, B5 and B6) seem to form a spatial cluster, somewhat removed from another cluster formed by the bundled double secondary (B8) and other secondaries (B10, B12 and B13). However, despite spatial separation, it is plausible that all these burials relate to an event or episode linked to the interment of the B1 primary, as the dates from B1 and B8 overlap nicely. These Group I dates are quite early compared to the two Group II dates from the spatially tight cluster (bundles actually in contact with one another) formed by the infant primary B15 and associated secondaries (B9, B11 and B14). The two Group II dates on palm and badger tissues from B15 agree with each other

very well; unfortunately, there are no dates on terrestrial materials from the associated secondaries. Of interest is the fact that ochre painting of bones occurs in both the early and late burial clusters, demonstrating the persistence of this practice over centuries.

In the case of BC 111, the only sample in Group I is a palm braid and we unfortunately have been unable to ascertain with which burial it was associated. Three samples fall into Group II, while a palm braid with B3 is the extreme early statistical outlier discussed above.

Like BC 114, Massey describes BC 75 as undisturbed, although the missing pelvis and mandible of B6 seems somehow to have become associated with B1. While stratigraphic evidence was wanting, Massey infers that the B5 primary must have been interred first because of its depth and location and because he felt that, if the five secondaries had already been in place, the grave of B5 could not have been dug without disturbing them. B2 and B3, sharing the same "bed" of palm bark and the same covering of palm fronds were interred at the same time. B4 was beneath B3 and separated from it by palm fronds and "several inches of gravel" (Massey 1955:64). The cane fragment date from B4 falls into Group I and the dates on two seeds and one palm braid with B5 belong to Group II. This does not support Massey's contextual interpretation.

From what we hope is a careful consideration of archaeological association and context, combined with a conservative approach to the radiocarbon dating (because of the unsettled questions surrounding marine reservoir effects on dates on human bones and feathers of possibly marine feeding birds), it appears that Las Palmas cave burial sites represent both single and accretionary events. BC 114, the largest of Massey's sites demographically, contained only a small number of burials (19). We appear to have a very limited sample of burials from the time period represented by the Las Palmas Culture and mortuary complex. Perhaps some Las Palmas burials are among the shell midden burials discussed by Carmean and Molto (1991) and Fujita (1995b). Investigating cultural linkages between Las Palmas burial cave sites, open sites such as shell middens, some with burials, and other types of sites, such as rock art sites, remains an important challenge for future research in the Cape region of Baja California.

For radiocarbon dating in this region, two major interrelated problems remaining are: (a) quantitative paleodietary reconstruction for the ancient human population(s) and (b) addressing the complex issue of marine reservoir effects on radiocarbon determinations on human bone collagen. Until and unless the reservoir effects problem is better understood, it is wise to place primary confidence on dates on purely terrestrial materials.

The technical problems mentioned in the preceding paragraph could lead to "dating errors," as opposed to "dating anomalies" (Dean 1978). Dating anomalies arise from problems of archaeological context, association, and contemporaneity. Although we think the contexts and associations reported by Massey are valid, we must note the possibility some associated items

may not be contemporaneous with the deaths of the humans. Wrappings, mats, and bindings made of materials such as palm bark and, especially, fronds, presumably were fresh and, therefore, contemporaneous with persons buried as primaries. However, since secondaries had died some time prior to their reburial in such wrappings, the bones of secondaries would be older than these materials. Items included as grave goods also represent potential problems. In the case of primary burials, there is the possible presence of heirloom artifacts, while in the case of secondaries, there is the possibility that grave goods date to the time of the reburial rather than to that of the initial burial. Such discrepancies may not be discernible by radiocarbon dating but they should be kept in mind when choosing samples.

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