MAMMOTHS AND HUMANS AS LATE PLEISTOCENE CONTEMPORARIES ON SANTA ROSA ISLAND

LARRY D. AGENBROAD[1], JOHN R. JOHNSON[2], DON MORRIS[3] AND THOMAS W. STAFFORD, JR.[4]

[1]*The Mammoth Site, P.O. Box 692, Hot Springs, SD 57747; Larry4mammoth@mammothsite.com*
[2]*Department of Anthropology, Santa Barbara Museum of Natural History, 2559 Puesta del Sol, Santa Barbara, CA 93105*
[3]*155 Rincon Avenue, Ventura, CA 93001*
[4]*Stafford Research Laboratories, Inc., 5401 Western Avenue, Suite C, Boulder, CO 80301*

Abstract—Radiocarbon dating of a pygmy mammoth (*Mammuthus exilis*) thoracic vertebra provides evidence of the contemporaneity of the pygmy mammoth and early human remains on Santa Rosa Island, California. Charcoal associated with the vertebra was radiocarbon dated by accelerator-mass spectrometer (AMS) techniques at 11,010 ± 70 radiocarbon years before present (RCBP; B-133594). That date was significantly close to the extinction date for continental mammoths to warrant a date directly from the bone. The resultant date was 11,030 ± 50 RCBP (CAMS 71697), only 20 years older than the charcoal date. The significance of the two dates was that the date of human remains from the Arlington springs site (CA-SRI-173), Santa Rosa Island was reported by others to be 10,960 RCBP (CAMS 16810). The contemporaneity of the mammoth bone date and the human bone date indicates that mammoths were still extant on the islands when humans arrived. These data are from only one mammoth and one human. More research needs to be conducted on the mammoth and human remains on the island. Was the contemporaneity coincidence, or the prelude to extinction?

Keywords: AMS radiocarbon, Arlington woman, human contemporaneity, Mammuthus exilis, terminal Pleistocene

INTRODUCTION

Three islands off the southern California coast have had reported remains of diminutive mammoths. These modern islands are the higher elevations of a Pleistocene super-island known as Santarosae (Fig. 1), which had formed due to sea level lowering during the Pleistocene, as water was held on the continents in the form of glaciers and ice sheets (Orr 1968). As the continental ice melted, sea level rose, inundating approximately 76% of Santarosae, as calculated from bathymetric information (Johnson 1965).

Mammoth remains were noted by the U.S. Coast and Geodetic Survey as early as 1853. The first published report did not appear until 1873 (Stearns1873). A hiatus in mammoth data from the islands ensued until the 1920s when Chester Stock gave them status as a new species, *Mammuthus exilis* (Stock and Furlong 1928). A second hiatus followed until the 1940s when Phil Orr, from the Santa Barbara Museum of Natural History (SBMNH), began archaeological field studies on the islands. Orr collected mammoth remains in conjunction with his interpretation of 'hearths' containing 'charred' mammoth bones (Orr 1968).

The 1994 Mammoth Skeleton

In July 1994, at the request of the National Park Service, L. Agenbroad was called in to examine a recently discovered large mammalian skeleton on the northeast coast of Santa Rosa Island, Channel Islands National Park (CHIS), California. The remains were identified as the nearly complete skeleton of *Mammuthus exilis*, the pygmy mammoth of the northern Channel Islands of California. In August 1994, a team consisting of B. Agenbroad, L. Agenbroad, D. Morris, S. Morris, T. Rockwell, and L. Roth excavated and recovered the most complete (>90%) skeleton of the species yet recovered. The remains were of a mature male of about 50 years of age when it died. Accelerator-

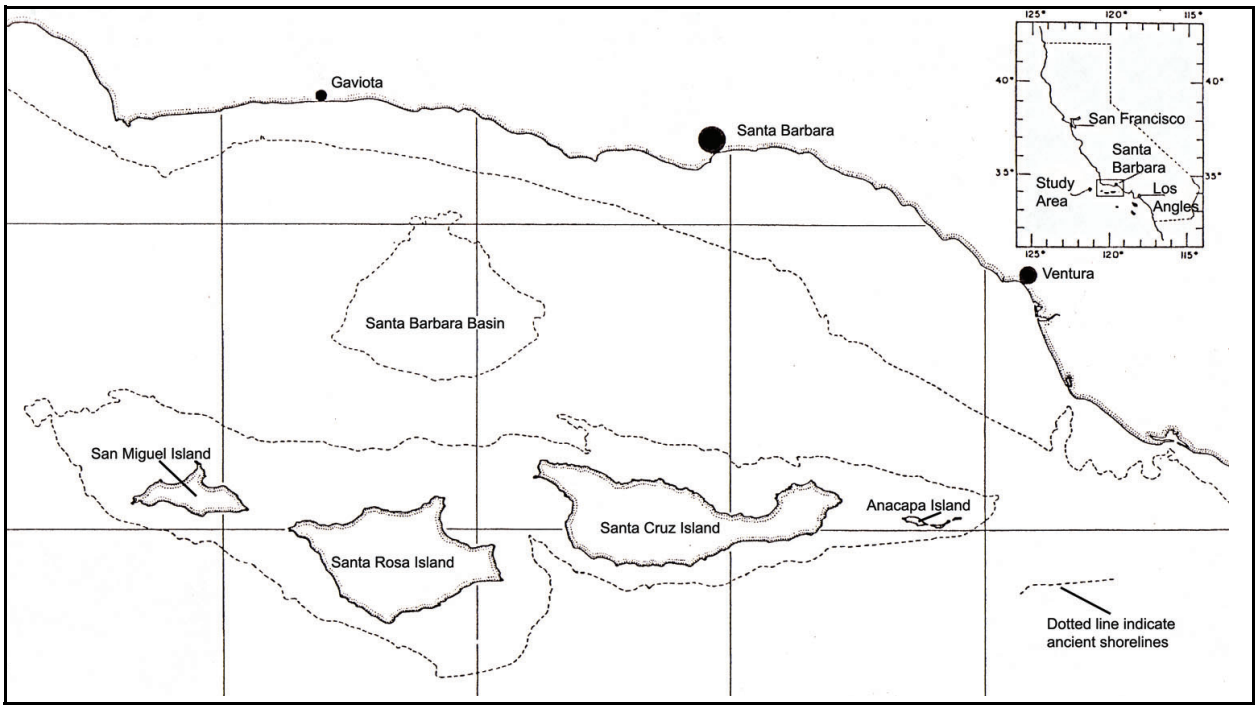

Figure 1. A map of the modern Channel Islands and the outline of the Pleistocene coast of southern California and the 'super' island of Santarosae. [Map courtesy of the Santa Barbara Museum of Natural History].

mass spectrometer dating of the bone collagen from the specimen gave a time of death as 12,840 ± 410 RCBP (CAMS–24429; Agenbroad 1998, 2002).

Realizing there had been very little proboscidean paleontology done on the islands since the 1960s (Orr 1968), a pedestrian survey of the island was initiated. Each locality of mammoth remains was recorded with global positioning system (GPS) coordinates. More than 160 new localities were recorded on San Miguel, Santa Rosa, and Santa Cruz Islands, with the majority of localities found on Santa Rosa Island.

Most of the remains were found in the elevated marine terraces and the alluvial deposits of modern drainages that dissect the terraces. Contrary to published reports stating that the mammoth remains were most abundant on the northwest coast of Santa Rosa Island (Stock and Furlong 1928, Orr 1968, Roth 1982, 1996), mammoth remains were recovered in nearly every portion of the island circumference, with the exception of the east coast. The north coast and elevated terraces of San Miguel Island are also relatively productive, with remains as far inland as the west flank of San Miguel Hill. Proboscidean remains on Santa Cruz Island have thus far been confined to the alluvial deposits of the west end of the island.

Early Human Remains on Santa Rosa Island

From the late 1940s, through the early 1960s, Phil Orr (SBMNH) conducted archaeological investigations of Santa Rosa Island. He frequently encountered mammoth remains, and collected enough material to make a composite skeletal mount for the museum, as well as initiate a collection of mammoth remains for a repository. He became convinced that the island mammoths were exterminated by the early human arrivals on the islands (Orr 1968). His theory gained new strength when he discovered human femora *in situ* nearly 12 m (35 ft) below the modern surface. He christened the remains Arlington Springs Man, since the remains were found in the west wall of Arlington Canyon (Orr 1968). Orr cast the human bones and the enclosing sediments in a plaster jacket and relocated them to SBMNH. Orr dated charcoal from the sediments in contact with the human bones, receiving a date of 10,400 ± 2000 RCBP (L-568-A). In 1989, Berger and Protsch (1989) again dated the human bone yielding an age of 10,800 ± 810 RCBP (UCLA-1899). In 1987,

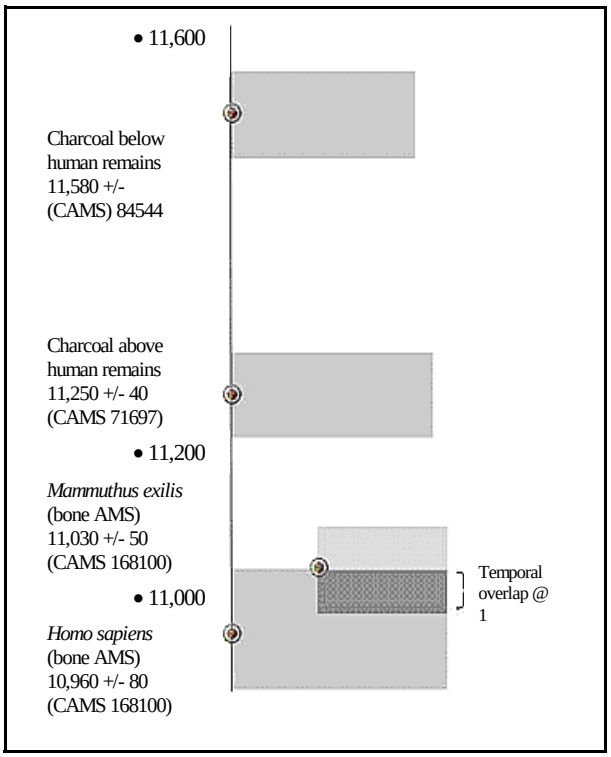

Figure 2. Graphic representation of the AMS dates for human and mammoth bones, plus the interpreted bracketing dates for the strata containing the human remains. At the youngest stratigraphic date there would have been +200 years of contemporaneity of humans and mammoths, prior to mammoth extinction; at the youngest bone dates, there would have been a minimumof 70 years of contemporaneity. (Chronologic ages increase UPWARD).

John Johnson (SBMNH) and Don Morris (CHIS) relocated the cast and opened it, collecting bones of the extinct deer mice (*Peromyscus nesodytes*) for AMS dating as well as another sample of human bone. The results suggested the human remains were between 10,000 and 11,500 radiocarbon years old. It was also determined that the femora were those of a female, resulting in the remains being renamed Arlington Springs Woman (Johnson et al. 2002).

Prior to 1994, only 16 radiocarbon dates for mammoths and mammoth associated materials had been derived for Santa Rosa Island. Wenner et al. (1991) branded all those dates as equivocal. Those authors were under the assumption that there were no *in situ* mammoth remains on the island and that redeposition did not allow accurate dating. The discovery, excavation, recovery, and AMS bone collagen date of the nearly intact, articulated, *in situ* skeleton of a mature, male, pygmy mammoth in 1994 negated their major assumption (Agenbroad 1998).

Contemporaneity of Mammoth and Human Remains on Santa Rosa Island

During an ongoing field survey for mammoth remains on Santa Rosa Island in April 1999, a thoracic vertebra of a pygmy mammoth was discovered in the upper 10 cm of the upper marine terrace. The stratigraphic location, near the terrace surface, plus associated charcoal prompted an AMS date on the charcoal. The date of 11,010 ± 70 RCBP (B-133594) suggested a possible late date for mammoth remains on the island. The centrum of the vertebra was drilled to provide sufficient bone samples for an AMS date on bone collagen. The mammoth bone date of 11,030 ± 50 RCBP (CAMS-71697) and the associated charcoal date (only 20 years difference) temporarily placed the mammoth bone and the human remains from Arlington Springs as contemporaneous. The close temporal proximity of the dates from the bone collagen and associated charcoal shows that mammoths in alluvium can be accurately dated. The significance of the dates was immediately apparent: mammoths were living on Santa Rosa Island at, or about the time of, initial human presence. Erlandson et al. (1996) had established early human occupation of Daisy Cave at 10,390 ± 410 RCBP (CAMS-9094), and possibly earlier as implied by underlying charcoal stains on San Miguel Island.

CONCLUSIONS

The nature of early human presence on Santarosae remains uncertain. The paucity of remains from pertinent levels of Daisy Cave (Erlandson et al. 1996) and the isolated skeletal remains of Arlington Springs Woman (Johnson et al. 2002) certainly do not support a demographically robust, thriving occupation of the islands. It is not certain that human occupation began this early although extensive sites occur on the islands by 9,000 yr BP (Erlandson and Morris 1992).

Detailed stratigraphic, paleoenvironmental, and chronological studies were undertaken at the Arlington Springs archaeological site (CA-SRI-

173) in April 2001, in an attempt to refine the dating of Arlington Springs Woman. The best estimate of the correct stratigraphic horizon dates between 11,250 ± 40 (CAMS 84543) RCBP (above the human remains) to 11,580 ± 45 (CAMS 84544) RCBP (below the human remains; J.R. Johnson unpubl. data). If the bone dates are considered to be minimal dates and the stratigraphic position is correct, this is indicative of a minimum of ca. 200 years overlap between these human remains and the last of the pygmy mammoths (Fig. 2). Dates taken from mammoth bone and human bone indicate contemporaneity at one standard deviation (Fig. 2). Of course, this is based on only one mammoth and one human, on one island. Several additional samples of the youngest mammoth remains and several samples of the oldest human remains are needed to strengthen the temporal association.

Phil Orr (1968) was convinced the island mammoths were exterminated by a late Pleistocene human arrival on these islands. He was unable to convince his peers, based on the dating techniques available and field evidence interpretations during the period of his field activities. Now, with AMS radiocarbon techniques, the case is stronger for temporal overlap between the last island mammoths and the first human contact on the island.

Was the contemporaneity due to (1) simple coincidence? Mammoths, in both pygmy and continental forms, have been on the islands for more than 47,000 years (the upper limit of radiocarbon dating). Their extinction occurs at, or shortly after the time humans arrived on the islands; (2) extinction by human hunting? There are multiple sites demonstrating successful human hunting of mammoths on the continental mainland at, or near, the same temporal interval. The hunting skill and knowledge for mammoth hunting existed in North America. In addition, island mammoths were miniature forms, presumably making them a less formidable quarry; (3) the introduction of a lethal pathogen? There are multiple problems associated with the introduction of a "killer pathogen" approach to extinction—particularly in a very short time period—even on islands; (4) climate change? With the antiquity of mammoths on the island(s), noted above, they have endured worse and better climatic conditions in their tenure on Santarosae. The northern Channel Islands currently experience a marine phase of a Mediterranean type climate, as contrasted to the continental interior (Johnson 1965). Even the Younger Dryas cold period would be less significant on the offshore islands.

It will take more research and more dating, and the possibility of a 'smoking spear' kill-site to satisfy skeptics. We think the case for drastic climatic change, or an unknown disease, as the cause(s) of the extinction of this mammalian "dodo bird" seem far less likely than human predation.

ACKNOWLEDGMENTS

The funds for two AMS radiocarbon dates were provided by the family and friends of the late Jim Jensen of Englewood, Colorado.

REFERENCES

Agenbroad, L.D. 1998. New pygmy mammoth (*Mammuthus exilis)* localities and radiocarbon dates from San Miguel, Santa Rosa and Santa Cruz Islands, California. Pages 169–175. *In*: Weigand, P.W. (ed.), Contributions to the geology of the Northern Channel Islands. Pacific Section, American Association of Petroleum Geologists, Bakersfield, CA.

Agenbroad, L.D. 2002. New localities, chronology, and comparisons for the pygmy mammoth (*Mammuthus exilis):* 1994–1998. Pages 518–524. *In*: Browne, D., K. Mitchell and H. Chaney (eds.), Proceedings of the Fifth California Islands Symposium. USDI Minerals Management Service and The Santa Barbara Museum of Natural History, Santa Barbara, CA.

Berger, R. and R. Protsch. 1989. UCLA radiocarbon dates XI. Radiocarbon 31:55–67.

Erlandson, J.M., D.J. Kennett, B.L. Ingram, D.A. Guthrie, D.P. Morris, M.A. Tveskov, G.J. West and P.L. Walker. 1996. An Archaeological and Paleontological Chronology for Daisy Cave (CA–SMI–261), San Miguel Island, California. Radiocarbon 38:1–19.

Erlandson, J.M. and D.P. Morris. 1992. CA–SRI–1: a "Pleistocene" shell midden on Santa Rosa Island, California. Current Research in the Pleistocene 9:7–10.

Johnson, D.L. 1965. Landscape evolution on San Miguel Island, California [Ph.D. dissertation]. University of Kansas, Lawrence, KS, 378 pp.

Johnson, J.R., T.W. Stafford, Jr., H.O. Ajie and D.P. Morris. 2002. Arlington Springs Revisited. Pages 541–545. *In*: Browne, D., K. Mitchell and H. Chaney (eds.), Proceedings of the Fifth California Islands Symposium. USDI Minerals Management Service and The Santa Barbara Museum of Natural History, Santa Barbara, CA.

Orr, P.C. 1968. Prehistory of Santa Rosa Island. Santa Barbara Museum of Natural History, Santa Barbara, CA.

Roth, V.L. 1982. Dwarf mammoths from the Santa Barbara, California Channel Islands: size, shape, development, and evolution [Ph.D. dissertation]. Yale University, New Haven, CT, 276 pp.

Roth, V.L. 1996. Pleistocene dwarf elephants of the California Islands. Pages 250–253. *In*: Shoshani, J. and P. Tassy (eds.), The Proboscidea: evolution and palaeoecology of elephants and their relatives. Oxford University Press, Oxford, UK.

Stearns, R.E.C. 1873. [no title: paraphrase of comments attributed to Stearns in the minutes of the Academy's regular meeting]. Proceedings of the California Academy of Sciences 5:152.

Stock, C. and E.L. Fulong. 1928. The Pleistocene elephants of Santa Rosa Island, California. Science 68:140–141.

Wenner, A.M., J. Cushing, E. Noble and M. Daly. 1991. Mammoth radiocarbon dates from the northern Channel Islands, California. Proceedings of the Society for California Archaeology 4:1–6.