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FORTY NEW RADIOCARBON DATES FROM RECENT ARCHAEOLOGICAL RESEARCH ON SAN SALVADOR, BAHAMAS: IMPLICATIONS FOR ISLAND CHRONOLOGY AND SETTLEMENT

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ABSTRACT

Forty new AMS radiocarbon dates were acquired during the 2002-2010 research performed by J. Blick and his teams. The cost of the AMS radiocarbon assays, run at the University of Arizona NSF Accelerator Facility (1 specimen) and the Center for Applied Isotope Studies at the University of Georgia (39 specimens), was approximately $14,000, with one date each funded by Dr. Don Gerace and J. Blick and a GCSU faculty research award to Blick. The dates derive from two previously known sites, Minnis-Ward (SS-3), North Storr's Lake (SS-4), and two previously unrecorded sites, Barker's Point Shell Midden (SS-37) and the Mary Ann Blick site (SS-41) on Green Cay. The implications of these new AMS radiocarbon dates for site settlement patterns and contemporaneity of sites on San Salvador is discussed.

INTRODUCTION

With the increase in radiocarbon and AMS dated prehistoric archaeological sites on San Salvador Bahamas, we can now begin to develop a synthesis of cultural developments and population changes on the island from the time of colonization (ca. A.D. 600) to the end of the prehistoric period and the arrival of the Spanish (A.D. 1492).

The addition of forty new radiometric dates from Minnis-Ward (SS-3), North Storr's Lake (SS-4), Barker's Point Shell Midden (SS-37) and the Mary Ann Blick site (SS-41) has essentially doubled the number of radiometric dates known for San Salvador in the last decade (ca. 2002-2011). Today, approximately 25% of prehistoric archaeological sites on San Salvador have been dated (~10 of ~39 sites) (Table 1). While some may assert this is a relatively meager sample, the total number of some 80+ radiocarbon dates for San Salvador makes its prehistoric occupations some of the best dated (and best studied) in the Bahamian Archipelago (Figure 1).

Recent AMS radiocarbon dates from Minnis-Ward range from pre-Columbian times through the Loyalist period and into the modern era (calibrated [cal] AD 980-1160, cal AD 1670-1780, and cal AD 1870-1920, 2σ). These three Minnis-Ward dates are associated with Lucayan remains, Barbadan sheep bone (Caprinae), and modern glass-bearing levels, respectively.

A much larger suite of 26 AMS dates has been recovered from the 2005 and 2006 excavations at the North Storr's Lake site (Blick and Murphy 2005; Blick, Creighton and Murphy 2006). Five dates from a household midden dominated by fish remains at North Storr's Lake span the period cal AD 1300-1600 (2σ), averaging AD 1453. The 2006 excavations at North Storr's Lake

recovered a large quantity of sea turtle (Cheloniidae), charcoal, and a number of fragments of sea turtle barnacles (*Chelonibia* spp.) from an apparent sea turtle processing locality. The AMS radiocarbon dates from the 2006 excavations ranged from cal AD 900-1620 (2σ), averaging AD 1184. Sea turtle barnacles were directly dated to cal AD 900-1320 (2σ) and wood charcoal from the site (cal AD 890-1280, 2σ) confirmed the ages of the sea turtle barnacles. Direct dates on sea turtle and parrotfish (Scaridae) bone span the period cal AD 1050-1620 (2σ), averaging AD 1305, a date that falls within the range of the sea turtle barnacles.

The Barker's Point Shell Midden site (SS-37), the source of the controversial shell projectile point previously reported by Blick (2007), has yielded two AMS radiocarbon dates, one from a *Strombus gigas* (queen conch) shell (collected with Dr. Gerace) embedded in the midden (cal AD 1200-1510, 2σ) and one from the shell projectile point itself (cal AD 1170-1490, 2σ). These dates average AD 1342. Clearly, the overlapping ages of the midden shell and the projectile point from Barker's Point demonstrate the near-contemporaneity of the two artifacts (i.e., the projectile point is of a pre-Columbian age virtually indistinguishable from that of the midden).

Finally, four recently processed AMS radiocarbon dates on *Strombus gigas* from the Mary Ann Blick site (SS-41) on Green Cay have yielded ages ranging from cal AD 1020-1650 (2σ), averaging cal AD 1373. Clearly, the Barker's Point Shell Midden and the Mary Ann Blick site, itself a shell midden and minor occupation site, appear to have been occupied at approximately the same time (they are separated by only ca. 1 km of water).

Five dates that are considered unreliable by the authors (one is too early, one is modern, and three are inconsistent and based on bone collagen) have also been recently reported (Blick and Dvoracek 2011, see also Table 2). All AMS radiocarbon dates are reported at the 2σ level with the Marine Reservoir Correction applied to marine samples (Stuiver, Reimer and Reimer 2010).

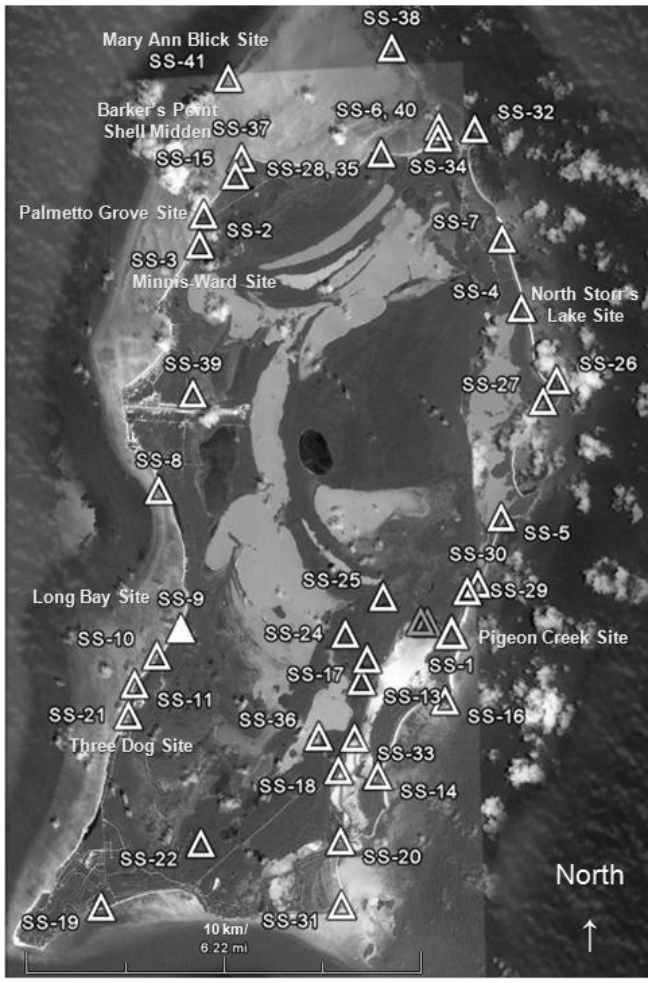

Figure 1. San Salvador Island showing locations of known prehistoric archaeological sites. The Long Bay site (SS-9, solid white triangle) is the probable landing site of Columbus in 1492. Scale is 10 km. (Map by J. Blick based on GoogleEarth 2011.)

PREHISTORIC ARCHAEOLOGICAL SITES ON SAN SALVADOR

There are 39 known prehistoric archaeological sites located on San Salvador Island (Figure 1). Archaeological investigations began on San Salvador in the late 1950s and early 1960s with the efforts of avocational archaeologist Ruth Wolper and professionals John Goggin and Charles Hoffman. Sites on San Salvador were discovered primarily through non-systematic pedestrian survey and verbal reporting. In the early 1980s through the early 2000s, John Winter made systematic pedestrian surveys of the island specif-

ically searching for archaeological sites. Virtually the entire island has been surveyed by scientists of various sorts working in association with the Gerace Research Centre of the College of the Bahamas. Data on the archaeological sites are documented on the Commonwealth of the Bahamas Archaeological Site Form for each site and are available for researchers at the Gerace Research Centre.

Of the 39 sites on San Salvador (Table 1), about seven have been the subject of systematic, scientific excavations. Prehistoric sites in the Bahamian Archipelago have been classified by Keegan (1992) into the following categories: villages, hamlets, households, shelters, allochthonous, caves and rockshelters, and resource procurement sites (e.g., conch processing stations). On San Salvador, sites have been classified according to the size and density of the deposits and are mostly habitation sites. Sites were classified based upon written descriptions in the site forms, site visitations and surface inspections, review of literature, and shovel testing and excavations performed at several of the sites. Sites on San Salvador are classified accordingly: very large sites, large sites, medium sites, small sites, very small sites, caves and rockshelters, and resource procurement sites (conch processing) (Blick, Hopkins and Oetter 2011; Hopkins, Oetter and Blick 2011). Eight of these sites have radiometric dates or other datable objects covering the period ca. AD 600-1550, and most of the larger, better studied and dated sites, have generally lengthy, and late, occupations: Three Dog (AD 600-1160/Spanish contact); North Storr's Lake (AD 850-1550); Pigeon Creek (AD 890-1170 and AD 1430-1480); Minnis-Ward (AD 950-1450); Palmetto Grove (AD 1280-1480); Major's Cave (AD 1260-1390); Barker's Point Shell Midden (AD 1390-1490); and the probable Columbus landfall site at Long Bay (AD 1492/Spanish contact) (Berman 2011; Blick 2011).

ARCHAEOLOGICAL CHRONOLOGY OF SAN SALVADOR

The prehistoric occupation on San Salvador can be divided into periods referred to generally as the Early Period (A.D. 600-900), Middle Period (A.D. 900-1200), and Late Period (A.D. 1200-1492). Other scholars have chosen names that are more generally applicable to the pan-Caribbean region, such as the chronology devised and modified by Walker (1997) and Wilson (1997): Post-Saladoid/Early Ostionoid (A.D. 600-900); Late Ostionoid (A.D. 900-1200); Taíno Period (A.D. 1200-1492); and Contact Period (A.D. 1492-1530 and later). M.J. Berman (2011) uses the terms: Antillean Expansion (A.D. 600-900); Early Lucayan (A.D. 900-1200); Late Lucayan (Chican Ostionoid) (A.D. 1200-1492); and Post-Contact (A.D. 1492-1530 and later). The general cultural developments of each of the periods described above have been described previously (Berman 2011; Keegan 1992; Rouse 1992; Walker 1997; Wilson 1997; etc.). For the sake of simplicity, the chronological terms Early, Middle, and Late will be used in this article.

On San Salvador, very few sites have Early Period (A.D. 600-900) occupations, including SS-1 (Pigeon Creek*), SS-3 (Minnis-Ward*), SS-4 (North Storr's Lake*), and SS-21 (Three Dog). (Sites marked by an asterisk will be explained in the following section.) The Middle Period (A.D. 900-1200) on San Salvador appears to have been a period of moderate population growth with the known occupied sites increasing to about five (the same four early sites listed above plus SS-41, the Mary Ann Blick site). All sites with known dated remains, ~10 sites, have Late Period (A.D. 1200-1492) components including all of the five sites named above plus: SS-2 (Palmetto Grove); SS-9 (Long Bay); SS-37 (Barker's Point Shell Midden); SS-39 (Major's Cave); and the recently described find from SS-24 (Farquharson's Cave) (Winter 2011). Therefore, San Salvador's prehistoric occupation seems to date primarily to the Late Period, an observation that is consistent with recent paleodemographic population growth models proposed by Blick (2011) and at least one point of Keegan's (1985, 1992) migration hypothesis.

CHRONOLOGY AND SETTLEMENT ON SAN SALVADOR

Early Period Sites (A.D. 600-900)

The earliest settlement on San Salvador is the Three Dog site (SS-21), cal AD 600-850/990 (Berman and Gnivecki 1995) on the southwestern corner of the island, a logical landing spot if colonists were to have paddled canoes from the southwest as the Cuban Arroyo del Palo-like pottery at Three Dog suggests (Berman and Gnivecki 1995; Tabío and Guarch 1966). There is also evidence of contact with the island of Hispaniola in the early period, so the source of the colonization is still debated. Pigeon Creek (SS-1) and North Storr's Lake (SS-4) have late Early Period dates with midpoints around cal AD 850-990.*

These few sites with Early Period components on San Salvador are located around the perimeter of the island in all major quadrants of the island's 154 km^2 landmass (Figure 2). The island of Nevis, in the Lesser Antilles, has a landmass of similar size, 132 km^2, with only two of its 21 reported sites having Early (Saladoid) components (Wilson 1989). These factors make the two islands excellent examples for purposes of comparative prehistoric settlement pattern analysis.

Recent identification of Crooked Island Ware in the lowest levels at the Minnis-Ward site* on San Salvador (M.J. Berman, personal communication, 2011) suggests that Crooked Island Ware is a good chronological marker for early components (A.D. 600-900) in the Bahamian Archipelago. In addition, Minnis-Ward has archaeological deposits all the way down to bedrock (beach rock) at ca. 80-100 cm below surface. Some have raised the possibility of earlier (Lithic/Archaic) components on San Salvador, but outlying radiocarbon dates of cal BC 1880-1730 (wood from SS-4, Blick et al. 2011) and AD 120-260 (wood from SS-3, Winter 1981) suggest this is a low probability scenario as of the present time.

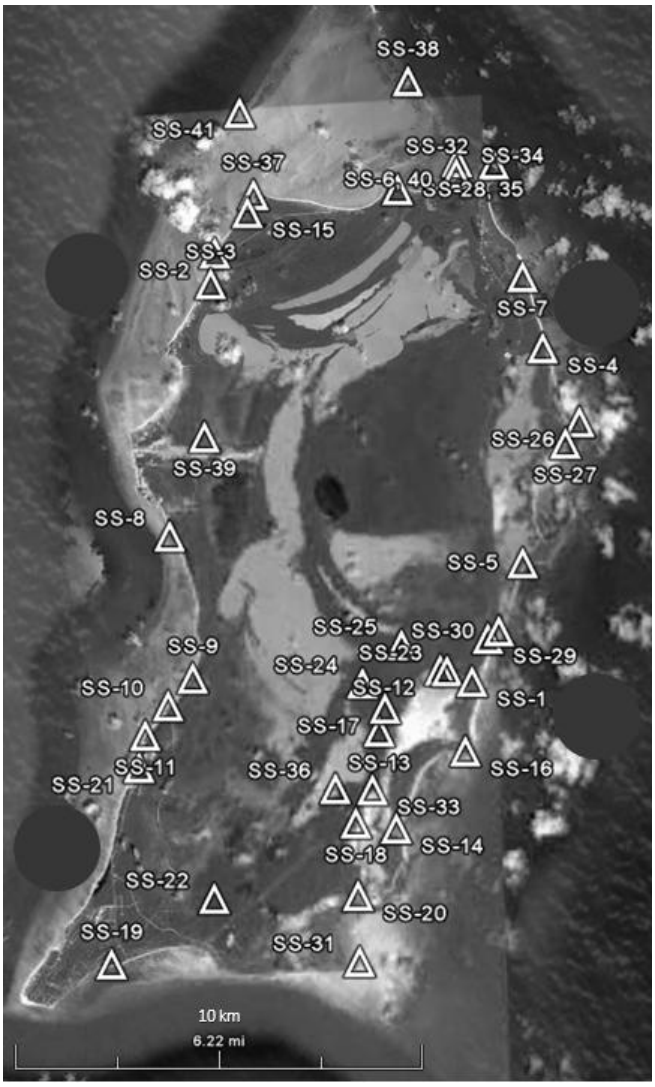

Figure 2. San Salvador Island showing locations of Early Period (A.D. 600-900) archaeological sites. (Map by J. Blick based on GoogleEarth 2011.)

Middle Period Sites (A.D. 900-1200)

Middle Period Sites, only about five of which are known, are likewise dispersed virtually island wide (Figure 3). It is during this time period that population growth appears to be at its lowest on San Salvador, perhaps in the wake of the rapid growth of the Early Period. There is some minor growth in the Middle Period, from four to five components. Middle Period occupations are found at the same sites with evidence of Early habitation, with the addition of the resource procurement site, the Mary Ann Blick site (SS-41) on

the northwest corner of the island on Green Cay. Once again, the issue of sampling and sample size arises, and surely one should expect to find more sites on San Salvador with Middle Period components.

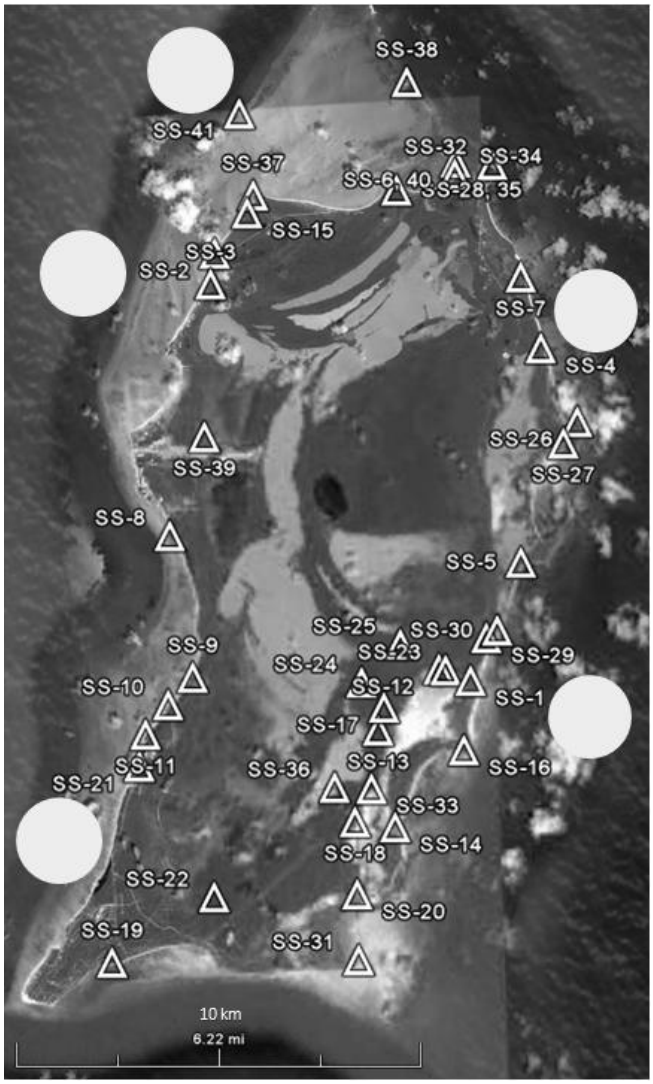

Figure 3. San Salvador Island showing locations of Middle Period (A.D. 900-1200) archaeological sites. (Map by J. Blick based on GoogleEarth 2011.)

Late Period Sites (A.D. 1200-1492)

Late Period sites on San Salvador are the most numerous and appear to concentrate in the west and northwest of the island (Figure 4). One might ask whether or not this distribution is a by-product of research focused on the western side of the island. The latest occupations on San Salvador exhibit the presence of late Lucayan pottery and in at least two cases late Lucayan pottery mixed with Spanish colonial artifacts dated to ca. 1471-1550 (i.e., Long Bay and Three Dog).

As on the island of Nevis (Wilson 1989), there appears to have been a lack of prehistoric settlement in the interior of San Salvador (although, once again, this could be a byproduct of research focused on the coast); also, as on Nevis, there appears to have been a preference for windward location of sites (59% on San Salvador) and a strong orientation toward the coast (74% of sites on San Salvador are $\leq$ 500 m from the coast) (Blick, Hopkins and Oetter 2011; Hopkins, Blick and Otter 2011).

Nevis's major period of population growth occurred from ca. A.D. 700 through 1492 and up until English contact in 1585 when the Arawakans of Nevis were decimated (Wilson 1989). The major period of population growth on San Salvador was during the Late Period (A.D. 1200-1492), after which time the Lucayan population of San Salvador went into serious decline and experienced eventual cultural (if not outright) extinction by the 1520s-1530s.

General Comments Regarding Prehistoric Settlement on San Salvador

Based upon GIS and K-means cluster analysis performed on site settlement locations (coordinates) (Blick, Hopkins and Oetter 2011; Hopkins, Blick and Oetter 2011), it is now clear that the distribution of sites on San Salvador is nonrandom (similar to the case of Nevis, Wilson 1989). For example, sites cluster from early on into NW, NE, SW, and SE quadrants (n = 39 sites, F-ratio = 31.274, p = 0.000) (Figure 5). The average distance between sites is 3.95 km (total island area) or 2.41 km (if only total land area is used). Most prehistoric archaeological sites are highly proximate to the coast (74% of sites with 500 m of coast; 54% of sites within 1000 m of a coral reef), and in fact are highly proximate to each other: the nearest neighbor linear distance between sites is 1.15 km and 68% of the sites are

within 750 m of another settlement (supporting the "paired settlement" hypothesis of Sullivan 1981; Keegan 1992, 1999).

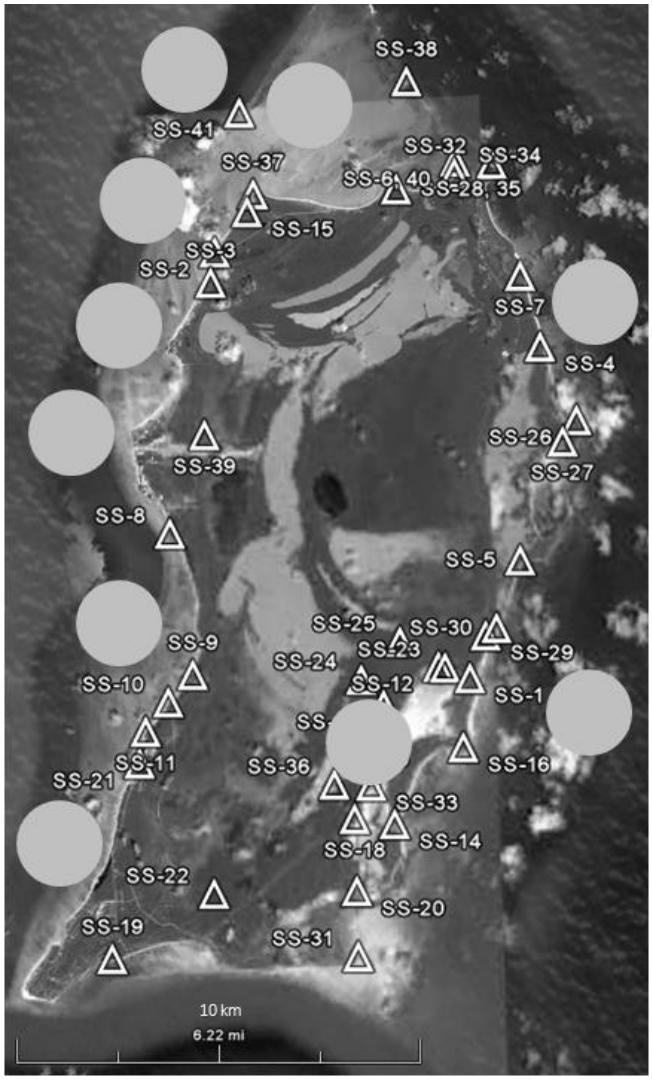

Figure 4. San Salvador Island showing locations of Late Period (A.D. 1200-1492) archaeological sites. (Map by J. Blick based on GoogleEarth 2011.)

Furthermore, most of the sites on San Salvador appear to have been occupied at approximately the same time (Late Period, A.D. 1200-1492) as was also found on Nevis (Wilson 1989). Many of San Salvador's sites appear to be roughly the same size, small (as on Nevis), and of the same type: habitation (see Table 1). This suggests there was no major rank-size hierarchy of sites on San Salvador (considering the fact that the exact sizes of Pigeon Creek, Minnis-Ward, North Storr's Lake, and Long Bay are not yet completely known, and that the largest site on the island, Pigeon Creek, appears to consist of two occupations, Dune 1 and Dune 2, separated by space and time – see Table 1, SS-1).

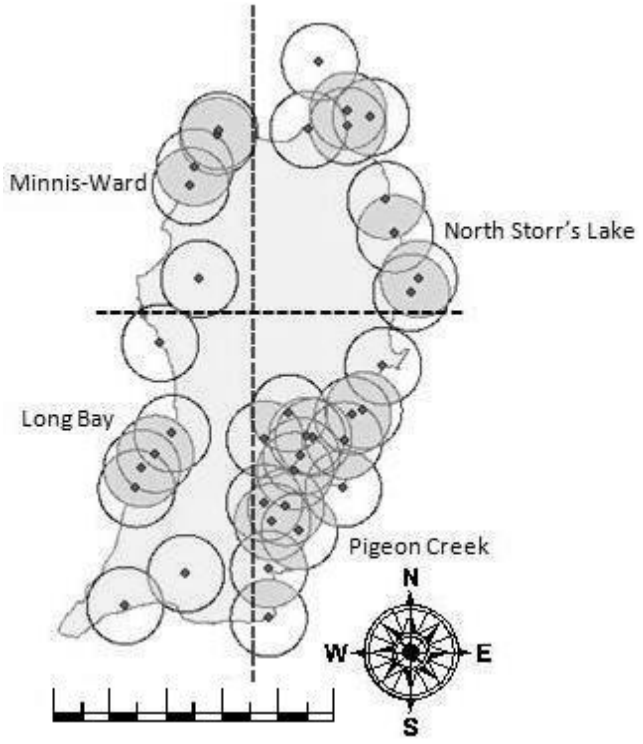

Figure 5. San Salvador Island showing division of prehistoric archaeological sites into four major quadrants (K-means cluster analysis: n = 39 sites, F-ratio = 31.274, p = 0.000). (Map by J.H. Hopkins using ArcGIS 9.2 and the San Salvador GIS Database.)

ARCHAEOLOGICAL COMPONENTS AS INDICATORS OF POPULATION GROWTH AND SETTLEMENT ON SAN SALVADOR

The number of archaeological components (i.e., dated occupations at various sites) can be informative about the nature of the rate of component growth (which approximates population growth) during the time periods in question. In the case of San Salvador, Early Period (A.D. 600-900) components number 4 or 40% of all known components and 4 of 39 known sites (10.26% of known sites). Middle Period (A.D. 900-1200)

components number 5 or 50% of all known components and 5 of 39 known sites (12.82% of known sites). Late Period (A.D. 1200-1492) components number 10 of 10 or 100% of known components and 10 of 39 known sites (25.64% of known sites) (see Table 3 and Figure 6).

Period	No. and % of Components	No. and % of Total Sites	Rate of Growth
Early (AD 600-900)	4/10 or 40%	4/39 or 10.26%	~1.62x
Middle (AD 900-1200)	5/10 or 50%	5/39 or 12.82%	1.24x
Late (AD 1200-1492)	10/10 or 100%	10/39 or 25.64%	2.00x

Table 3. Numbers and percentages of components and total sites on San Salvador with estimated rates of growth of components from the Early to Late periods.

From the figures in Table 3, we can estimate the rate of component growth, which can stand as a proxy for human population growth. For example, the estimated rate of component growth for the Early Period is approximately 1.62x (estimated by averaging the growth rates of the Middle and Late periods since we have no period prior to the Early Period upon which to base an estimate). The rate of component growth slows down during the Middle Period to about 1.24x indicating that the Middle Period experienced a slower growth rate after the initial colonization event of the Early Period. The rate of component growth from the Middle to the Late Period is estimated as 2.00x, suggesting that the population doubling model (a common growth rate utilized by demographers) previously used to estimate prehistoric population on San Salvador by Blick (2011) may be a good general model to apply to prehispanic population growth in this case (Figure 7).

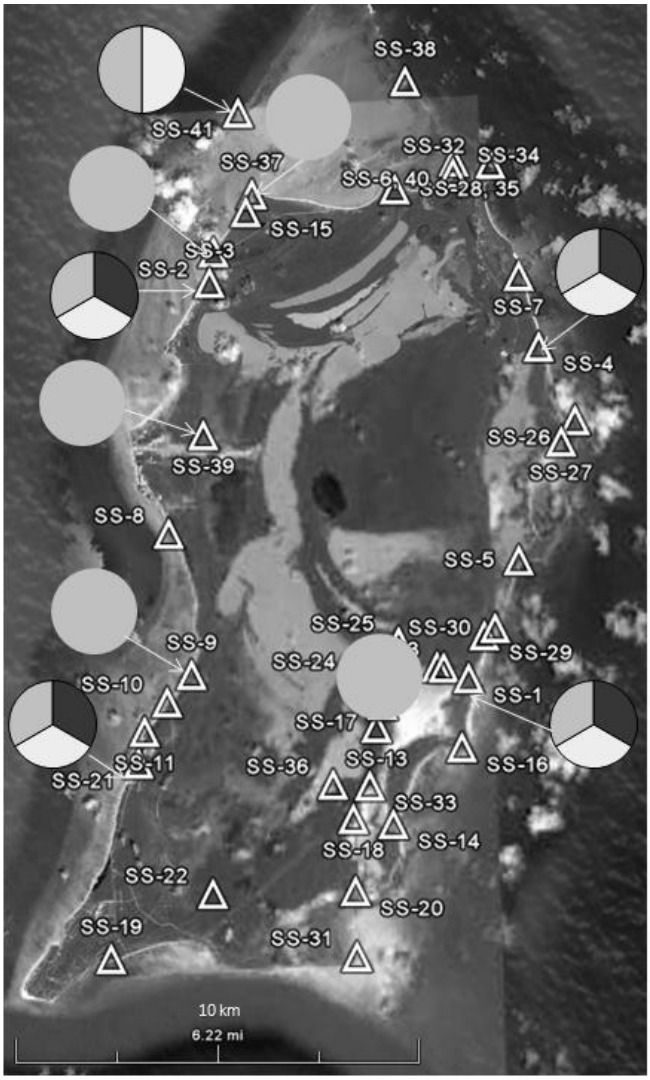

Figure 6. San Salvador Island showing locations of all known prehistoric archaeological sites and all known dated components on the island. Red = Early Period (A.D. 600-900), Yellow = Middle Period (A.D. 900-1200), Orange = Late Period (A.D. 1200-1492). (Map by J. Blick based on GoogleEarth 2011.)

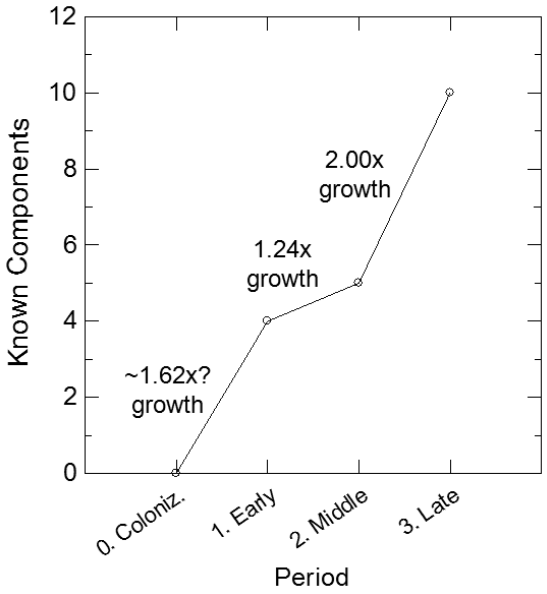

Figure 7. Rate of component growth (≈ population growth) based on number of known components from Colonization (T_0), ca. A.D. 600, to the end of the Late Period (A.D. 1200-1492).

The population of colonizers of San Salvador ca. A.D. 600 is, of course, unknown, but it is possible to make some estimates. Seidemann (2001) has suggested that canoes would have needed large crews of rowers to paddle against the strong currents, such as those between Cuba (Old Bahama Channel and others) or Hispaniola (Silver Bank Passage) and the Bahamas. Polynesian expeditions often had 40-50 people per outrigger canoe and sometimes up to 80-100 persons per twin-hulled canoe (Lewis 1994:79-80). We know from Columbus's *Diario* that the Lucayans and Taínos had dugout canoes capable of transporting at least 40-55 persons (Columbus 1969; Dunn and Kelley 1989). University of Florida anthropologist John H. Moore (Carrington 2002; Kondo et al., eds. 2003), making calculations for long distance space missions, suggested that a viable breeding population would consist of about 150-180 people for 60-80 generations or about 2000 years. It seems that an estimated size for the colonizing population of San Salvador of ca. 150-180 persons is reasonable and would have involved only a few large seaworthy dugout canoes.

If we begin with a colonizing population of 180 people, and apply the component growth rates from Table 3 to the human population on San Salvador, we see a rise from ~180 colonists at ca. A.D. 600 to ~292 people by the end of the Early Period, ~362 people by the end of the Middle Period, and ~723 people by the end of the Late Period (Figure 8). These population estimates conform well with previous paleodemographic estimates by Blick (2011:206, Table 1). Perhaps the most shocking aspect of Figure 8 is the rapid decline in population during the contact period (1492-ca. 1530). Two known sites on San Salvador contain Spanish artifacts (Long Bay and Three Dog) (Brill et al. 1987; Hoffman 1987; Berman and Gnivecki 1995; Berman and Pearsall 2000). The presence of a large suite of Spanish colonial trade goods at Long Bay, and more ominously, the presence of a lead arquebus ball at Three Dog, foreshadow the end of the Lucayan occupation of San Salvador and of the Bahamas which were reported by Juan Ponce de León to be uninhabited by 1513 (Sauer 1966; Scisco 1913). Several of the 40 recent AMS dates from North Storr's Lake stretch into the 1520s-1550s (cal 2σ) suggesting the possibility of Lucayan survival on San Salvador into the first few decades of the 16th century.

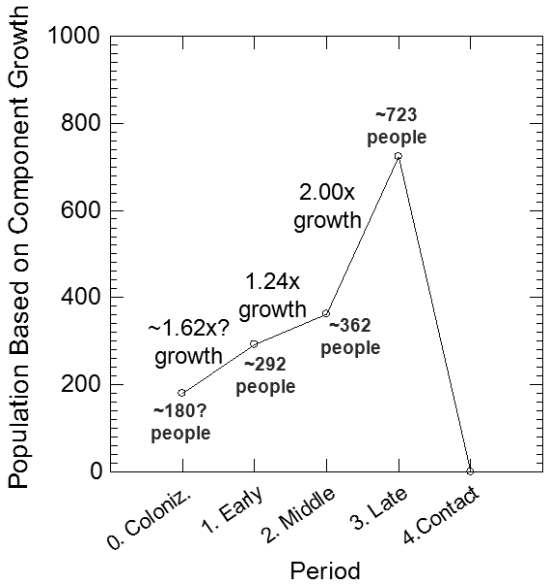

Figure 8. Population growth on San Salvador based on 180 colonists and known component growth rates. After 1492, the population dropped precipitously (Sauer 1966; Scisco 1913).

SUMMARY

On San Salvador, archaeological evidence for an increasing number of components becomes obvious after A.D. 600 (Early Period). The Early Period would have begun with the initial colonization of the island by some ~180 individuals followed by a period of fairly significant population growth as the colonists and early inhabitants were able to take advantage of previously unexploited (or less intensively exploited) resources (Keegan 1985, 1992). The Middle Period (A.D. 900-1200) appears to have been a period of slower growth, as measured by the increase in the number of known components on the island. Population is hypothesized to have grown from ~292 people at the end of the Early Period to ~362 people by the end of the Middle Period. By all measures, the Late Period (A.D. 1200-1492, also known as the Taíno Florescent Period) was the period of most dramatic growth, to ~723 people, as measured by the doubling of the number of components occupied on San Salvador (10 of 10 known and dated components and 10 of 39 [25.64%] known sites). This Late Period marks the culmination of the development of "complex" sociopolitical institutions that had already begun in other parts of the Greater Caribbean around A.D. 1000. This complex sociopolitical organization was expanding into the Bahamas by the Late Period, e.g., the large chiefly village at Delectable Bay, Acklins Island (Keegan 1992). Complex sociopolitical organization is less apparent on San Salvador where the archaeological record indicates that economic activities such as shell bead manufacturing, sea turtle hunting and processing, shell tool making, long-distance trading, etc., are found at multiple sites and at multiple household localities or multiple activity areas within sites. Even the presence of exotic artifacts (trade goods, non-local pottery, non-local stone artifacts, copper or guanín artifacts, etc.) appear to be spread across the island at sites where the most archaeological research has been performed. These economic patterns suggest that the Bahamas was an area of "simple chiefdoms" with island populations in the hundreds or low thousands as opposed to the "complex chiefdoms" of the Greater Antilles with polities in the multiple thousands or tens of thousands.

By the time the Europeans arrived (Spanish artifacts date to ca. 1471-1550 on San Salvador), the cultural process of ethnogenesis had created a people that referred to themselves as the "Lucayo" (derived from *lu-* ["people, group, tribe"] and *-caya* ["island"], Granberry 1991; Granberry and Vescelius 2004:101-114, Table 1.1), or the "Island People" of the Bahamas. The Bahamas were later referred to by the Europeans for centuries as the "Lucayan Isles." As we have seen in Figure 8, San Salvador was reported by Juan Ponce de León as uninhabited by 1513; by comparison, the Arawakans of the island of Nevis survived until about 1585 when encountered by the English corsair, Sir Francis Drake (Wilson 1989). Scholars such as Kathleen Deagan (2004), Grace Turner (2006), ourselves, and others have recently suggested Taíno and Lucayan survival and persistence into the 16th century in the Greater Antilles (e.g., the En Bas Saline site, Haiti; José María Cave, Dominican Republic) and the Bahamas. Deagan (2004) has even argued for Taíno influence on Spanish Caribbean culture primarily through women's roles, in ceramic manufacture, cooking, and foodways. On San Salvador, a series of late AMS dates from North Storr's Lake and other sites ranges into the 1520s-1550s (calibrated, 2σ) and supports Grace Turner's recent contention (2006, and personal communication, 2011) that the Lucayans of the Bahamas, and San Salvador, survived at least into the first few decades of the 16th century.

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REFERENCES

Berman, M.J. 2011. Good as gold: The aesthetic brilliance of the Lucayans. Pp. 104-136 *in* Curet, A. and Hauser, M., eds., *Islands in the Stream: Migration, Seafaring, and Interaction in the Caribbean*. University of Alabama Press, Tuscaloosa.

Berman, M.J. and P.L. Gnivecki. 1995. The colonization of the Bahama Archipelago: A reappraisal. World Archaeology 26 (3): 421-441.

Berman, M.J. and D.M. Pearsall. 2000. Plants, people, and culture in the prehistoric central Bahamas: A view from the Three Dog site, an early Lucayan settlement on San Salvador Island, Bahamas. Latin American Antiquity 11:219-239.

Blick, J.P. 2004. Report on the 2004 Archaeological Investigations at Barker's Point (SS-15, SS-37) and Minnis-Ward (SS-3), San Salvador, Bahamas, with Commentary on the Nature of Fire-Cracked Rock. Research report presented to the Gerace Research Centre, San Salvador, Bahamas.

Blick, J.P. 2007. A new projectile point type from Barkers Point Shell Midden (SS-37), San Salvador, Bahamas. Pp. 158-169 *in* Rathcke, B.J. and Hayes, W.K., eds., *Proceedings of the Eleventh Symposium on the Natural History of the Bahamas*. Gerace Research Centre, San Salvador, Bahamas.

Blick, J.P. and B. Murphy 2005. Report on the 2005 Archaeological Investigations at the North Storr's Lake Site (SS-4), San Salvador, Bahamas. Research report presented to the Gerace Research Centre, San Salvador, Bahamas.

Blick, J.P., A. Creighton, and B. Murphy. 2006. Report on the 2006 Archaeological Investigations at the North Storr's Lake Site (SS-4), San Salvador, Bahamas: Stratigraphic Excavations and The Role of the Sea Turtle in Lucayan Subsistence. Research report presented to the Gerace Research Centre, San Salvador, Bahamas.

Blick, J.P., C.C. Jackson, F.O. Thacker, and J.M. Pittman. 2009. Archaeological Excavations at the Minnis-Ward Site (SS-3), and the Discovery of the Mary Ann Blick Site (SS-41), May-June 2009. Research report presented to the Gerace Research Centre, San Salvador, Bahamas.

Blick, J.P. 2011. Paleodemographic Reconstruction of the Pre-Columbian Population of Guanahani (San Salvador, Bahamas). Pp. 200-212 in Baxter, J. and Cole, E., eds., *Proceedings of the Thirteenth Symposium on the Natural History of the Bahamas*. Gerace Research Center, San Salvador, Bahamas.

Blick, J.P. and D. Dvoracek. 2011. Forty new radiocarbon dates from recent archaeological research on San Salvador, Bahamas: Implications for island chronology and settlement. Paper presented at the Fourteenth Symposium on the Natural History of the Bahamas, Gerace Research Centre, San Salvador, Bahamas. June 16-20, 2011.

Blick, J.P., J.H. Hopkins, and D. Oetter. 2011. The prehistoric settlement pattern of San Salvador, Bahamas. Journal of Island and Coastal Archaeology 6:421-441.

Blick, J.P., R. Kim and T.G. Hill. 2010. Lucayan shell, stone, and coral Beads from San Salvador, Bahamas (ca. A.D. 900-1500). Beads: Journal of the Society of Bead Researchers 22:27-40.

Brill, R.H., I.L. Barnes, S.S.C. Tong, E.C. Joel, and M.J. Murtaugh. 1987. Laboratory studies of some European artifacts excavated on San Salvador Island. Pp. 247-292 *in* Gerace, D.T., ed., *Columbus and His World: Proceedings of the First San Salvador Conference*. Bahamian Field Station, San Salvador, Bahamas.

Carrington, D. 2002. Magic number for space pioneers calculated. New Scientist 16:45. Available: http://www.newscientist.com/ article/dn1936

Columbus, C. 1969. *The Four Voyages of Christopher Columbus*. (translated by J.M. Cohen). Penguin, New York.

Deagan, K. 2004. Reconsidering Taíno social dynamics after Spanish conquest: Gender and class in culture contact studies. American Antiquity 69(4):597-626.

Dunn, O. and J.E. Kelley. 1989. *The Diario of Christopher Columbus's First Voyage to America, 1492-1493*. University of Oklahoma Press, Norman.

GoogleEarth. 2011. Satellite image of San Salvador Island. Available: www.googleearth. com

Granberry, J. 1991. Lucayan toponyms. Journal of the Bahamas Historical Society 13:3-12.

Granberry, J. and G. Vescelius. 2004. *Languages of the Pre-Columbian Antilles*. University of Alabama Press, Tuscaloosa.

Hoffman, C.A. 1987. Archaeological investigations at the Long Bay Site, San Salvador, Bahamas. Pp. 237-246 *in* Gerace, D.T., ed., *Columbus and His World: Proceedings of the First San Salvador Conference*. Bahamian Field Station, San Salvador, Bahamas.

Hopkins, J.H., D. Oetter, and J.P. Blick. 2011. Analysis of prehistoric settlement patterns on San Salvador, Bahamas, using the San Salvador GIS database. Pp. 213-228 *in* Baxter, J. and Cole, E., eds., *Proceedings of the Thirteenth Symposium on the Natural History of the Bahamas*. Gerace Research Center, San Salvador, Bahamas.

Keegan, W.F. 1985. *Dynamic Horticulturalists: Population Expansion in the Prehistoric Bahamas*. Unpublished doctoral dissertation, Ann Arbor, University Microfilms.

Keegan, W.F. 1992. *The People who Discovered Columbus: The Prehistory of the Bahamas.* University of Florida Press, Gainesville.

Keegan, W.F. 1999. Middle Caicos Earthwatch Report, 1999: Before Columbus: Caonabo's Homeland. Available: http://www.flmnh.ufl.edu/caribarch/middle1999.htm

Kondo, Y., F.C. Bruhweiler, J.H. Moore, and C. Sheffield, eds. 2003. *Interstellar Travel and Mutigeneration Space Ships*. (Papers presented at the American Association for the Advancement of Science, 2002). Apogee Books, Burlington, Ontario.

Lewis, D. 1994. *We the Navigators: The Ancient Art of Landfinding in the Pacific*. University of Hawaii Press, Honolulu.

Robinson, M.C. and R.L. Davis. 1999/2005. *San Salvador Island Geographic Information Systems Database* (CD-ROM). San Salvador and New Haven: University of New Haven and Gerace Research Centre. Available: http://www.newhaven.edu/sansalvador/gis/topo.htm

Rouse, I. 1992. *The Taínos: The People Who Greeted Columbus*. Yale University Press, New Haven.

Sauer, C.O. 1966. *The Early Spanish Main*. University of California Press, Berkeley.

Scisco, L.D. 1913. The track of Ponce de León in 1513. Bulletin of the American Geographical Society 45(10): 721-735.

Seidemann, R.M. 2001. The Bahamian problem in Florida archaeology: Oceanic perspectives on the issue of pre-Columbian contact. The Florida Anthropologist 54(1):4-23.

Shaklee, R., G. Fry, and T. Delvaux. 2007. An archaeological report on the Storr's Lake site, San Salvador: 1995-2005. Bahamas Naturalist and Journal of Science 2(1):31-39.

Stuiver, M., P. Reimer and R. Reimer. 2010. Marine reservoir correction database. Available: http://calib.qub.ac.uk/calib/

Sullivan, S.D. 1981. *Prehistoric Patterns of Exploitation and Colonization in the Turks and Caicos Islands*. Unpublished doctoral dissertation. Ann Arbor, University Microfilms.

Tabío, E.E. and J.M. Guarch. 1966. *Excavaciones en Arroyo del Palo, Mayarí, Cuba*. Departamento de Antropología, Academia de Ciencias de la República de Cuba, Havana.

Turner, G.S. 2006. Dark visions from the ocean: Lucayan perspective on a Spanish vessel. Paper presented in the Session: Current Research in Bahamian Prehistoric and Historic Archaeology: Papers in Memory of Charles A. Hoffman (session organized by J. Blick). Society for American Archaeology 71st Annual Meeting, San Juan, Puerto Rico. April 26-30, 2006.

Walker, J.B. 1997. Taíno stone collars, elbow stones, and three-pointers. Pp. 80-91 *in* Bercht, F., Brodsky, E., Farmer, J., and Taylor, D., eds., *Taíno Pre-Columbian Art and Culture from the Caribbean*. Monacelli Press/Museo del Barrio, New York.

Wilson, S.M. 1997. The Caribbean before European conquest: A chronology. Pp. 15-17 *in* Bercht, F., Brodsky, E., Farmer, J., and Taylor, D., eds., *Taíno Pre-Columbian Art and Culture from the Caribbean*. Monacelli Press/Museo del Barrio, New York.

Wilson, S.M. 1989. The prehistoric settlement pattern of Nevis. Journal of Field Archaeology 16:427-450.

Winter, J. 2011. Archaeological remains from the Farquarhson Cave, San Salvador. Paper presented at the Fourteenth Symposium on the Natural History of the Bahamas, Gerace Research Centre, San Salvador, Bahamas. June 16-20, 2011.

Winter, J. 1982. Reconnaissance of San Salvador, January 1982. Pp. 8-10 *in* Gerace, D.T., ed., *Bahamas Archaeology Project Reports and Papers*. CCFL Bahamian Field Station, San Salvador, Bahamas.

Winter, J. 1981. 1981 Archaeological site reconnaissance: San Salvador, Cat Island, and Rum Cay. Pp. 4-7 *in* Gerace, D.T., ed., *Bahamian Archaeology Project Reports and Papers 1981*. CCFL Bahamian Field Station, San Salvador, Bahamas.

Winter, J. 1980. A preliminary archaeological survey of San Salvador, Bahamas. Pp. 1-3 *in* Gerace, D.T., ed., *Bahamas Archaeological Project Reports and Papers 1980*. CCFL Bahamian Field Station, San Salvador, Bahamas.

KEY FOR TABLE 2

- STPL = sea turtle processing locality
- stb = sea turtle bone
- ba = barnacle
- ch = charcoal
- lpgm = lower pharyngeal grinding mill (parrotfish)
- **Marine Reservoir Correction applied
- UGAMS = University of Georgia AMS
- AA = University of Arizona NSF Accelerator Facility
- a = apatite
- c = collagen
- ~ = complex probability distribution calculating radiocarbon age
- 04 = 2004 excavation
- 05 = 2005 excavation
- 06 = 2006 excavation
- B.P. = Before Present

Table 1. Site numbers, names, types, size classification, and dates for sites on San Salvador.

Site No.	Name (info. from site forms)	Type	Size	Dates & Notes
SS-1	Pigeon Creek Site	multiple habitations (village)	very large	AD 890-1170 and 1430-1480/1630
SS-2	Palmetto Grove Site	habitation	medium	AD 1280-1490/1650
SS-3	Minnis-Ward Site	habitation (village)	large	AD 960-1520/1570
SS-4	North Storr's Lake Site	habitation (village)	very large	AD 850-1530/1640
SS-5	Dim Bay Site	habitation	very small	
SS-6, 40	Cut Rock Site/North Point Site	habitation	very small	site recorded twice, same coordinates
SS-7	Davis Site	habitation	small	
SS-8	Fernander Site	habitation	small	
SS-9	Long Bay Site	habitation (village)	medium	AD 1492, Spanish contact (1471-1550)
SS-10	Fork Site	habitation	small	
SS-11	Sugar Loaf Cemetery Site	habitation	small	
SS-12	Williams Site	habitation	small	
SS-13	South Farquharson Site	habitation	medium	
SS-14	East Snow Bay Site	habitation	small	
SS-15	Barker's Point Site	short-term habitation	very small	
SS-16	Bluff Site	habitation	small	
SS-17	Farquharson Site	habitation	small	
SS-18	Old Place Site	habitation	very large	
SS-19	French Bay Site	habitation	very large	
SS-20	Pigeon Creek Delta Site	habitation	medium	
SS-21	Three Dog Site	habitation (several households)	medium	AD 600-1020 and Spanish contact
SS-22	Storr's Cave	cave and rockshelter	small	
SS-23	Williams Cave	cave and rockshelter	small	
SS-24	Farquharson Cave	cave and rockshelter	small	ca. AD 1255-1325 (Winter 2011)
SS-25	Black Pond Cave	cave and rockshelter	small	
SS-26	Chicago Tribune Site	habitation, resource procurement	small	
SS-27	South Crab Cay Site	habitation	small	
SS-28, 35	Dump (Point) Site	habitation	medium	site recorded twice, same coordinates
SS-29	Kerr Mount Sinkholes	habitation	small	
SS-30	Two Pond Site	habitation	small	
SS-31	Sandy Hook Site	habitation	small	
SS-32	Mann Head Cay Site	habitation, resource procurement	very small	
SS-33	Boat Ramp Site	habitation	small	
SS-34	Graham's Harbour Dock Site	habitation	small	
SS-36	Stout's Lake Cave	known burial cave	small	
SS-37	Barker's Point Shell Midden Site	resource procurement	small	AD 1172-1507; was SS-38
SS-38	Catto Cay Site	resource procurement	very small	was SS-37; changed to correct admin. error with site forms
SS-39	Major's Cave Site	known burial cave	small	AD 1260-1390
SS-41	Mary Ann Blick Site	resource procurement	small	AD 1023-1646 (avg. 1373)

Table 2. Forty recent radiocarbon dates from San Salvador (see Table 2 key for abbreviations).

Site No.	Site Name	Material Dated	Provenience	AMS Date (1σ)	Calibrated Date (2σ), unrounded	Lab No.
SS-3	Minnis-Ward Site	charcoal, midden	SS-3/04-1, Level 1	4 ± 37 B.P.	~cal AD 1868-1918	UGAMS-17155
SS-3	Minnis-Ward Site	charcoal, midden	SS-3/04-2, Level 2	137 ± 42 B.P.	~cal AD 1668-1781	UGAMS-17156
SS-3	Minnis-Ward Site	charcoal, midden	SS-3/04-3, Level 3	985 ± 43 B.P.	cal AD 984-1159	UGAMS-17157
SS-4	North Storr's Lake Site	charcoal, midden	SS-4/05-1, Level 1	271 ± 39 B.P.	~cal AD 1486-1604	UGAMS-17150
SS-4	North Storr's Lake Site	charcoal, midden	SS-4/05-2, Level 2	475 ± 42 B.P.	cal AD 1394-1488	UGAMS-17151
SS-4	North Storr's Lake Site	charcoal, midden	SS-4/05-3, Level 3	561 ± 41 B.P.	~cal AD 1300-1368	UGAMS-17152
SS-4	North Storr's Lake Site	charcoal, midden	SS-4/05-4, Level 4	416 ± 37 B.P.	cal AD 1424-1522	UGAMS-17153
SS-4	North Storr's Lake Site	charcoal, midden	SS-4/05-5, Level 5	418 ± 40 B.P.	cal AD 1421-1523	UGAMS-17154
SS-4	North Storr's Lake Site, STPL	bone, apatite (Cheloniidae, sea turtle)	SS-4/06-1a/stb, Level 1	1190 ± 25 B.P.	cal AD 1047-1396**	UGAMS-4345a
SS-4	North Storr's Lake Site, STPL	bone, collagen (Cheloniidae, sea turtle)	SS-4/06-1a/stb, Level 1	210.515 B.P.	***lab error, 104% modern (graphite standard)***	UGAMS-4345c
SS-4	North Storr's Lake Site, STPL	sea turtle barnacle (*C. testudinaria*)	SS-4/06-11/ba1, Level 1	1334 ± 30 B.P.	cal AD 903-1283**	UGAMS-4333
SS-4	North Storr's Lake Site, STPL	sea turtle barnacle (*C. testudinaria*)	SS-4/06-12/ba2, Level 2	1278 ± 27 B.P.	cal AD 965-1316**	UGAMS-4334
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-12a/ch, Level 2	1118 ± 24 B.P.	cal AD 886-986	UGAMS-4327
SS-4	North Storr's Lake Site, STPL	bone, apatite (Cheloniidae, sea turtle)	SS-4/06-12b/stb, Level 2	1087 ± 25 B.P.	cal AD 1147-1465**	UGAMS-4344a
SS-4	North Storr's Lake Site, STPL	bone, collagen (Cheloniidae, sea turtle)	SS-4/06-12b/stb, Level 2	929 ± 24 B.P.	cal AD 1295-1619**	UGAMS-4344c
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-3a/ch, Level 3	881 ± 28 B.P.	cal AD 1146-1220	UGAMS-4331
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-3b/ch, Level 3	3470 ± 31 B.P.	***lab error, invalid age***	UGAMS-4324
SS-4	North Storr's Lake Site, STPL	bone, apatite (Cheloniidae, sea turtle)	SS-4/06-3c/stb, Level 3	1094 ± 29 B.P.	cal AD 1133-1460**	UGAMS-4343a
SS-4	North Storr's Lake Site, STPL	bone, collagen (Cheloniidae, sea turtle)	SS-4/06-3c/stb, Level 3	676 ± 24 B.P.	***unreliable date***	UGAMS-4343c
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-13a/ch, Level 3	1048 ± 29 B.P.	cal AD 948-1027	UGAMS-4323
SS-4	North Storr's Lake Site, STPL	sea turtle barnacle (*C. testudinaria*)	SS-4/06-13a/ba3, Level 3	1339 ± 30 B.P.	cal AD 899-1282**	UGAMS-4335
SS-4	North Storr's Lake Site, STPL	bone, apatite (Cheloniidae, sea turtle)	SS-4/06-13a/stb, Level 3	1092 ± 25 B.P.	cal AD 1139-1460**	UGAMS-4342a
SS-4	North Storr's Lake Site, STPL	bone, collagen (Cheloniidae, sea turtle)	SS-4/06-13a/stb, Level 3	541 ± 24 B.P.	***unreliable date***	UGAMS-4342c
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-13b/ch, Level 3	1033 ± 23 B.P.	cal AD 974-1029	UGAMS-4328
SS-4	North Storr's Lake Site, STPL	sea turtle barnacle (*C. testudinaria*)	SS-4/06-13b/ba4, Level 3	1291 ± 29 B.P.	cal AD 949-1308**	UGAMS-4336
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-14a/ch, Level 4	967 ± 24 B.P.	~cal AD 1076-1154	UGAMS-4326
SS-4	North Storr's Lake Site, STPL	bone, apatite (Cheloniidae, sea turtle)	SS-4/06-14b/stb, Level 4	1013 ± 25 B.P.	cal AD 949-1308**	UGAMS-4341a
SS-4	North Storr's Lake Site, STPL	bone, collagen (Cheloniidae, sea turtle)	SS-4/06-14b/stb, Level 4	1072 ± 26 B.P.	cal AD 1164-1472**	UGAMS-4341c
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-5a/ch, Level 5	780 ± 34 B.P.	cal AD 1207-1283	UGAMS-4330
SS-4	North Storr's Lake Site, STPL	bone, collagen (Cheloniidae, sea turtle)	SS-4/06-15a/stb, Level 5	977 ± 26 B.P.	cal AD 1244-1553**	UGAMS-4340
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-6a/ch, Level 6	979 ± 30 B.P.	~cal AD 1076-1154	UGAMS-4325
SS-4	North Storr's Lake Site, STPL	charcoal, midden	SS-4/06-16a/ch, Level 6	970 ± 30 B.P.	cal AD 1017-1155	UGAMS-4329
SS-4	North Storr's Lake Site, STPL	bone, apatite (*S. viride*, parrotfish)	SS-4/06-16b/lpgm, Level 6	1073 ± 24 B.P.	cal AD 1165-1471**	UGAMS-4332a
SS-4	North Storr's Lake Site, STPL	bone, collagen (*S. viride*, parrotfish)	SS-4/06-16b/lpgm, Level 6	574 ± 40 B.P.	***unreliable date***	UGAMS-4332c
SS-37	Barker's Point Shell Midden	midden shell (*Strombus gigas*)	embedded in beach rock	1028 ± 34 B.P.	cal AD 1200-1507	AA-51432
SS-37	Barker's Point Shell Midden	shell projectile point (*Strombus gigas*)	surface find	1054 ± 37 B.P.	cal AD 1172-1489	UGAMS-00836
SS-41	Mary Ann Blick Site, Green Cay	midden shell (*Strombus gigas*) with round puncture hole	surface find	1220 ± 25 B.P.	cal AD 1023-1357	UGAMS-6694
SS-41	Mary Ann Blick Site, Green Cay	midden shell (*Strombus gigas*) with round puncture hole	surface find	1020 ± 25 B.P.	cal AD 1217-1510	UGAMS-6692
SS-41	Mary Ann Blick Site, Green Cay	midden shell (*Strombus gigas*) with round puncture hole	surface find	930 ± 25 B.P.	cal AD 1294-1619	UGAMS-6691
SS-41	Mary Ann Blick Site, Green Cay	midden shell (*Strombus gigas*) with round puncture hole	surface find	890 ± 25 B.P.	cal AD 1319-1646	UGAMS-6693