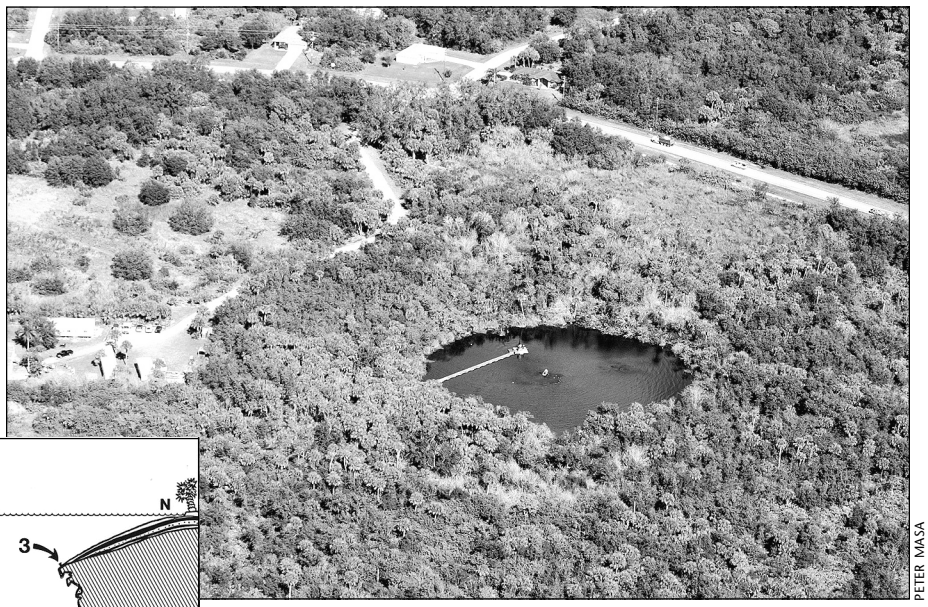
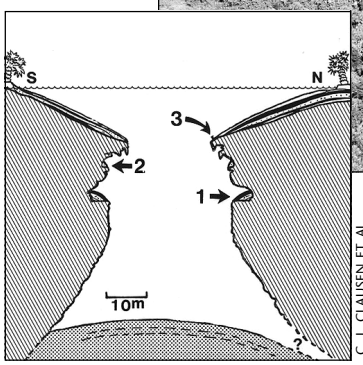
DIVING into Paleo Florida

BEFORE THE NORTHERN GLACIERS MELTED, sea levels rose, and water became more plentiful, long before there was an Everglades and Lake Okeechobee, Florida's lower peninsula was a cool, dry savanna-like landscape about twice as broad as it is today. Freshwater was scarce. Near the center of this prehistoric landscape, a site in southwest Florida today less than 10 miles inland from the Gulf of Mexico, sparkled a particularly attractive watering hole that drew hunters and prey.

Near the twilight of the last Ice Age, a hungry prehistoric hunter watched a giant land tortoise crawl along the edge of this oasis. For the hunter, this ancient evening turned out well. He impaled the tortoise on a sharp stick and cooked it on site for a hearty meal. That's the picture described by underwater archaeologists who more than 12,000 years later found the shell of the now extinct tortoise species pierced by a stake on what is known as the "27-meter ledge," a shelf 90 ft below the present surface of Little Salt Spring. The tortoise, we have to remember, was killed on dry land that existed before the site was later inundated and incorporated into the depths of the widening spring.

In John A. Gifford's view, Little Salt Spring (8SO18) near North Port in Sarasota County, Florida, is one of the most significant archaeological sites in North America. Dr. Gifford, professor of marine affairs and policy at the University of Miami's Rosenstiel School of Marine & Atmospheric Science, is also principal investigator of the Little Salt Spring Underwater Archaeology Project. For more than a quarter century, the spring has given archaeologists tantalizing glimpses into the world of Paleoindian hunters and gatherers.





C. J. CLAUSEN ET AL.

PETER MASA

***Above,* low-altitude oblique aerial view of Little Salt Spring from the south (January 2006). *Inset,* Clausen's 1979 drawing of a cross section of the spring: 1, the 27-meter ledge on which the tortoise and stake were excavated; 2, the 16-meter ledge; 3, the drop-off at 12–13 m, where most of the wooden stakes have been excavated.**

It's an invariable law: Discoveries draw critics

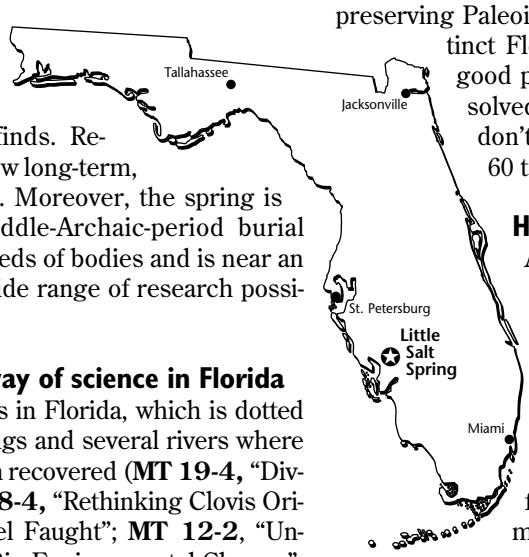
The impaled tortoise shell, one of the most important finds at the spring, dates to 12,000 RCYBP (about 14,000 CALYBP). This remarkable artifact has also been highly contentious. Some researchers doubt that the stake was actually used to kill the tortoise; the dating of the stake, they argue, is at odds with calcium carbonate dates from the tortoise shell. Gifford, using collagen dating on the shell (a technique not available to researchers in the 1970s when it was found), has determined that its age is commensurate with that earlier published for the stake in the 1979 edition of *Science* by underwater archaeologist Carl C. J. Clausen.

Some critics also claim there was insufficient "direct contextual association" between the stake and the fate of the tortoise. Clausen maintains that the stake's point of entry into the tortoise shell—along with carbonized long bones and fire-hardened clay found around the tortoise remains—strongly supports his hunter-and-prey hypothesis. Ambiguous, say the critics, who want more evidence. Although Gifford concedes that Clausen's report lacks clarity on the issue, he has evidence to calm the debate. "I found a 16mm color film shot when the tortoise was excavated," Gifford explains, "that shows the direct contextual association of the stake with the tortoise shell." Convinced it was a real association, Gifford robustly defends Clausen's published account. He plans to discuss the issue at the March 2008 SAA meetings and will likely show the film too.

Artifacts pulled from the spring over the years include a 7,000-year-old greenstone pendant, and a carved atlatl handle (spear thrower) believed to be from the Early Archaic (8,000 to 9,000 years old). The spring also yielded four non-returning boomerangs that Gifford says are so rare they may be "the only four in the world." He frankly admits that researchers don't know what to make of them; lacking comparative artifacts, they

can't identify with certainty the function of the curved throwing sticks.

Sharpened wooden stakes, wooden digging sticks, human bones, bones from such prehistoric megafauna as the giant ground sloth, and a curiously sparse collection of arrowheads and non-diagnostic lithics cram laboratory storage bins. "Mind-boggling," Gifford says of the finds. Recorded dates from the artifacts show long-term, continuous occupation of the site. Moreover, the spring is associated with an early- to middle-Archaic-period burial ground containing possibly hundreds of bodies and is near an Archaic village site—opening a wide range of research possibilities.



Submarine archaeology, the way of science in Florida

Underwater archaeology flourishes in Florida, which is dotted by more than 600 freshwater springs and several rivers where Paleoindian artifacts also have been recovered (**MT 19-4,** "Diving into Florida Prehistory"; **MT 18-4,** "Rethinking Clovis Origins: A Conversation with Michael Faught"; **MT 12-2**, "Underwater Site Opens Window on Big Environmental Change"; **MT 10-1**, "Underwater Site Details Mastodons' Life History"; **MT 3-2**, "Florida Archaeologists Plunge Into the Past").

Little Salt Spring was originally believed to be a shallow-water pond. In 1959 William Royal, a retired Air Force officer, began scuba diving there and discovered it to be an hourglass-shaped sinkhole nearly 80 m deep, typical of Florida's karst topography. Early researchers describe its surface as approximately 78 m in diameter and about 5 m above sea level. A sinkhole is similar in many respects to the *cenote* found in the Yucatán—a relatively shallow water-filled basin above a vertical underwater cavern (**MT 20-3,** "Early Humans South of the Border: New Finds from the Yucatán Peninsula"). In a sinkhole, deep vents at the cavern bottom feed oxygen-depleted ground water, producing an anoxic environment below a depth of about 3 m. Bacteria necessary for decomposition are prevented from forming, thus creating an ideal environment for preserving Paleoindian artifacts as well as fossil bones of extinct Florida megafauna. "We have extraordinarily good preservation because there is almost no dissolved oxygen in the water," Gifford says. "We don't have 100 percent preservation, but we have 60 to 70 percent preservation, and that's great."

Hard-won fame for a challenging site

As a graduate student in the 1970s, Gifford heard of archaeological discoveries being made at the spring. It was about the time when the property owners, the General Development Foundation, hired Clausen, then the Florida State Archaeologist, to direct the Little Salt Spring Research Facility. Thus began an intensive era of company-financed academic research there. Clausen made many of the earliest finds at the spring and set the stage for Gifford's later study.

Clausen's years of research at the spring convinced him of the overall importance of the site to understanding Paleoindian life. "Unique cultural evidence," he writes, "especially artifacts of wood, bone and shell, which seldom survive in the Southeast, has been preserved in what can be described as a natural time capsule at Little Salt Spring." The site has yielded evidence among the earliest of human activity in Florida, their association with an extinct vertebrate in the Southeast, and evidence that they preyed on an extinct species of giant tortoise. (The evidence of early human presence at Little Salt Spring is supported by the discovery below the Aucilla River surface of an American mastodon tusk bearing cutmarks. The tusk has been dated to 12,425 ± 35 RCYBP.) Clausen determined that humans occupied the site between 12,000 and 9,000 years ago, and again between 6,800 and 5,200 years ago. Gifford emphasizes that his research confirms Clausen's conclusions concerning the site's occupational dates and archaeological significance.

J. GIFFORD

Digital photomosaic, made from five 35mm color slides taken underwater in December 1975, shows the stake in direct association with the tortoise (the plates are the shattered plastron) in the excavation trench on the 27-meter ledge.

State and federal officials in 1979 placed Little Salt Spring on the National Register of Historic Places, thereby confirming the site's research potential. In 1982, the General Development Foundation donated the site to Miami University. The university in 1983 hired Gifford to direct the present Little Salt Spring Project. Unfortunately they didn't hand him a pot of money, the


THOMAS STREET

Gifford (*right*) describes late-Paleoindian wooden artifacts recovered from Little Salt Spring basin excavations to a local newspaper reporter.

mother's milk of archaeology. He admits that finding money to continue research has been difficult. Conducting underwater archaeology is expensive—about 10 times more costly than terrestrial archaeology. A lack of funds curtailed research at the site between 1982 and 1992, but money has gradually surfaced. The University of Miami and other donors fund activities, including underwater archaeological field schools up to three weeks in duration that Gifford has conducted since 1993.

The hard way to do business

Gifford's underwater work is time-consuming and equipment-intensive. Working conditions in the field are quite different from those faced by terrestrial archaeologists. A 2007 feature story in the *Tampa Tribune* recounts a typical underwater session: After wriggling into scuba gear and tanks, research divers cross a pontoon bridge onto a floating platform at the spring. From there, they plunge through upper level aquarium-like swarms of small fish and turtles to deeper excavation sites. Using an underwater vacuum powered by a pool pump, divers clear specific areas, working from a suspended trampoline secured by plastic pipe to hold equipment and collected artifacts. Excavation moves with tortoise-like slowness, with divers frequently measuring minute progress in weeks. Gradually, though, the spring yields a few more of its secrets.

Late-Paleoindian (ca. 9250 RCYBP) deer ▲ antler artifact of unknown function recovered from Little Salt Spring.


BOTH: J. GIFFORD

Middle-Archaic greenstone pendant from ▶ the east slope of the Little Salt Spring basin, ca. 6000–7000 RCYBP.

"Much of the work we have done has complemented Clausen's work," Gifford says. After more than a decade, Gifford's research has yielded more wooden tools and a pendant of non-native greenstone that possibly came as a trade item from the Appalachian region, the suspected source of the greenstone. His team has also found a second greenstone pendant, which has yet to be identified and sourced, and a series of pointed wooden stakes excavated from about 35 ft below the water, one of which has been dated at 9350 ± 90 RCYBP (Beta-216035), about 10,500 CALYBP. Gifford is confident the stakes were driven into sediments at the drop-off above the water's surface during the late paleo period. He suspects that the stakes served as anchor points for lowering objects, perhaps people, over the edge and down into the throat of the spring to the water's surface, which at that time may have been 20 ft below the level of the stakes, or about 55 ft below the present surface of the spring.

Not only have money problems eased since Gifford took over research at Little Salt Spring, help of a non-financial nature appeared in the person of 26 divers with the Florida Aquarium, boasting more than 1,000 hours' combined diving experience, who have participated for the past three years. The Aquarium also plans to exhibit some of the artifacts recovered by Gifford's team. The restored tortoise shell and stake have been on public display at the Museum of Florida History in Tallahassee.

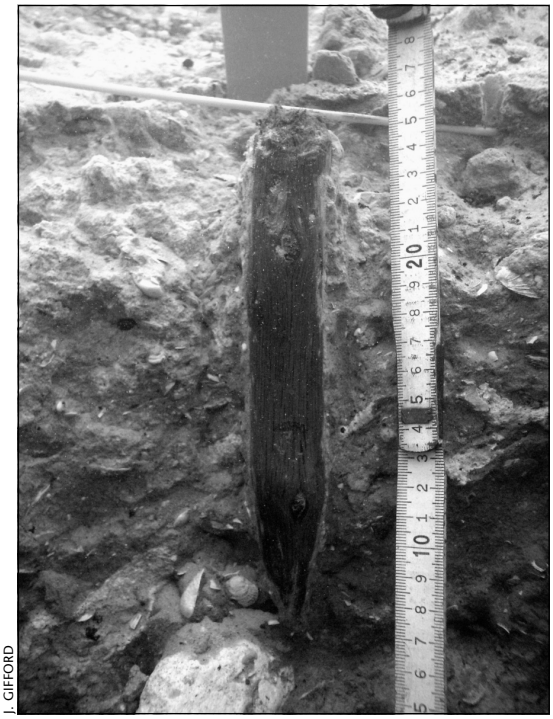
Meanwhile, Gifford's field school students have opened three 2-by-2-m underwater test excavations. "Actually," he explains, "we are still working on one of them because we have not yet hit bedrock." The process gobbles time, and sometimes divers surface empty-handed. Progress can be maddeningly slow: In a 2-week field season in 2007, it took one week just to excavate a 10-cm-deep level. However, with the excavation now coming onto new sediments, the potential is promising. Divers haven't yet hit bedrock, further buoying Gifford's hopes for new finds.

Gearing up for the job

Other benefits, too, accrue from work at the site. Researchers are perfecting new techniques for recording excavations. To take the place of still photography and sketching artistry used by their terrestrial counterparts, Gifford and his fellow re-

searchers create digital video mosaics of the excavation. The process saves time in their underwater time-pressured environment and produces more detailed results than traditional methods. Gifford has amassed a large database of digitized records that can be quickly and easily expanded, used, and shared with other researchers.

Excited about finds at the site to date, Gifford is eager to take the next major step. His sights are set on the 27-meter ledge. Only 5 percent of this natural re-entrant has been explored, and Gifford believes it has the greatest potential for extremely old finds. Exploring it, however, will be a particularly expensive venture, requiring specialized equipment and an exotic mixture of breathing gases for divers that includes helium, nitrogen, and oxygen. The optimum breathing mixture allows divers to stay at the 90-ft depth for 50 to 60 minutes in the morning and the afternoon, a marked increase over 20 minutes of bottom time limited by the standard compressed-air breathing mixture—which also requires a lengthy decompression time and involves added health risks. More bottom time means more opportunity to make discoveries.



J. GIFFORD

Underwater photo, taken in March 2006, of a partially excavated oak stake in situ at a depth of about 12 m. Since the upper portion of this stake, like all the others, is missing, its original length is unknown. This stake has been dated to 9350 ± 90 RCYBP, or 10750–10260 CALYBP (2-sigma). Gifford admits that "we still don't know why these stakes were being driven into the soft sediment just above the drop-off." Clausen's theory is that they were "belaying pins" to secure ropes used to lower something to the water's surface, which 10,000 years ago would have been a few meters below the drop-off.

Data with an unsettling edge

Little Salt Spring has opened a window on Paleoindian life. The site also has given researchers a yardstick for measuring climate change, and the data reveal a fact that may bode a bleak future for human habitation of south Florida.

At the nub is how to explain the fact that no cultural remains younger than 5,500 years have been found in the sinkhole. This issue has puzzled researchers for years because it suggests human occupants suddenly abandoned the site. The prevailing wisdom, whose adherents included Clausen, theorizes that the exodus was the result of climate change, perhaps because the area around the spring became more arid and therefore less habitable, or perhaps because burgeoning water supplies elsewhere, caused by climate warming and glacier melt, lured people away from Little Salt Spring.

Gifford's team, however, offers an alternate hypothesis that suggests the site bears witness to an ancient event hostile to humans. In a study presented in the 2005 edition of the journal *Palaeogeography, Palaeoclimatology, Palaeoecology,* Carlos A. Alvarez Zarikian (a graduate student of Gifford's), Gifford, and others examine fossilized organisms known as ostrocods found in Little Salt Spring. They conclude that increases in saltwater, as glaciers melted and sea levels rose, may have degraded the water quality at the spring and forced humans to seek habitation elsewhere. Their study is a cautionary tale of what may lie in store for Florida if global warming causes a rise in sea level as predicted. "I have seen a number of predictions," Gifford remarks, "and it doesn't look good for south Florida." His primary concern, however, is uncovering the lives of past occupants around the spring.

Although Gifford concedes that we may never know for certain what caused people to vacate the spring, he is confident that continuing paleoenvironmental research will more clearly define the chain of events taking place at what had once been, without question, a scarce oasis and valued hunting ground for a very long time. It most certainly should produce more artifacts to examine.

"I think we have the potential for finding very old, and very well preserved, material," Gifford says. "We certainly have an untapped reservoir of material to explore here."

–George Wisner

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Suggested Readings

Clausen, C. J., A. D. Cohen, C. Emiliani, J. A. Holman, and J. J. Stipp 1979 "Little Salt Spring, Florida: A Unique Underwater Site." In *Science*, 203:609–14.

Kornake, S. 2007 "Deep in Florida's Past: The Artifacts in Little Salt Spring Could Help Rewrite History." *Tampa Tribune*, Metro Section, Monday, July 2.

Zarikian, C. A. A., P. K. Swart, J. A. Gifford, and P. L. Blackwelder 2005 "Holocene Paleohydrology of Little Salt Spring, Florida, Based on Ostracod Assemblages and Stable Isotopes." In *Palaeogeography, Palaeoclimatology, Palaeoecology*, 225:134–156.