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A climbing vine with baseball-sized fruit, this plant is a living link to our past, with a seed dispersal mystery.

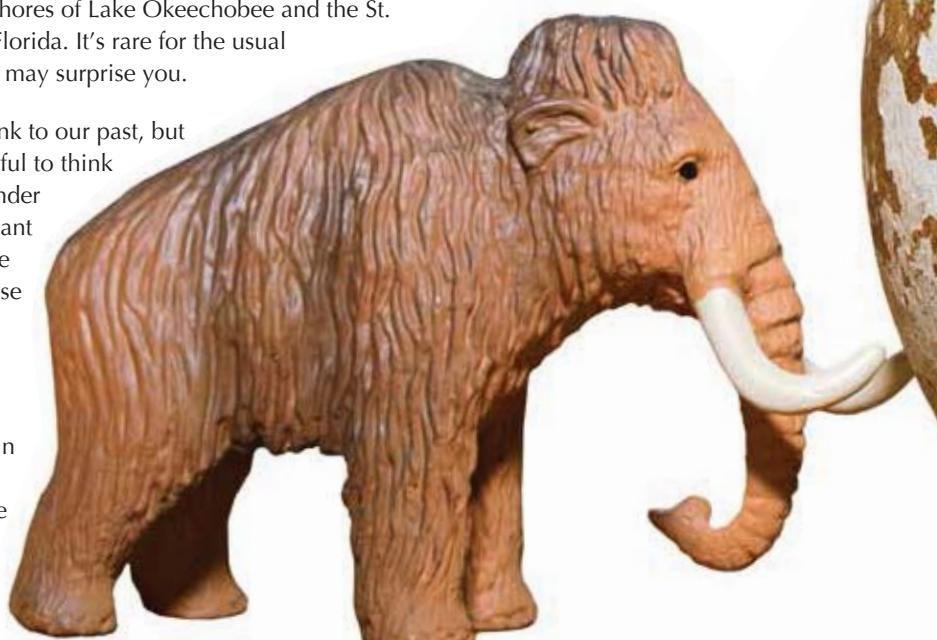
REVISITING THE RARE OKEECHOBEE GOURD

Text and photos by Kenneth Setzer

The rare Florida Okeechobee gourd grows in only two places in the world: The southern shores of Lake Okeechobee and the St. John's River, both in Florida. It's rare for the usual reasons, plus one that may surprise you.

This plant provides a living link to our past, but before we time travel, it's useful to think like the plants and animals under consideration. Why does a plant produce fruit that look or taste or behave a certain way? These features are not coincidental; it's all about survival and reproduction.

The purpose of fruit is to aid in dispersing seeds. Some seeds float, some are released to the wind, some stick to passing creatures, some appeal to



RIGHT

A preserved fruit from the Fairchild Herbarium; about the size of a baseball.

BELOW

Pleistocene megafauna and an Okeechobee gourd: Long-lost partners reunited?

Photos by Kenneth Setzer/FTBG



animals with their edible flesh. The last strategy has particular benefits: Some seeds will likely be consumed along with the flesh, and those that survive the digestive tract will be dispersed far from the parent plant in the animal's dung, a handy packet of moisture and fertilizer that leaves it ready to germinate.

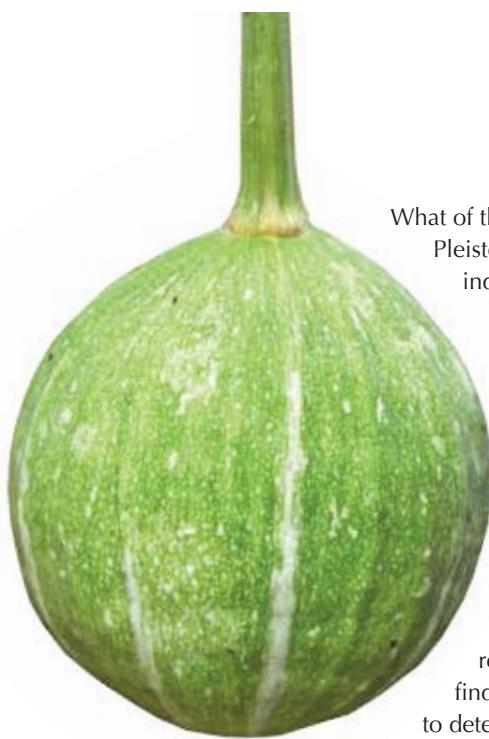
The Okeechobee gourd (*Cucurbita okeechobeensis*) is a climbing vine that produces pale, cream-colored flowers and a baseball-sized fruit—the gourd. Botanists John Kunkel Small and Liberty Hyde Bailey described it in the early 20th century; naturalist William Bartram noted it in the 18th century along the St. John's River. Its current scarcity—after Bartram, it wasn't seen in that region again until 1994—is due in part to clearing of land for agriculture and to flooding, especially along Lake Okeechobee. Small indicated that the gourd was common in the pond apple forests along the southern shores of Lake Okeechobee in the very early 1900s, but by 1930 he estimated the areas hosting the plant had been reduced by 95%.

Thinking like a plant

Evolutionary biologists Paul Martin and Dan Janzen famously researched plants that have no living seed disperser (among other oddities like plants with overbuilt thorny defenses), publishing "Neotropical Anachronisms" in *Science* in 1982. They describe anachronisms as morphology or other features that appear to have evolved in response to an ecological pressure or opportunity that no longer exists. Anachronistic traits have been observed in the fruit of the Kentucky coffee tree, Osage orange, and *Cucurbita foetidissima*, the desert gourd, among many.

Consider the avocado seed. The flesh is appealing, but the seed is bitter and reportedly somewhat toxic. No animal alive today that lives anywhere near the avocado homeland could swallow the seed whole. However, as recently as the Pleistocene Epoch, there were lots of animals that could swallow an avocado, seed and all—giant sloths, mastodons, mammoths, equids, glyptodonts, camels, daeodons, toxodonts—the so-called megafauna. Most all of these "ice-age" megafauna were extinct by about 12,000 years ago, not long before humans took an interest in plant cultivation. The avocado and its seed are anachronistic.





The green-striped and rare Okeechobee gourd

Photo courtesy of Keith A. Bradley,
University of South Carolina Herbarium.



One of the *Cucurbita okeechobeensis*
in Fairchild's Herbarium.

What of the Okeechobee gourd? Is it, too, anachronistic?

Pleistocene Florida was inhabited by all manner of megafauna; indeed mastodon remains are often found in the central and northern parts of the state, with a Columbian mammoth found as far south as Cutler Hammock in Palmetto Bay.

So megafauna were likely contemporaries of the Okeechobee gourd.

Many plants in the Cucurbitaceae family, like pumpkins and gourds, produce biochemical compounds called cucurbitacins. These impart a bitter taste, are toxins and are thought to deter herbivores from attacking the plant. The fruit, too, may repel smaller animals that would eat its flesh, as well as chew the seeds, thus destroying them. Recently, researchers analyzed bitter taste receptor genes in mammals, finding that larger animals (like elephants) had a reduced ability to detect bitterness. A large body also means toxins are more easily diluted and excreted. So this suggests megafauna like mastodons at least *could* have eaten the gourd.

But did they? Remarkably, the Page-Ladson site in Florida's Aucilla River contains thick layers of well-preserved American mastodon remains and dung (about 12,500 years old), and it contains gourd seeds—though not of the Okeechobee gourd. One seed was even found within the eye socket of a mastodon skull. Tantalizingly close evidence, this at least indicates mastodons ate gourds. Interestingly, Osage orange—another fruit thought to be anachronistic—was also found in the deposit.

So how do anachronistic plants survive once their primary means of seed dispersal dies away? They either face extinction, or are kept going by a secondary partner. As for the avocado, humans became the seed disperser thousands of years ago, and we still are, although the avocado we know today has been cultivated for taste, size and durability.

Many cucurbits likely survived thanks to human cultivation. Gourd fragments were even discovered along with the 8,000-year-old remains of the "Windover" people near Titusville, Florida. It's odd however that no Okeechobee gourd remains have been found in the many well-preserved ancient sites in Florida, though other gourds and their seeds have. It doesn't mean they weren't around, but why, if mastodons ate gourds, would they not have eaten the Okeechobee? Maybe they did, or maybe it was rare then, too. I doubt it was introduced intentionally by humans, who would have cultivated it for less-bitter, larger fruit.

It just may be that since the megafauna extinctions, the Okeechobee gourd has indeed been dwindling, alone and without a major partner in seed dispersal, whatever the original seed disperser was. Natural process or not, let's at least not hasten the gourd's extinction with more habitat destruction. 