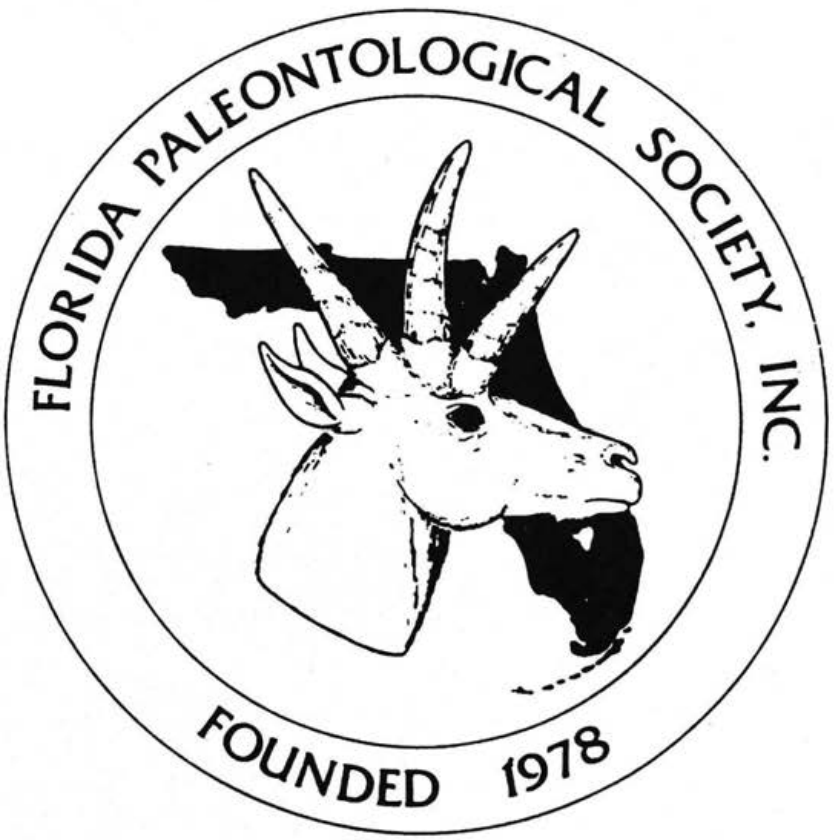
Florida Paleontological Society, Inc.

Newsletter



Volume 12 Number 3 Summer Quarter 1995

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Florida Museum of Natural History
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FLORIDA PALEONTOLOGICAL SOCIETY INC. NEWSLETTER

Volume 12, Number 3 **Summer Quarter 1995**

CONTENTS

FPS Fall Meeting
October 28-29
Wakulla Springs, Florida
St. Marks National Wildlife Refuge
Final Details Inside, pages 5-6.

Attention FPS Members!
Donations Needed for the Fall Fossil Auction
Bring your extra fossils, casts, books, and other related paleontological items for our Auction!

All Proceeds go to the FPS's Gary Morgan Student Research Award Fund

News Notes...

Fall Meeting Update...

Please check the updated Fall Meeting pages in this issue for the latest times and schedules. Note that the time for the butterfly trip is moved to 6:00 AM Sunday at the St. Marks Refuge. Also, a snorkeling trip to the Steinhatchee River for vertebrate fossils has been added as an option.

Some people were reportedly disappointed that the Wakulla Springs lodge was fully booked. At the time of this writing, several rooms had opened up there, so keep checking with them if you are interested in staying at the Springs.

Finally, don't forget to bring your donations for the annual fossil auction. The auction's past successes have been the result of generous donations from people like yourselves.

From the Florida Museum of Natural History...

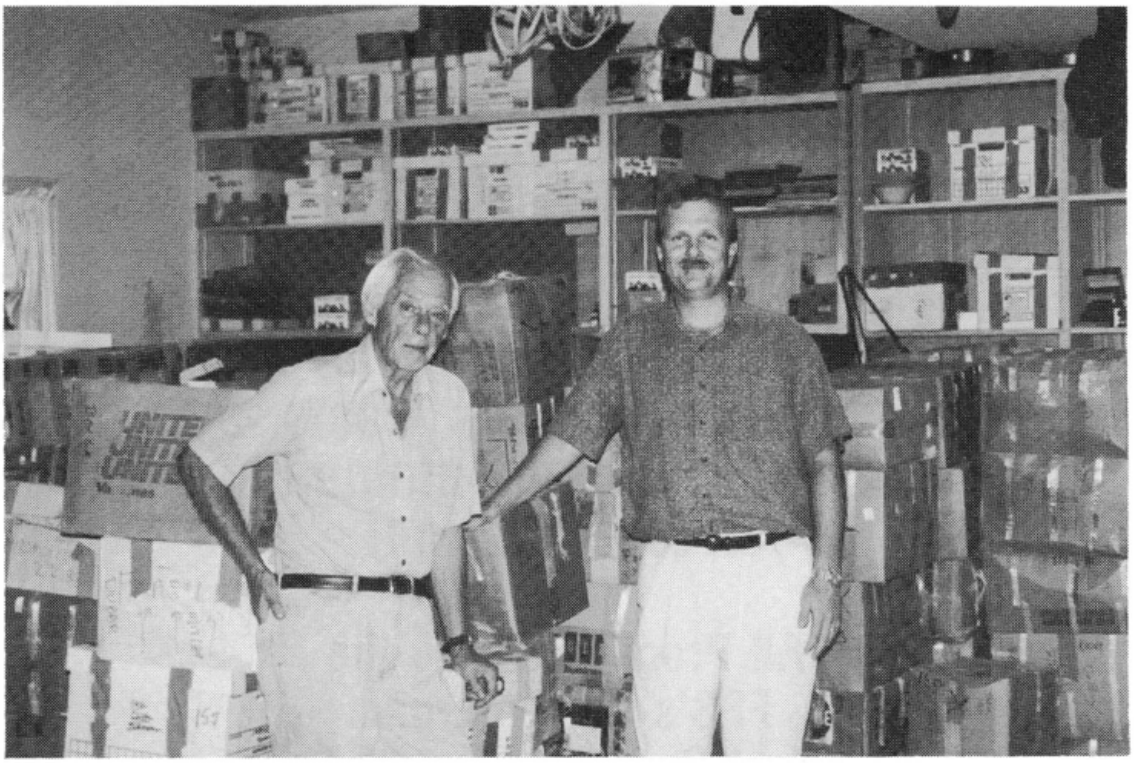
The Invertebrate Paleontology Division recently acquired the fossil collection and reprint library of Dr. Jules DuBar. Transferred in August from Dr. DuBar's home in Charlottesville, Virginia, the collection represents more than forty years of research. Most fossils are identified and numbered and include excellent locality descriptions with field notes, maps, and cross sections. Associated research data include heavy mineral analyses, amino acid or oxygen isotope age determinations, sedimentary analyses, foraminiferal studies, as well as lithologic descriptions and fossil lists. The collection contains approximately 15,000 lots.

Dubar's area of special interest includes Mesozoic and Cenozoic biostratigraphy, paleoecology, and paleogeography of the Atlantic and Gulf Coastal Plain Provinces and molluscan and echinoid paleontology. Dr. DuBar spent much of his academic career at Morehead State University, Kentucky, as a Professor of Geoscience.

Dr. DuBar published nearly 70 papers and/or books, many on Florida fossils. Some of these that the F.P.S. members might be familiar with include:

1958, Stratigraphy and paleontology of the Late Neogene strata of the Caloosahatchee River area of southern Florida: Florida Geological Survey Bulletin 40, 267 p.

1962, Neogene biostratigraphy of the Charlotte Harbor area in southwestern Florida: Florida Geological Survey Bulletin 43, 83 p.



Drs. Jules DuBar and Douglas Jones with the 170 boxes of invertebrate fossils being transferred from Charlottesville, Virginia to the Florida Museum of Natural History in Gainesville.

1968, with R.D. Perkins et al., Late Cenozoic stratigraphy of southern Florida - a reappraisal: Miami Geological Society, Second Annual Fieldtrip Guidebook, 110 p.

1974, Summary of the Neogene stratigraphy of southern Florida, *in:* Oaks, R.Q., and Dubar, J.R. (ed s.), Post-Miocene stratigraphy, central and southern Atlantic Coastal Plain: Utah State University Press, p. 102-122.

More on the Portell's new Arrival...

As mentioned in our last newsletter, the Portell's have a new daughter. Roger wasted no time escorting Jennifer around the state to meet with some of our enthusiastic fossil collectors. Stops on this most hurried trip were with: Evelyn and Ernest Bradley and Greta and Andy Murray of Bradenton, Lelia and Bill Brayfield of El Jobean, and Billy Bell, Wendy Conway, and Gary Schmelz of Naples.

Jennifer with Evelyn and Ernest Bradley discussing the good ole days at the Macasphalt Shell Pit. You can see Jennifer's reaction upon learning of the closure of that now famous collecting site.

Jennifer and her mom (Anne) after discussing vertebrate fossils with Lelia and Bill Brayfield. As you can see Jennifer found that discussion most satisfying.

Book Bits

In response to one reader's request for information on papers published on Florida paleontology, Roger Portell supplied the following list of recent invertebrate fossil papers by Douglas S. Jones and himself. These papers deal in-part or wholly with Florida paleontology, and represent only a portion of all the papers published by these authors.

Roger Portell

1995:

Portell, R.W., Schindler, K.S., and Nicol, D., Biostratigraphy and paleoecology of the Pleistocene invertebrates from the Leisey Shell Pits, Hillsborough County, Florida, *in:* Hulbert, R.C., Morgan, G.S., and Webb, S.D., (eds.), Paleontology and Geology of the Leisey Shell Pits, Early Pleistocene of Florida: Bulletin of the Florida Museum of Natural History, v. 37, pt. 1, p. 127-164.

Brogan, A.E., and Portell, R.W., Early Pleistocene freshwater bivalves (Mollusca: Unionidae) from the Leisey Shell Pits, Hillsborough County, Florida, *in:* Hulbert, R.C., Jr., Morgan, G.S., and Webb, S.D., (eds.), Paleontology and Geology of the Leisey Shell Pits, Early Pleistocene of Florida: Bulletin of the Florida Museum of Natural History, v. 37, pt. 1, p. 165-176.

1994:

Newman, W.A., Buckeridge, J.S., Portell, R.W., and Spivey, H.R., Victor August Zullo (24 July 1936 - 1 July, 1993): Journal of Crustacean Biology, v. 14, n. 2, p. 179-181.

1993:

Allmon, W.D., Rosenberg, G., Portell, R.W., and Schindler, K.S., Diversity of Atlantic coastal plain mollusks since the Pliocene: Science, v. 260, p. 1626-1629.

Zullo, V.A., and Portell, R.W., Paleobiogeography of the late Cenozoic barnacle fauna of Florida, *in:* Zullo, V.A., Scott, T.M., Harris, W.B., and Portell, R.W., (eds.), The Neogene of Florida and adjacent regions, Proceedings of the third Bald Head Island conference on coastal plains geology: Florida Geological Survey Special Publication 37, 112 p.

1992:

Portell, R.W., and Vokes, E.H., A new species of *Dicathias* (Gastropoda: Muricidae) from the Pliocene Tamiami Formation of southern Florida: Tulane Studies in Geology and Paleontology, v.25, n. 4, p. 169-174.

Portell, R.W., Schindler, K.S., and Morgan, G.S., The Pleistocene molluscan fauna from Leisey Shell Pit 1, Hillsborough County, Florida, *in:* Scott, T.M., and Allmon, W.D., (eds.), The Plio-Pleistocene stratigraphy and paleontology of southern Florida: Florida Geological Survey Special Publication 36, 194 p.

1991:

Zullo, V.A., and Portell, R.W., A new species of *Eoceratoconcha* Newman and Ladd, 1974 (Cirripedia, Archaeobalanidae) from the Pliocene of Florida: Journal of Paleontology, v. 65, n. 2, p. 271-276.

Portell, R.W., and Schindler, K.S., *Menippe mercenaria* (Decopoda: Xanthidae) from the Pleistocene of Florida: Papers in Florida Paleontology, v. 3, p. 1-8.

Zullo, V.A., and Portell, R.W., Balanoid barnacles from the early Miocene Parachucla Formation and Penny Formations, northern Florida: Tulane Studies in Geology and Paleontology, v. 24, n. 4, p. 79-86.

Douglas Jones

1995:

Jones, D.S., Mueller, P.A., Acosta, T., and Shuster, R.D., Strontium isotopic stratigraphy and age estimates for the Leisey Shell Pit faunas, Hillsborough County, Florida: Bulletin of the Florida Museum of Natural History, v. 37, pt. 1, p. 93-105.

Bryant, J.D., Jones, D.S., and Mueller, P.A., Influence of freshwater flux on $^{87}Sr/^{86}Sr$ chronostratigraphy in marginal marine environments and dating of vertebrate and invertebrate faunas: Journal of Paleontology, v. 69, p. 1-6.

Jones, D.S. and Allmon, W.D., Records of upwelling, seasonality and growth in stable-isotope profiles of Pliocene mollusk shells from Florida: Lethaia, v. 28, p. 61-74.

Allmon, W.D., Spizuco, M.P., and Jones, D.S., Taphonomy and paleoenvironment of two turritellid-gastropod-rich beds, Pliocene of Florida: Lethaia, v. 28, p. 75-83.

1993:

Krumm, D.K., and Jones, D.S., A new coral-bivalve association (*Actinastrea - Lithophaga*) from the Eocene of Florida: Journal of Paleontology, v. 67, p. 945-951.

Jones, D.S., Mueller, P.A., Hodell, D.A., and Stanley, L.A., $^{87}Sr/^{86}Sr$ geochronology of Oligocene and Miocene marine strata in Florida, *in:* Zullo, V.A., Harris, W.B., Scott, T.M., and Portell, R.W., (eds.), The Neogene of Florida and Adjacent Regions, Proceedings of the Third Bald Head Island Conference on Coastal Plain Geology: Florida Geological Survey Special Publication 37, 112 p.

1992:

Jones, D.S., Integrated stratigraphic approach to geochronology of marine - nonmarine sites in the Plio-Pleistocene of Florida, *in:* Scott, T.M., and Allmon, W.D., (eds.), The Plio-Pleistocene stratigraphy and paleontology of southern Florida: Florida Geological Survey Special Publication 36, p. 51-62.

1991:

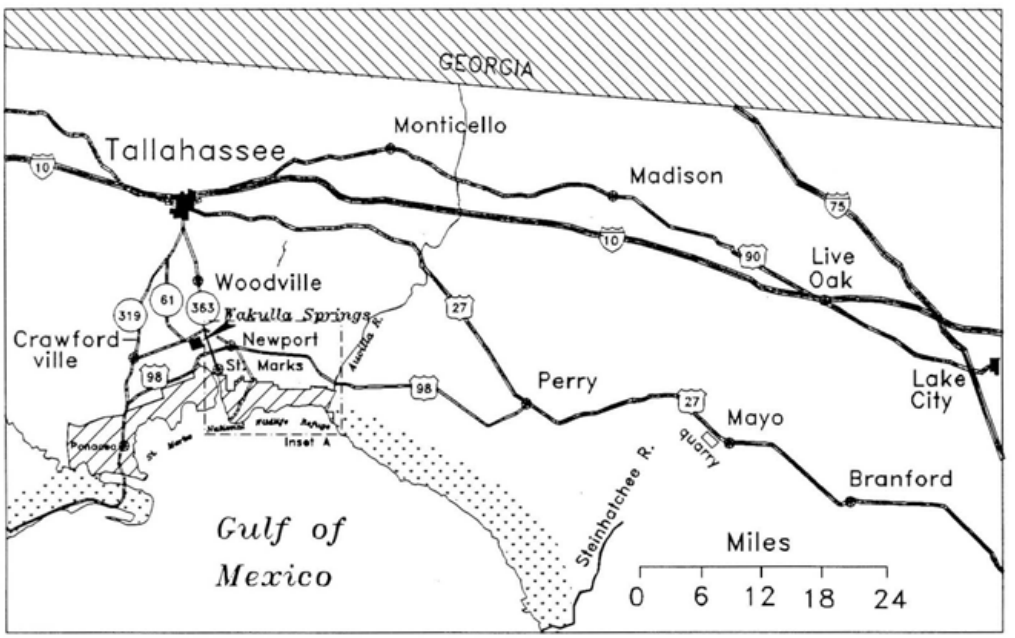
Jones, D.S., MacFadden, B.J., Webb, S.D., Mueller, P.A., Hodell, D.A., and Cronin, T.M., Integrated geochronology of a classic Pliocene fossil site in Florida: Linking marine and terrestrial biochronologies: Journal of Geology, v. 99, p. 637-648.

Diblin, M.C., Randazzo, A.F., and Jones, D.S., *Lithoplaision ocalae*: A new trace fossil from the Ocala Limestone (Eocene), Florida: Ichnos, v. 1, p. 255-260.

UPDATED INFORMATION

F.P.S. Fall Meeting 1995

Saturday October 28 and Sunday October 29, 1995
Wakulla Springs State Park
St. Mark's National Wildlife Refuge

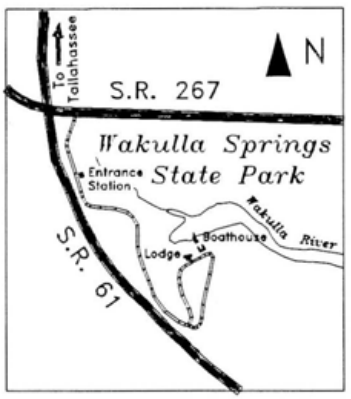


ITINERARY

Saturday October 28, 1995

Invertebrate Quarry Field Trip - Mayo, FL*	7:30 AM - 11:00 AM
Vertebrate Field Trip - Snorkeling the Steinhatchee River	7:30 AM - 11:00 AM
Lunch on your own and travel to Wakulla Springs	11:00 AM - 2:00 PM

*Note: Both field trips meet at 7:30 AM at MacDonald's restaurant in Perry. If quarry ownership changes prior to meeting, the invertebrate trip may be cancelled. Those attending the vertebrate trip bring snorkeling equipment and, if possible, a wet suit, underwater light, bucket, and screen. If the river level is too high, the snorkeling trip may not be possible.



Wakulla Springs State Park, Wakulla County, Florida

Wakulla Springs, a 2,900 acre park where a wide variety of birds, fish, turtles, deer and alligators live in a protected area, is located 15 miles south of downtown Tallahassee on Florida Highway 267. The Florida Park Service offers glass bottom boat tours over the clear water of the 185-foot deep spring. Jungle boat tours take you far down river to view abundant wildlife and lush vegetation. You can also swim in the cool, refreshing waters of the Spring. An abundance of fish and a few fossilized mastodon bones can be seen in the spring (Collecting is not allowed!). Picnic areas including tables and grills are provided within the park.

Saturday - continued:

Presentations at Wakulla Springs Lodge: 2:00 PM - 4:00 PM

Dr. Steven Manchester, Florida Museum of Natural History, "Paleobotany of the Florida Panhandle"

Dr. Douglas Jones, Florida Museum of Natural History, "Paleomagnetics and Monarchs"

Tim Young, "Pleistocene Vertebrate Paleontology of the St. Marks River"

Frank Rupert, "Geology of the Eastern Florida Panhandle"

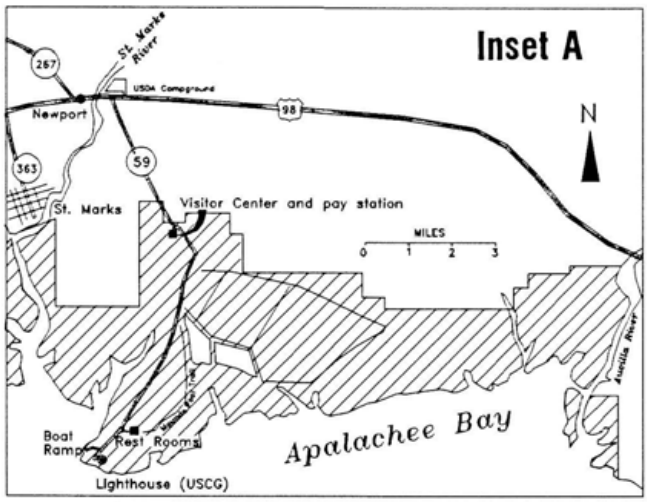
FPS Board of Director's Meeting: 4:00 PM - 5:00 P.M.

Banquet Dinner: 6:30 PM - 7:30 PM, Wakulla Springs Lodge restaurant. Buffet includes two entree selections, two vegetables, tossed green salad, oven-warm rolls and butter, freshly brewed coffee (including decaffeinated), freshly brewed iced tea, and dessert ($14.95 per person/children under 12 $4.95). If you plan to attend the banquet, fill out the buffet reservation form in the last issue and return to Phil Whisler **Now**.

Guest Speaker: Tonya Van Hook, Department of Entomology, University of Florida, "Monarch Migration and the St. Mark's Wildlife Refuge"

Annual Auction: 7:45 PM - ????

Sunday, October 29, 1995 Butterfly watching at St. Marks National Wildlife Refuge and Annual Monarch Butterfly Festival featuring nature activities and Arts and Crafts.



St. Marks National Wildlife Refuge

The office/visitor center is located down County Rd. 59, 3 miles south of the Newport fire tower on U.S. Highway 98. Entrance fee $4.00 per vehicle (or free with valid Duck Stamp). There are no overnight or eating establishments on the refuge, but picnic tables, drinking water and restrooms are available. In October, Monarch butterflies begin migrating through the Refuge on their way to their Mexican wintering grounds and Northern harriers can be seen hunting over refuge marshes. Viceroy, Queen, American Painted Beauty, Fritillary, and Buckeye butterflies are common. Purple iron weed, lantana and firewheel are a few wildflowers to be found. Birds, mammals, frogs and toads, snakes and alligators also abound. **Bring your binoculars, a light jacket or windbreaker, flashlights, and your camera!!!!**

Sunday's events:

Monarch Butterfly Migration: **6:00 AM** at the Lighthouse.

Presentation by Tonya Van Hook

Slide Presentation at visitor's center

Guided and self-guided nature walks and bird watching

Annual Butterfly Festival at Refuge

Visit to Book Store for T-Shirts, Bags & Gifts

Prep Talk

by Russ McCarty

Greetings from the bone lab! Hope you're all beating the heat. With a controlled environment of 55% relative humidity and 70 degree temperature, the lab is the place to be during most days of this dreadfully hot summer. I know that museums in many of the western states have a seasonal collecting policy, a pragmatic response to the long harsh winters that precludes most fieldwork. Perhaps, here in Florida, we should only collect in the winter. Sounds like a good idea to me. However, let's not forget the optimist standing before the firing squad whose last words were: "...things could be worse!". We might be living in Florida during the first half of the Miocene, when Dante's Inferno would have been a more apt moniker for Florida than the 'Sunshine State'. At that time, the Florida peninsula, or that portion of it which was exposed during the early Miocene, experienced an extremely humid, hot climate with temperatures averaging nine to twelve degrees warmer than those at present. Add to this unpleasant scenario, the presence of those giant, flightless, Miocene mosquitoes that were capable of draining a rhino dry in one bite, and you'll agree there are many reasons to feel we've got it pretty good now (of course, I was just kidding about the mosquitoes). Nevertheless, I think the Miocene is probably one of the most interesting epochs in Florida's prehistory, and if I possessed a time machine, I'd surely want to visit this bit of prehistory. If, by chance, the destination of my hypothetical trip to the Miocene just happened to be 16 million years ago, I would have had extreme difficulty trying to navigate my time machine around Florida by compass. Paleomagnetic studies have determined that 16 million years ago, the earth's magnetic field was shifting rapidly, as much as six degrees per day. At intervals, the earth's magnetic field reverses itself . This reversal, which results in the north magnetic pole becoming the south magnetic pole, takes about 5000 years to complete. However, a six degree shift per day is a rate far greater that any scientist would have expected, but that's just what Robert Coe and other researchers from the University of California at Santa Cruz found in paleomagnetic samples taken from Oregon lava deposits. This evidence implies, that during the period of reversal, magnetic field lines were in rapid flux, probably oscillating back and forth until the reversal was complete. Organisms which incorporate magnetite crystals in their tissues or brains, and that includes most organisms on earth, must have been quite disconcerted by this magnetic madness. I would be surprised, if some subtle evolutionary change had not accompanied this event.

After that diversion, its time to get this article back on course. In June, I attended a course at the San Diego Natural History Museum, which had as its focus, the preservation and conservation of museum specimens of geological origin. That definition covers a broad spectrum of specimen categories, and includes all types of fossils, mineral collections, stone tools, meteorites, folgerites, and any cultural artifacts made or carved from mineral material. The intensive six day course was taught by Chris Collins, chemist and conservator from Oxford, England and Sally Shelton from the San Diego Natural History Museum. Both instructors are well known in their fields and those attending the course returned home much enlightened. Starting with this issue I would like to talk

about the basic tenets of conservation and preservation. What do the professionals do? When do you intervene in a specimen's integrity by treating it with hardeners, and when do you just leave it alone? We'll discuss polymers used in glues and hardeners and find out which are good and which can prove to be a death sentence for your specimens.

The Palm Bay Whale

Several days before Hurricane Felix struck the east coast, heavy equipment operators building a sewage treatment pond at Palm Bay, in Brevard County unearthed a number of large bone fragments. Photos sent to the museum showed the largest piece of bone to be the skull of a 30 to 40 foot baleen whale. Unfortunately, the museum had neither the personnel to recover it, nor the space to house this large fossil. My suggestion to the curators was to get one of the fossil clubs involved in a salvage operation, specifically, the Florida Fossil Hunters in Orlando, since they were only an hour's drive away from the site. A phone call to Jody Barker and Dean Sligh got the ball rolling and within a few days Florida Fossil Hunters had a crew on site and the skull jacketed. Then came Felix. Instead of hitting south Florida as had been predicted, the storm came ashore right on top of the fossil site. While Brevard County claims the skull and other fossils recovered at the site, the Florida Fossil Hunters were entrusted with the excavation and preparation of these fossils. Over numerous phone conversations between Dean Sligh, myself, and other members of the club, we arrived at a plan on how to best deal with the site and its fossils. To aid in identification and preparation, I sent xerox copies of comparative whale material to the club. FFH member, Sarah Morey was also here at the museum to look at and photograph recent and fossil whale skulls to see if any of these matched her club's find.

Florida Fossil Hunters has done a superb job and is to be commended by all members of the Florida paleontological community. This is the way it should be! An important scientific specimen has been saved, rather than being bulldozed and carted off as land fill, and it was saved by an amateur paleontological society, which, in spite of the oxymoron 'professionalamateur' has performed in a most professional manner. Dean promises that they will have an article about the whale in this issue.

Problems and Treatment of Sub-Fossil Bone

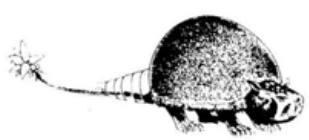
The whale skull presents us with a good example of one class of preservation problems---that of sub-fossilized bone specimens. For many collectors in the rivers of Florida, this class of bone may be the most common type in their collection. Living bone consists of collagen fibers and the mineral hydroxyapatite. Sub-fossilized bone, which is primarily from the Pleistocene and Recent Epochs retains a fair amount of the organic material (collagen) and the original mineralized bone (hydroxyapatite). You can easily test for collagen yourself, by holding a piece of Pleistocene bone against a grinding wheel, or in a flame. If it gives off a bad odor(like burning hair), it contains collagen. To maintain its integrity, sub-fossil bone needs to be kept in a stable environment. Once it is removed from the matrix in which it is found, it is likely to deteriorate rapidly, especially, if it is wet, and the bone is subjected to extreme fluctuations of temperature and humidity. There are two possible approaches to preserving wet specimens, both of which, can be done at the same time, if necessary. The first is the use of water based consolidants. These can be applied by brushing, immersing, spraying, or vacuum impregnation.. The most frequently used water based consolidants are water soluble

plastics such as polyvinyl acetate emulsions (white glues) andacrylic emulsions such as Rhoplex. These are mixed in a ratio of about one part consolidant to 10 parts of water. Some conservators argue against applying any water based consolidants to a completely dry specimen, because the high water content of the consolidant can cause the dry specimen to swell and crack. Dry specimens should be preserved with organic solvent based consolidants such as Butvar or Vinek.

The second approach to treating wet specimens is the slow, controlled drying method to prevent cracking and delamination. An inexpensive, but functional drying box can be easily constructed by placing a piece of clear plastic sheeting, such as Visqueen, over a sturdy box. Place the wet specimen inside the box and cut a few flaps or slits in the plastic. The flaps will allow a slow, controlled exchange of the moist air in the box with the lower RH (relative humidity) ambient air outside the box. Similarly, a large, clear plastic bag might be used. In the case of very large wet specimens, such as the Palm Bay whale skull, a tent made of Visqueen could be erected over the specimen. Again, flaps or slits cut into the tent would regulate the air flow. To monitor changes in RH, a humidity gauge can be placed in the containment area along with the specimen. Slow drying, since it keeps the specimen moist for a long time, might foster mold growth. A periodic spray of Lysol or any fungicide inside the containment area will probably control this problem.

The goal of all controlled drying procedures is to bring the high RH of the wet specimen slowly downward until it matches that of the storage area. Even if a water based consolidant is used to conserve (preserve) a wet specimen, it is advisable to apply controlled drying procedures until the specimen is stabilized to storage environment conditions. Ideally, the optimum storage environment for sub-fossil bone should be 50-55% relative humidity and a temperature somewhere between 65 and 72 degrees. Storage below 50% RH can lead to cracking and shrinking as the specimen dries out.RH above 70% encourages mold and fungal growth which can damage sub-fossil bone. Since both RH and mold and fungal growth are temperature dependent,it is important to keep the temperature in the narrow good range of 65 to 72 degrees. Particular attention should be given to filler materials used to repair or restore sub-fossil bone. Materials which shrink or expand upon curing should be avoided as either action can damage the specimen. Plaster of paris should not be used on very dry specimens, since the water in the plaster will cause the specimen to swell and crack. What's good to use? Paper mache and plaster mixed about 50/50 is not too bad, since the mache absorbs most of the water. Epoxy putties, like Magic Sculp, although they are not easily reversible, are OK if the repair is permanent, and not one that is likely to be undone. Butvar or polyvinyl acetate glues can be filled with Cab-O-Sil or silica microbeads to form a stiff paste that can be used to fill cracks and voids. The advantage of these last two fillers is that they are reversible with acetone. One final rule of thumb concerning treatment of sub-fossil bone comes from conservator, C.J. Buttler: 'Once treatment is completed, a specimen should not be placed back into an environment where it will deteriorate again.'

Questions, comments, suggestions? Contact Russ McCarty at the VP Prep Lab,care of the Florida Museum of Natural History, University of Florida,Gainesville, FL 32611. Telephone: (904) 392-1721. Email:Cormac@flmnh.ufl.edu



The Anatomy of a Salvage Dig

by Dean Sligh
Florida Fossil Hunters

Ray wiped the sweat from his forehead as he watched the huge earth-mover make another pass. The hot July sun reflected from the sand and shell of what would soon be the bottom of a 25 acre man-made reservoir at the Brevard County landfill on the outskirts of Melbourne. Suddenly something behind the giant machine caught his attention.

"What's that?" he wondered to himself as he approached a small black spot about the size of a dinner plate. He poked it. It was hard and unyielding, sort of rock-like. But Ray Futch hadn't seen any rock like that in his years as superintendent with Prince Contracting Company. He bent over and began brushing away the sand and shell around it. The "plate" grew larger....much larger. Soon he got a shovel from his pickup and began digging in earnest. When he had uncovered the outer edges of his black-mystery he was looking at the top of an object measuring nearly five feet in diameter and no longer bearing any resemblance to a plate.

Time to call Dick and Fritz.

When Dick Gosselin, construction coordinator for Brevard County Solid Waste Management and Fritz Von Bargen, the Project Engineer with Post, Buckley, Schuh and Jernigan joined Ray at the site of the mysterious object they all agreed on two things: they didn't know what it was, and they should contact someone. Time to call Jean Strickland, Post-Buckley's senior biologist.

After more discussions, Jean contacted Russ McCarty, senior preparator in the vertebrate paleontology lab at the Florida Museum of Natural History in Gainesville.

"Send me some pictures and I'll see if I can identify it for you" Russ advised.

Jean sent him a series of pictures by overnight courier, including several of one of her coworkers stretched out full length on top of the "black thing".

Next day they got the word.

"Congratulations Jean, you have a healthy 1000 pound skull of a Baleen whale!".

"Oh, great! Now what do we do?"

"Well, I'm afraid we can't help you Jean. We don't have the manpower or the storage space to handle it. I'd suggest you call Jody Barker or Dean Sligh with Florida Fossil Hunters in Orlando. They have about 200 members and can usually respond fairly quickly to situations like yours".

When I got home from work that Wednesday evening, July 26th, my answering machine was lit up like a Christmas tree. Jody had called, Russ had called, and Jean had called. I called each of them back and after several more calls and discussions the decision was made...*let's go for it!*

Friday morning Jean took Jewel Pozefski, our Education Chairperson and me to the site in Brevard County. After meeting Dick, Fritz, and Ray we proceeded to the roped-off area where the skull lay covered with a plastic tarp. You can imagine the rush of adrenalin Jewel and I experienced as the tarp was pulled back, exposing the huge black baleen skull. It measured five feet across and four and one half feet from the occipital condyle forward. Unfortunately the entire "beak" portion and the mandibles were missing. Judging from the size of the existing area, the original length of the skull would have been at least 10 to 12 feet.

Jean, Jewel and I spent several hours digging behind the skull (it was pointing southwest), looking for vertebrae and rib sections, but to no avail.

That evening Jewel was on the phone for about four hours mobilizing our dig crew for the next two days. I called my contact at the Orlando Sentinel to get some press coverage of the next day's excavation activity and then spent the next several hours discussing strategy with our club president, Jody Barker and vice president, Terry Rex Angel (T-rex for short).

Saturday morning, July 29th, twenty Florida Fossil Hunter members descended on the "whale site" for the biggest undertaking since our group was formed almost five years ago. The circular moat around the skull was widened and deepened to allow more room for the enormous plaster jacket to be applied. Another group dug a series of 20 to 30 feet long trenches behind the skull at intervals of about 10 feet, still hoping to find traces of the remainder of the skeleton. A layer of large clam shells at a depth of two to three feet made the digging extremely difficult and time consuming. Dick Gosselin had told us he

could hold off working that portion of the pond for possibly two to three weeks so we knew from the start that time was of the essence. Had we been able to see two to three days into the future we would probably have stayed and worked by lantern light!

With sweat pouring and breaths coming in short little pants, I remembered Dick had casually mentioned on our first look at the skull that he could probably get us some power equipment, such as a backhoe, when we were ready to lift the skull (Dick soon learned not to make casual promises to a group of amateur paleontologists caught up in ***fossil-hunting frenzy***...indeed, they can be more dangerous than an equal number of sharks!).

"Dick, did you say you might be able to get us a backhoe?", I asked, like a hungry orphan begging for bread. The next fifteen minutes were unbelievable. Dick lived up to his word, obtaining the use of Prince Construction Company's backhoe for the remainder of that day **and** the next with one minor problem...the operator was getting ready to go home. But wait! Not to worry...our own FFH member, mild-mannered Carl Darling stepped out of the shadows and announced that in real life he was a heavy equipment operator for Volusia County! (I can only say the Fossil Gods were truly looking out for us the first two days).

So as our V.P. "T-rex" put his UCF engineering degree to the test on jacketing and removing the half ton of skull and matrix, Carl guided the six foot shovel end of the backhoe through the partially completed, hand-dug trenches, biting through layers of thick shells with no strain (and no blisters). But even the backhoe did not magically produce the remainder of the skeleton or any part thereof.

"O.K. Carl, my theory of the skeleton lying somewhat in place behind the skull is down the toilet. Where do you think we should try next?" We decided to open a series of five trenches to the southeast of the skull in an area that had shown several small areas of bone fragments. This would give the group not working on the skull some areas to explore.

The first trench was uneventful. The second one likewise. By the time Carl started the third trench, our optimism was beginning to take a beating. Then suddenly Carl brought his mechanized beast to a stop, jumped off, and began digging frantically just behind the huge scoop. He quickly recovered some bone amid cheers of everyone around. In fact, the crew working the skull, about fifty yards to the northwest, looked to see what all the shouting was about

After Carl gently backed the hoe away, the hand digging began in earnest. From a spot a mass of bone emerged over the next day and a half that, as of this writing, is still unidentified.

By Sunday evening, July 31st, the skull was pretty well jacketed, much of the second mass of bone was exposed, and a few other odds and ends had been collected, including a heavily eroded whale earbone, a deer ankle bone, and numerous small, black, dense bone objects of varying sizes and shapes. The weekend had been a resounding success. Our first ***really big*** dig was under control! Then our friendly gods went to sleep at the wheel.

Tuesday (our day to explore the trenches Carl had opened) Hurricane Erin slammed into Brevard County and pelted the area with 13 inches of rain over a two-day period. A hoped-for return to the site on Thursday, August 3rd, had to be scrubbed at the last minute on word from Dick Gosselin that they had received more rain and were once again flooded. Instead I used that day to meet with Rachel Moehle, Director of the Brevard Museum of History and Natural Science in Cocoa where the whale material will be displayed. It was our first chance to tie in with Rachel and her staff so they could begin planning for the future exhibit.

By Saturday we returned to a somewhat disquieting scene. Both excavation holes were full of water and pumps had to be brought in to remove water so work could resume. Our trenches had disappeared along with some of the plaster jacketing from the previous weekend.

While two crews resumed work on the skull and the second group of bones, a third crew, including some of the staff and volunteers from the Brevard museum, criss-crossed a portion of the site still above water stuffing anything and everything into ziplock bags. The bags, with the collector's name and phone number inside, were turned in at the end of the day. After all material has been studied anything not needed for the exhibit or further research will be returned to the finder.

By late Saturday we had used our supply of plaster plus 300 more pounds Dick had procured from the County, as well as a full bolt of burlap we bought for the job and a second one Dick obtained. Jewel made a last minute run to Scotty's for more supplies while the crew labored on.

Sunday, our fourth full day on the site, was the day of two exciting discoveries. One large ear bone from the area under the skull and a second one near the site of the unidentified bone mass. Both are in near perfect condition, with the largest measuring 6.5

inches across the bottom.

Dick brought in a flat bed trailer with the assistance of a bulldozer and with steady-hand Carl at the controls, all the material was loaded. Phase one, the excavation, was complete. It was now 11 days and one hurricane since we had first been contacted...four of those days were "rained out". But as Mr. Harvey would say, "Now for the rest of the story!"

First, I can't begin to express how proud I am of all the FFH members who jumped in and made it happen, using individual skills, knowledge, and plain old common sense. They faced a challenge and came through like the real winners I know them to be.

But the real unsung heros are people like Ray Futch, who brought this discovery to someone's attention instead of just dumping a few inches of "fill" on top and going on with the job. And Ray's company, Prince Construction, who worked around the whale site giving us time to excavate. And without the use of their backhoe the second large group of bones would probably not have been discovered, including one "killer" of an earbone.

As far as Dick Gosselin goes, I just can't find words to adequately thank him. In his own busy schedule of overseeing this multi-million dollar contract he always had time to help us with our ever-growing needs. It got to the point where I was embarrassed to ask him for one more favor, and I noticed he avoided eye-to-eye contact when I headed in his direction (just kidding, Dick). And Brevard County not only gave us the opportunity to make this important recovery, they furnished some of the materials and rented a secured storage facility for us to work on the material recovered.

Without Jean Strickland's preserverance the whale material would probably now be resting at the bottom of Brevard County's newest 25 acre lake. She did all the right things to take this from "discovery" to "recovery". And her coworker Fritz Von Bargen graciously shared his construction site office as a meeting place for our "troops" arriving for the daily digs, let us hold several media conferences there, gave us technical information concerning the site and the on-going project, and in general made us feel comfortable and welcome (how many of you fossil collectors have experienced that from a construction company in the middle of a job??). Post-Buckley has two very community-minded employees in Jean and Fritz.

Russ McCarty at the Florida Museum of Natural History in Gainesville gave us tons of information and encouragement throughout the entire recovery process. He became so accustomed to my 7:00 P.M. calls to his home he began answering the ring with "Hello Dean, how did things go today?"

Last and by no means least is the media. My friend Jay Hamburg with the Orlando Sentinel set the ball in motion by arranging good coverage for us on the first day of our dig. The story, color photos and all, made the front page of one section of the Sunday Sentinel. This in turn brought TV reporter Michele Kane and photographer Greg Clark with Orlando's Channel 6 out Sunday to do an in-depth report, which they transmitted from the site that evening on the six and eleven o'clock news and to Channel 7 in Miami for the 6:30 evening news. Also, reporter Scott Rowe with Florida Today newspaper in Brevard County and his photographer did a photo-interview session for their Monday edition. All that combined exposure brought us calls from as far away as Miami, where the Miami Herald did a small write-up picked up from the Associated Press wire service.

Sandra Rawls, a volunteer with Harbor Branch Oceanographic Institute, called from her home south of Vero wanting to know how she could help. As a result, she put us in touch with one of the top authorities in the world on whale evolution, Dr. Lawrence Barnes, Curator of Vertebrate Paleontology at the LA County Museum in Los Angeles. Dr. Barnes is now studying some of the material we have sent him for possible identification and he has also graciously agreed to be the guest speaker at our December 20th meeting (subject? whale evolution, of course!). And Sandra and the Harbor Branch curator Debbie Krumm are also studying microscopic foraminifera associated with a section of whale rib we recovered hoping to derive an age for the deposit.

So what does all this mean? It means that thanks to the cooperation and positive attitude by so many people and organizations, the people of Brevard County and surrounding communities will have a piece of their heritage on display in the Brevard Museum to see and enjoy for many years to come. What kind of a price can you put on that? (Oh yeah, Dick, just one more favor...can you get me an appointment with the Brevard County Board of Commissioners? I want to petition them to officially designate your 25 acre pond the "Ray Futch Fossil Whale Site" in hopes that his actions will encourage others to do the same throughout this great state of ours.)

WHOSE TOOTH IS THIS, ANYWAY?

by David Thulman

Introduction

The purpose of this series of articles is to provide a set of keys or identifying characteristics which will assist amateur collectors in identifying mammalian fossils commonly found in Florida. Most of the scientific articles discussing fossils are not accessible for amateurs, while the publications for the public are broad in scope but not comprehensive. Hopefully this series will be comprehensive, easy to understand and contain enough information to identify a tooth to at least the genus and sometimes the species level.

The articles will focus on teeth because they are the most common undamaged or slightly damaged fossils found in rivers and they are usually unique enough, or diagnostic, for species identification. Each article will attempt to cover most of the species in a particular group of animals (depending on fossil availability); identify where the teeth were in the animal's jaw and give dimensions or descriptions which should aid in identification. This first article will give an overview of mammalian teeth, define some common terms, and then describe the dentition of the fossil Xenarthra (sloths, glyptodonts, armadillos, and giant armadillos) in Florida.

Structure of Mammal Teeth

Mammal teeth follow a common structure. The **crown** of the tooth protrudes beyond the jaw while the **root** anchors the tooth in the sockets, or **alveoli**, of the jaw. The tooth is composed primarily of **dentine** which surrounds the **pulp chamber** containing the living **pulp**, nerves and blood supply. While fresh dentine is tough, fossil dentine can be very fragile. The holes and cavities in the roots of fossil teeth comprise the pulp cavity. **Enamel** typically covers the crown but is missing entirely from the teeth in the Xenarthra. The tooth root is anchored to the jaws with **cementum** and fibrous tissue, although cementum may also be present in the crown of teeth with deeply infolded enamel, such as horse teeth. See **Figure 1**. Teeth may be rooted or rootless. Rootless teeth grow continuously.

Enamel is approximately 97% hydroxyapatite, a mineral consisting for the most part of phosphate and calcium densely packed in a crystalline mass. The remaining 3% is water and organic material. Dentine is approximately 75% inorganic, 5% water and 20% protein and collagen. The hydroxyapatite in dentine has a smaller and less organized structure than in enamel, hence, it is softer. Cementum is similar to bone. The difference in hardness between cementum, dentine and enamel creates edges and varied wearing surfaces where the work of teeth is done.

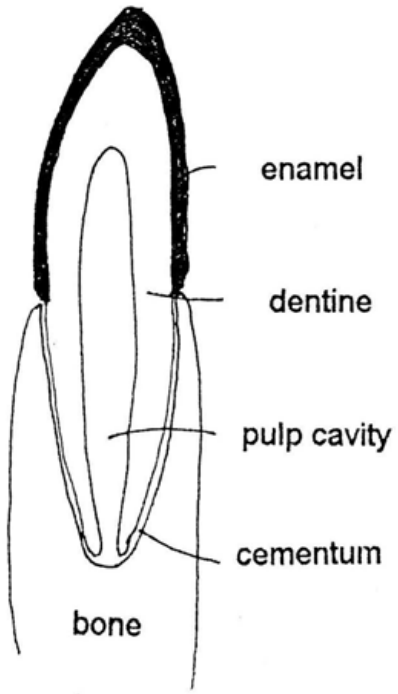


Figure 1.

Tooth descriptive terminology is very technical but some basic terms and concepts are necessary for describing teeth and the differences between them. Teeth are either **maxillary**, from the upper jaw, or **mandibular**, from the lower jaw. An animal's teeth are described in quadrants (upper right, upper left, lower right and lower left); each jaw being divided in half by the **median sagittal plane**. **Figure 2**. The side of a tooth facing along the dental arcade towards the median sagittal plane is **mesial** and side facing away from the plane is **distal**. The side facing the tongue is **lingual** and the side facing the cheek or lips is **buccal** or **labial**. On the front teeth, the forward facing side of the tooth is buccal while on the back teeth the forward facing side is mesial. The **occlusal** surface is where the upper and lower teeth meet. If a tooth does not occlude (such as an alligator's) it is described as having a **point** or **edge**.

Mammals are **thecodonts**, meaning their teeth are set in alveoli. Mammal teeth can be

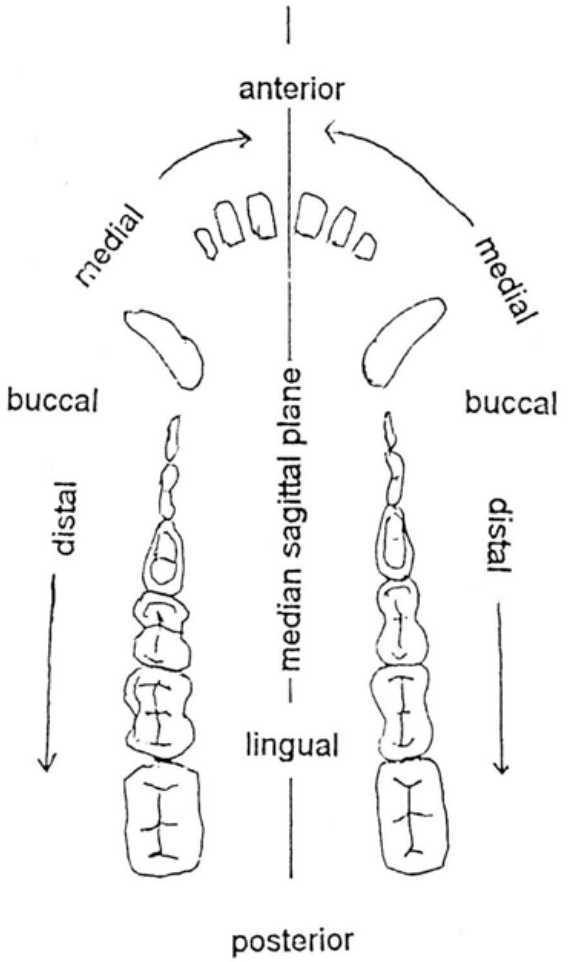


Figure 2.

grouped generally as **anterior** (those at the front of the jaw) and **cheek** (those along the side of the jaw), or more specifically as **incisors**, **canines**, **premolars** and **molars**. Teeth which do not neatly fit into these classes (like the teeth of the Xenarthra) can be described as being similar in structure or function to one of the recognized classes of teeth. For example, a sloth **caniniform** looks similar to a typical mammalian canine and an armadillo **molariform** functions like a molar.

The primative placental mammalian dentition pattern is three incisors, one canine, four premolars and three molars in both the upper and lower jaws. This **dental pattern** or **formula** can be written in shorthand as i 3/3, c 1/1, p 4/4, m 3/3. The individual teeth can be characterized further as (in order from front to back in any given quadrant):

i^1, i^2, i^3, c^1, p^1, p^2, p^3, p^4, m^1, m^2, m^3

i_1, i_2, i_3, c_1, p_1, p_2, p_3, p_4, m_1, m_2, m_3

Most mammals have variations on the generalized pattern. Most also have a first set of **deciduous** teeth which can be very different in size, number and form than the permanent teeth. Deciduous teeth are designated with a "d" before the formula shorthand, such as dp^2.

Teeth with high crowns are **hypsodont**; low-crowned teeth are **brachydont**. The **degree of hypsodonty** is the measure of the height of the tooth crown beyond the jaw bone and is used as a measure of the age of an animal with rooted teeth. In other words, the more worn the teeth, the older the animal. Raised peaks on the crown are **cusps** and rounded areas are **tubercles**. Teeth with rounded cusps are **bunodont**. Cusps fused into ridges are **lophs**. A ridge encircling all or part of a tooth is a **cingulum**. Each of the cusps and lophs has a specific designation depending upon its location. This only scratches the surface of tooth jargon, but for our purposes a greater level of detail at this point is not necessary.

The teeth described in the following section were generally measured in two dimensions: buccal-lingual, and mesial-distal. The anterior part of the jaws are on the left of the photographs and the teeth are described from left to right. The teeth were measured in millimeters at the greatest distance for width and length, unless indicated otherwise. I couldn't find a reference to a dental formula for some of these species and had to create my own, but I've indicated this where it happened.

A note about nomenclature: I relied on the Checklist of Florida Fossil Vertebrates (Hulbert 1992) for species classification, epoch and North American Land Mammal Age (NALMA) determinations, however, the Checklist is not complete. Knowing the age of the deposit may provide a clue to identification when the **morphology**, or form, of the dentition itself is not helpful. Sometimes I guessed at the species of a specimen by comparing the checklist with the age of the deposit in which the specimen was found.

Virtually all of the specimens in this article are from the Florida Museum of Natural History (FLMNH) in Gainesville. None of this would have been possible without the generous assistance and sage advice of Russ McCarty and Marc Frank, both of the museum's vertebrate paleontology lab.

Xenarthra Dentition

The Xenarthra comprises a primitive order of mammals originating from South America, including armadillos and sloths. The Xenarthra are represented in Florida's fossil record by the families Dasypodidae (armadillos), Pampatheriidae (giant armadillos), Glyptodontidae (glyptodonts), Mylodontidae (mylodont sloths), Megalonychidae

(megalonyx sloths), and Megatheriidae (eremotherium sloths and nothrotheriops sloths).

The Xenarthra are herbivorous and insectivorous and this diet is clearly reflected in the dentition which for the most part consists of simple grinding peg teeth. Much of the previous discussion on mammalian dentition is inapplicable for the Xenarthra, since the Xenarthra dentition is rootless, enamelless and falls well outside the generalized mammalian dentition pattern. The teeth of Xenarthra are commonly described as caniniform or molariform since they do not easily fit within typical descriptions of incisors, canines, premolars and molars. Teeth at the front of the palate (incisors) are missing. While they do not have enamel, the teeth are covered with cementum and appear to be composed of two types of dentine: a soft inner **vasodentine** and a harder, encircling **osteodentine**. The vasodentine wears faster than the osteodentine creating a single ridge or parallel ridges generally perpendicular to the median sagittal plane. In some fossil sloth teeth the cementum is readily identifiable as a thin (1 mm) band surrounding the tooth. This cementum can be very fragile and may peel off the tooth when it dries or is cleaned.

Sloth teeth have been described as among the most variable of any mammal, which makes the use of definitive dimensions for identification problematic. Not only that, but apparently the shape of the crowns of the teeth could change significantly as the animal aged, as would the circumference. In addition, along with a gradual size increase for many species during the Pleistocene, there was a corresponding gradual increase in tooth size. Unlike mammals with deciduous teeth, the circumference of the teeth of xenarthrans increased as the animals aged. This makes it difficult to determine whether a small tooth is from an adult of an earlier, smaller species, or a younger animal from a later, larger species. To complicate matters further, some species may have had deciduous teeth. Sloth teeth were parallel sided in adults but the juvenile teeth of some species were conical.

Dasypodidae

The Checklist lists *Dasypus bellus* (early late Pliocene to late Pleistocene) and an unnamed new genus and species from the early Pleistocene. The new genus and species has since been identified as *Pachyarmatherium leiseyi*. It was toothless. The example of *D. bellus* shown in **Figure 3** (UF 24978) was small enough to pass through a 1/4 screen. I don't know the dental formula. The teeth are peg-like with a single buccal-lingual ridge in the middle of the occlusal surface. The dimensions from left to right are 1.5 x 3.5, 2 x 4, 2.5 x 5, 3.5 x 4.5.

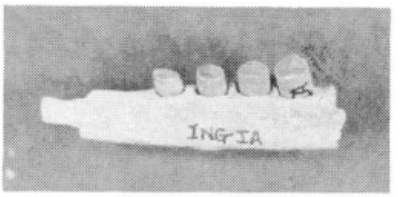


Figure 3.

Pampatheriidae

The Checklist lists two species: *Holmesina floridanus* (early late Pliocene to early Pleistocene), **Figures 4** (UF 121742) and **5** (UF 20948), and *Holmesina septentrionalis* (middle to late Pleistocene), **Figure 6** (UF 889). The teeth of these giant armadillos are similar, with the teeth of *H. septentrionalis* about a third larger than *H. floridanus*. The larger teeth have a distinctive line running anterior-posterior down the middle of the occlusal surface with faint lateral striations perpendicular to this line. The occlusal surfaces are flat.

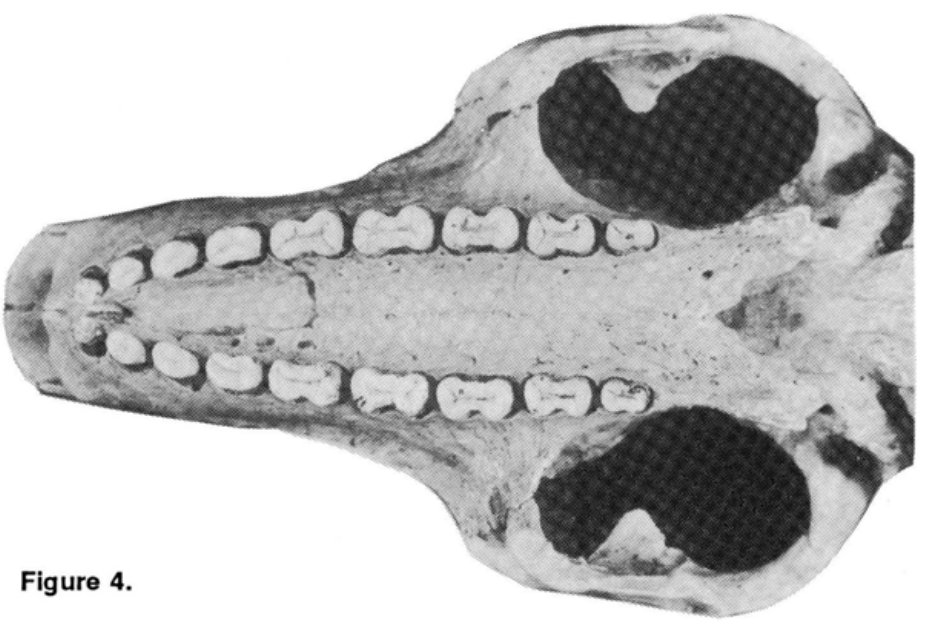


Figure 4.

Holmesina floridanus

The maxillary dental formula is c 1, m 8 (my guess). The dimensions: c^1 is 5, m^1 is 5x7, m^2 is 6x9, m^3 is 6x11, m^4 is 6x14, m^5 is 6x15, m^6 is 6x15, m^7 is 6x13, m^8 is 6x9. The mandibular dental formula is unknown but the specimen in **Figure 5** had at least eight teeth. This specimen is from a slightly later age than the skull in **Figure 4** and was identified only to the genus level by FLMNH, but because it was from the earliest Irvingtonian (very late Pliocene) I assigned it to *H. floridanus*.

Holmesina septentrionalis

The maxillary dental formula is unknown, but I suspect that a couple of teeth are missing from this specimen. The dimensions in **Figure 6** are m^1 is 5x10, m^2 is 5x13, m^3 is 6x15, m^4 is 7x18, m^5 is 8x20, m^6 is 7x20, m^7 is 7x20. The dimensions of the mandibular dentition for this specimen (not shown) are comparable to the maxillary dentition.

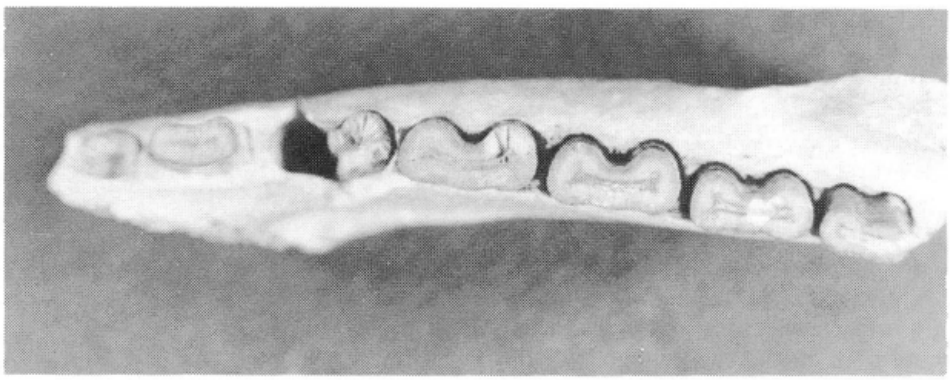


Figure 5.

Figure 6.

Glyptodonts are found in Florida from the early late Pliocene to the early Pleistocene and the late Pleistocene.

Glyptotherium sp.

The specimen in **Figure 7** (UF 147690) is from South America. All of the maxillary teeth are generally the same shape. The occlusal surfaces are flat. Like *Holmesina*, the teeth have a distinctive pattern on the upper surface. The dental formula is 8/8.

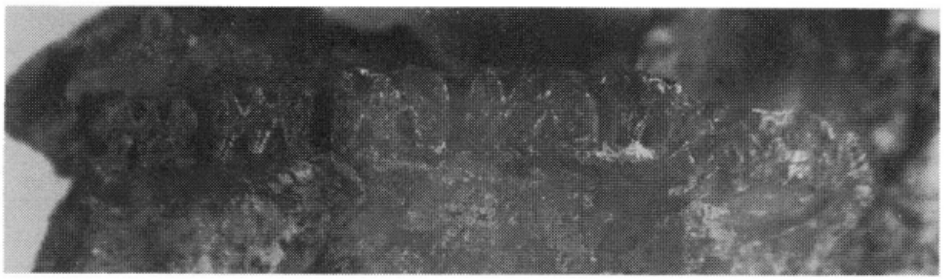


Figure 7.

Mylodontidae

The Mylodontidae have the most complicated teeth of any Florida sloth.

Thinobadistes sp.

This mylodont has been found in the early late Miocene and the very late Miocene. I have no examples of its dentition.

Glossotherium chapadmalense and ***Paramylodon harlani***

The Checklist provides that *G. chapadmalense* is found only in the late Pliocene in Florida. All Pleistocene occurrences of mylodonts are identified as *P. harlani*. The dental formula for both *G. chapadmalense* and *P. harlani* is c1/1, m3/4, although specimens of *P. harlani* have been found with five teeth on one side and four on the other. M_4 can be highly variable with an additional lobe appearing in the middle lingual side. The dentition flares out anteriorly like the bell of a trumpet.

Figure 8 (UF 10922) is the right maxillary dentition of *G. chapadmalense* enlarged to actual size. The ovate occlusal surface of c^1 is 12mm across the long diameter and rises 60mm above the jaw. M^1 is 11x20, m^2 is 20x23, m^3 is 17x22, m^4 is 16x20. **Figure 9** (UF 10922) is a *G. chapadmalense* left mandible from the same animal in Figure 8. The caniniform has an anterior and posterior occlusal surface. M_1 is 18 mm long, m_2 is 20x25, m_3 is 20x25, m_4 is 40mm long. **Figure 10** (UF 83335) is the right mandible of a *P. harlani*. C_1 is missing, m_1 17x20, m_2 is 23mm wide, m_3 is 16x24 and m_4 is 24x43. **Figure 11** is the same mandible from the buccal side showing a single central ridge in each tooth (the anterior of the specimen is on the right). **Figure 12** shows a well preserved left upper caniniform (UF 87042) of a *P. harlani* and the badly worn tip of a right upper caniniform found in a river. The lower tip of the ovate occlusal surface of the left c^1 tapers to the left; the right c^1 tapers right. **Figure 13** (clockwise from upper left: UF 87060, UF 87072, UF 87084, UF 87071) shows four juvenile *P. harlani* molariforms all of which taper towards the tip. Clockwise from upper left: right m^4 is 13x17; left m_3 is 14mm at the bottom tapering to 7mm; right m_2 is 13x15; left m_1 has a 10x13 ovate posterior occlusal surface and a total length of 40mm.

Megalonychidae

It isn't practical to differentiate to a species level without information on the age of the specimen.

Pliometanastes protistus

Pliometanastes protistus (early late Miocene to very late Miocene) has a wear pattern similar to *Megalonyx*. The dental formula is c1/1 m4/3. In **Figure 14** (UF 23586) c_1 is missing, m_1 is 10x15, m_2 is 10x17, m_3 is 10x15.

Megalonyx curvidens, M. leptostomus, M. wheatleyii, M. jeffersonii

Megalonyx sloths have been found from the very early Pliocene (*M. curvidens*), late Pliocene (*M. leptostomus*), early Pleistocene (*M. wheatleyii*), and late Pleistocene (*M. jeffersonii*). The dental formula for all *Megalonyx* is c1/1, m4/3. The two dentine layers are very apparent, with the inner vasodentine layer seemingly uniform while the surrounding osteodentine layer is perpendicularly striated. The pulp cavity is pyramidal, narrowing to a point.

Figures 15 (UF 20949) and **16** (UF 20938) are identified as a small megalonychid from the very late Pliocene. In Figure 15 c_1 is 9x24. In **Figure 16** m_1 is 11x16, m_2 is 11x16, m_3 is 11x16. **Figure 17** (UF 23924 and UF 23926) depicts two *M. wheatleyii* juvenile c_1's; the specimen on the right is 29mm at the base tapering to 19mm. **Figure 18** (UF 23565 and UF 23566) depicts from left to right a left c_1 and a right c^1. In *Megalonyx* the upper caniniforms have parallel lingual and buccal ridges, while the lower caniniform is missing the lingual ridge. However, **Figure 19** (no specimen number) shows an upper caniniform with an posterior cleft in the lingual ridge. Upper caniniforms are also more curved than lowers.

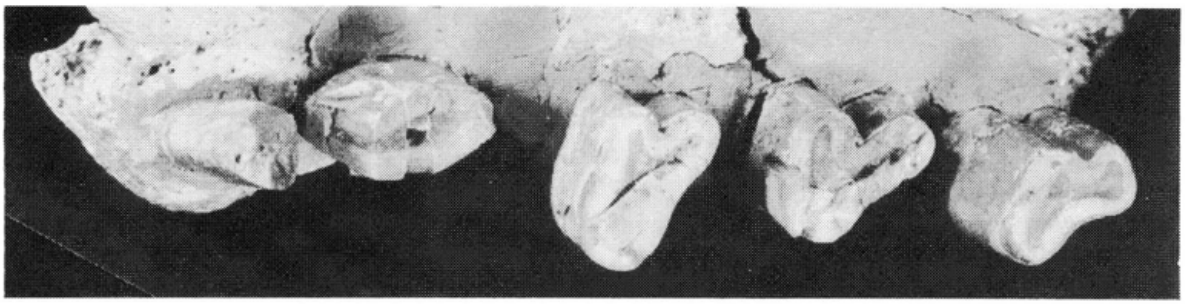


Figure 8.

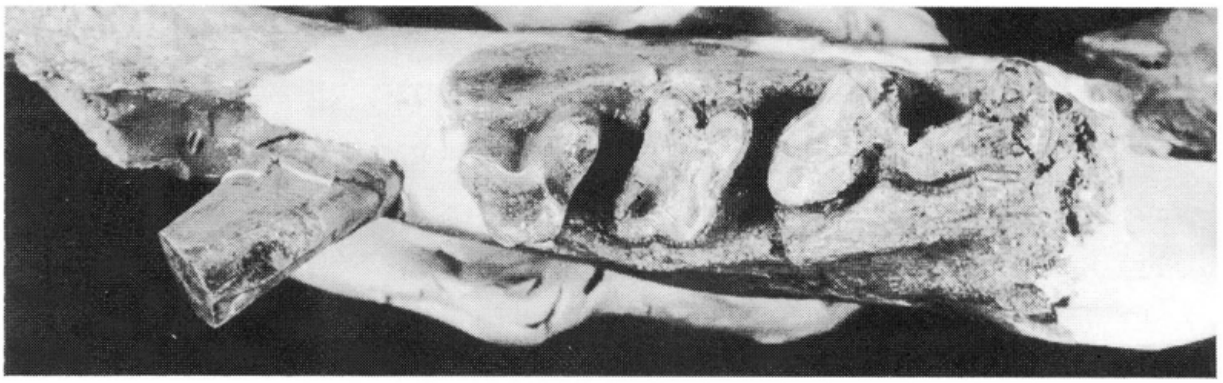


Figure 9.

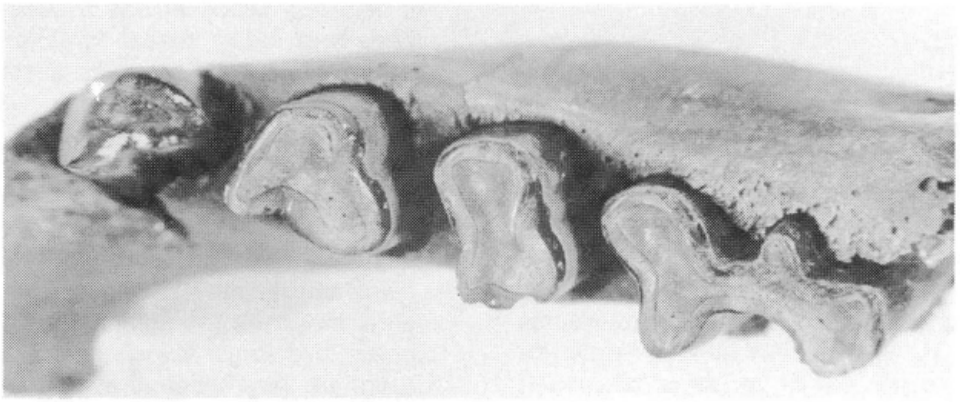


Figure 10.

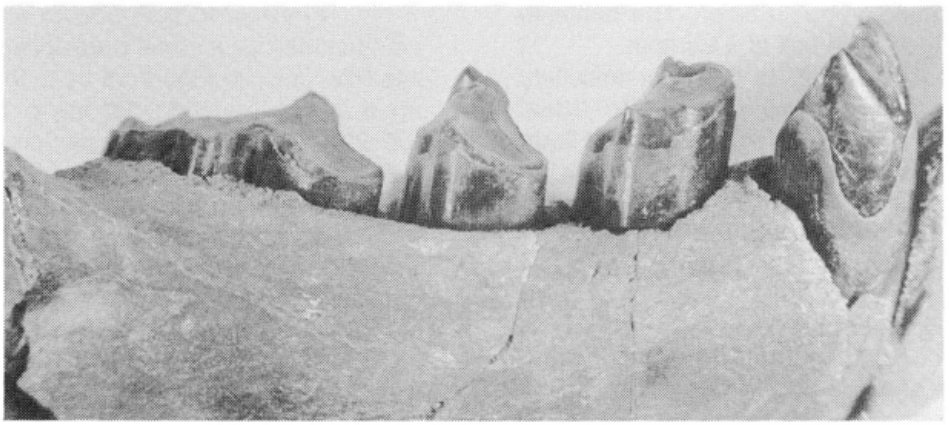
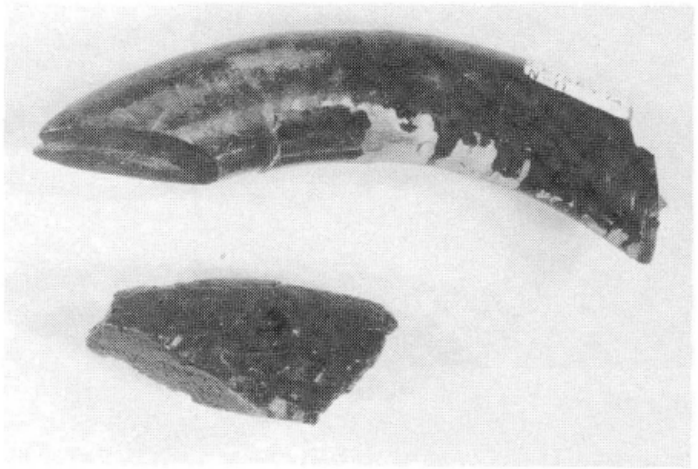


Figure 11.



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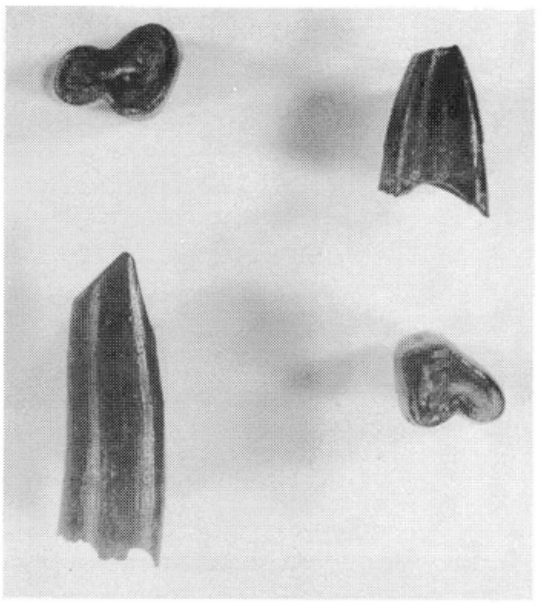

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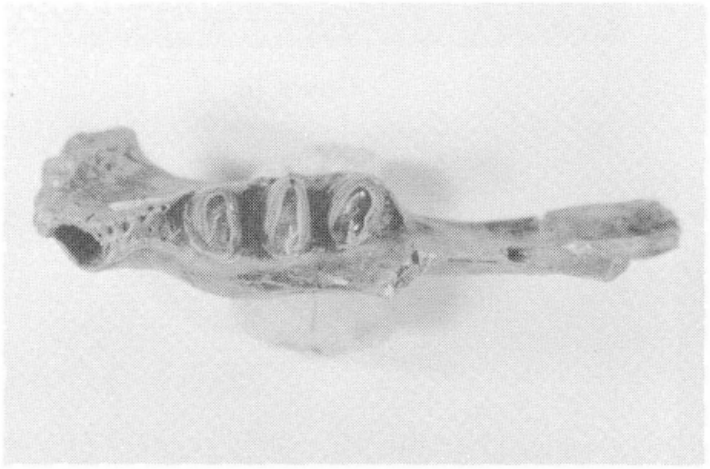

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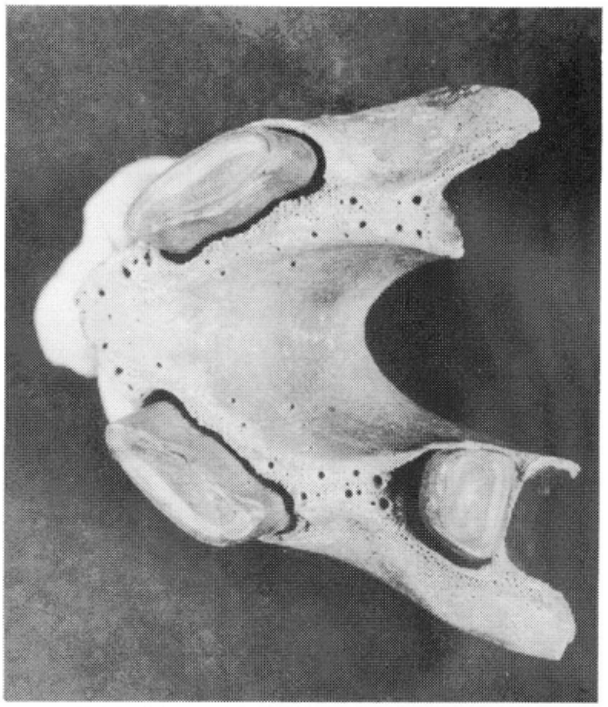

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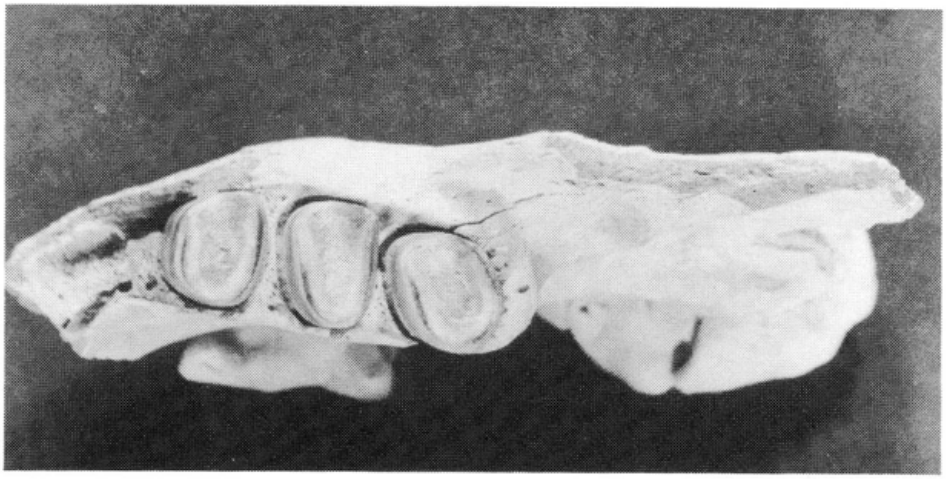

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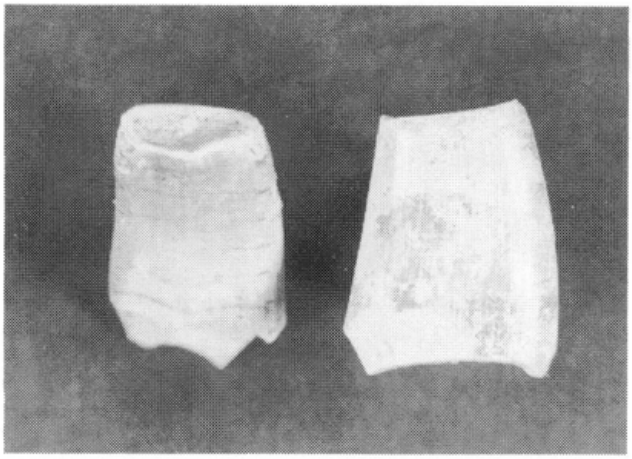

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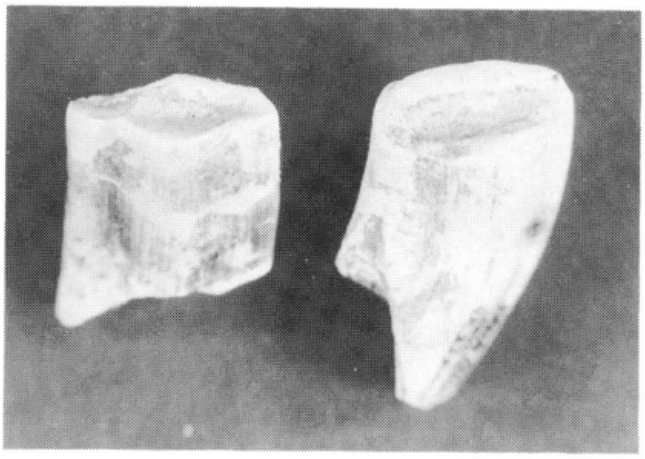

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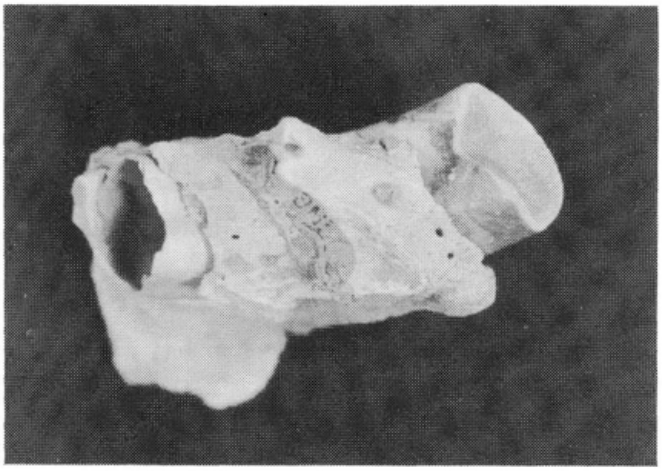

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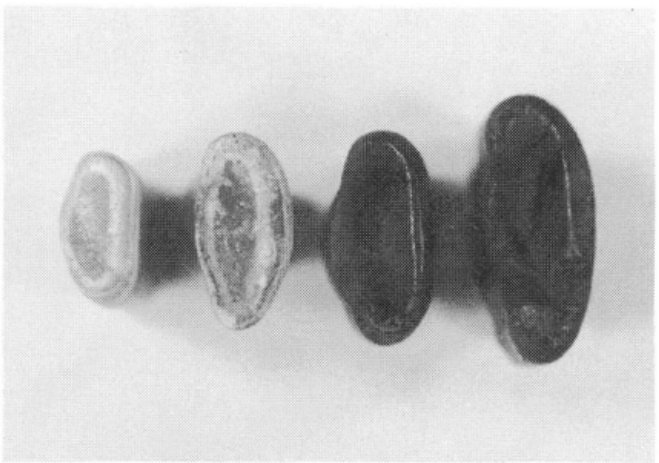
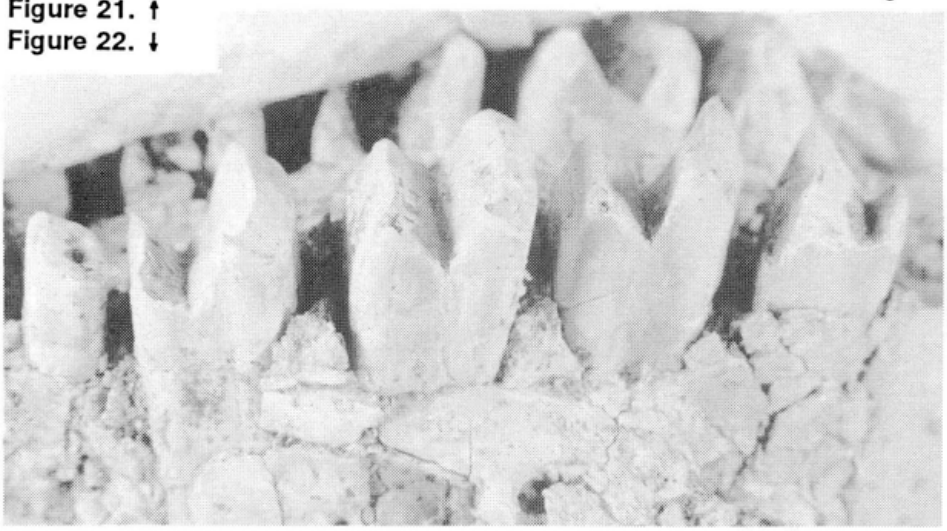


Figure 20.

Figure 20 (the smallest tooth is UF23562, the rest have no numbers) depicts four lower caniniforms; the smallest is from the late Pliocene and two largest are probably from the late Pleistocene. The largest teeth measure 15x30 and 16x38. **Figure 21** (no specimen numbers) demonstrates dimensional variation in molariforms. The first and third teeth are 20x25 and 17x25 and are probably from the late Pleistocene; the second and fourth teeth are 14x19 and 15x25 and are from the early Pleistocene.

Figure 21. ↑
Figure 22. ↓



Megatheriidae
Eremotherium sp.

The teeth of *Eremotherium* (late Pliocene to early Pleistocene and late Pleistocene) are the largest of the sloths, some specimens reaching a buccal-lingual dimension of over 50mm. They are readily recognizable because each tooth (except the caniniform) has two ridges running perpendicular to the sagittal plane. The teeth commonly fracture down the middle through the softer vasodentine so that a single ridge is a common find. The teeth also frequently fracture transversely.

The dental formula is c1/0 m4/4. **Figure 22** (UF 121737) is the maxillary dentition of an adult. The dimensions: c^1 is 18x24, m^1 is 35x45, m^2 is 38x53 with the occlusal surface lengths 19 and 15mm, m^3 is 43x47 with the occlusal surface lengths 22 and 16mm, m^4 is trapezoidal - 32mm wide and 27 and 42mm ridges. **Figure 23** (UF 45475) is a juvenile left mandible, but the adult teeth are generally the same shape. The dimensions of the juvenile teeth are listed and the corresponding adult dimensions (for the corrosponding mandible of the specimen in Figure 22) are in parentheses: m_1 is 18x19 (32mm on the buccal side, 35mm on the lingual side, 38mm on the anterior ridge and 45 mm on the posterior ridge), m_2 is 20x22 (35mm on the buccal side, 40mm on the lingual side, 45mm on the anterior ridge and 40 mm on the posterior ridge), m_3 is 20x20 (40x43), m_4 is trapezoidal - 19mm wide with 18 and 13mm ridges (38mm wide - 37 and 30mm ridges). **Figure 24** is a buccal side view of the specimen in Figure 23.

Figure 25 (no specimen numbers) shows an m_4 and a split tooth. **Figure 26** (no specimen numbers) shows two ridge fragments. The smaller one is probably a juvenile. **Figure 27** (UF 46372, UF 46374, UF 46371, UF 46383) shows four juvenile teeth showing a wide variation in occlusal surfaces. The tooth on the right is a caniniform.

Nothrotheriops sp.

The Checklist lists *N. texanus* as the only species of *Nothrotheriops* in Irvingtonian sites from Florida, however, *N. shastensis*, which was larger than *N. texanus,* has since been recognized from the Rancholabrean (middle to late Pleistocene). All the specimens pictured are *N. texanus.* The dental formula is 4/3 with no caniniforms. All the teeth have two distinctive grooves running the length of the buccal and lingual sides, except m_3 which has only one groove. **Figure 28** (UF86120) depicts maxillary dentition. M^3 is 10x14. **Figure 29** (UF 86899) depicts mandibular dentition. M_1 is 8x12, m_2 (which has a distorted lobe on the labial side) is 10x12, m_3 is 10x14. **Figure 30** (UF 83700, anterior is oriented to the right of the photograph) is a maxillary fragment from a juvenile showing distinctive parallel ridges, however, the ridges are not as uniform as those in *Eremotherium.* Some ridges may taper like those of *Megalonyx*. M^1 is 8x12, m^2 is 9x10, m^3 is 8x10. On the right edge of the specimen is an atavistic caniniform, which means the caniniform is the reappearance of an earlier form. **Figure 31** (UF 87139, UF 87132, UF 87135) depicts molariforms with a megalonyx-like dip in one of the ridges.

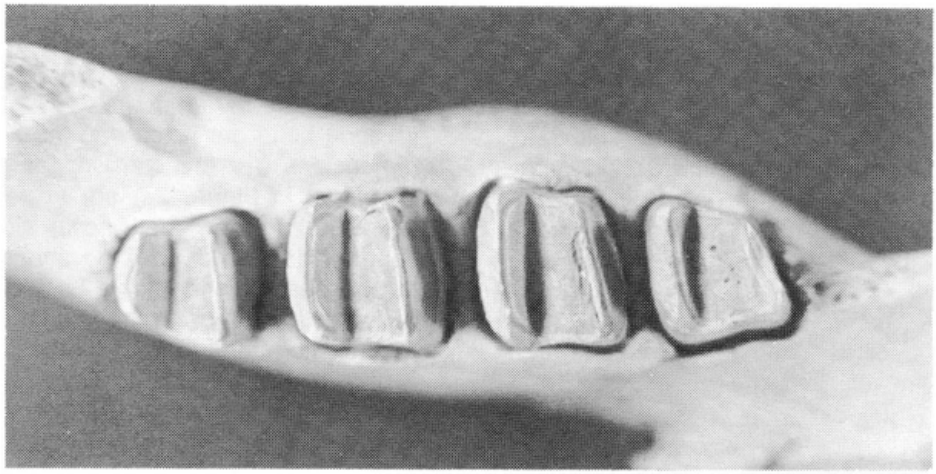
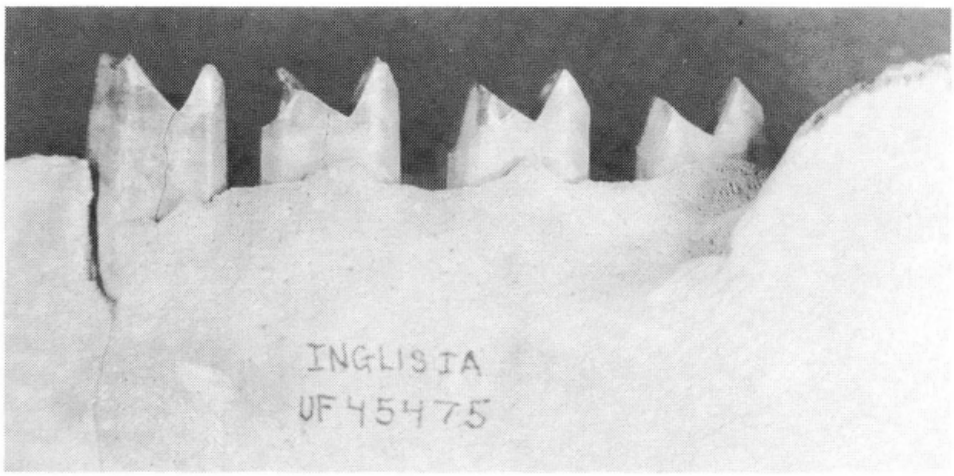


Figure 23.



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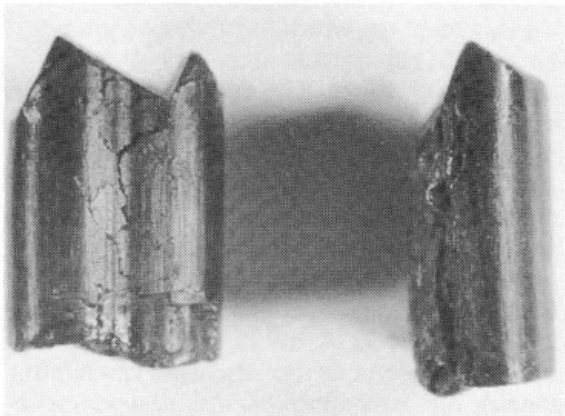

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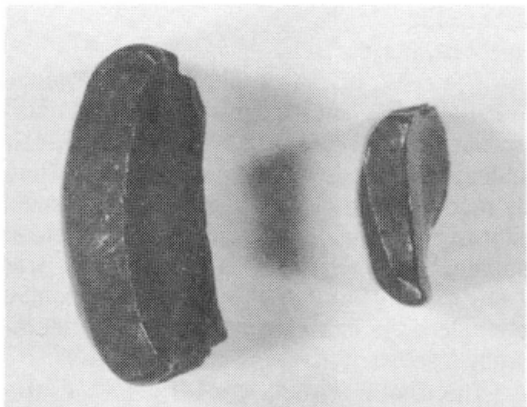

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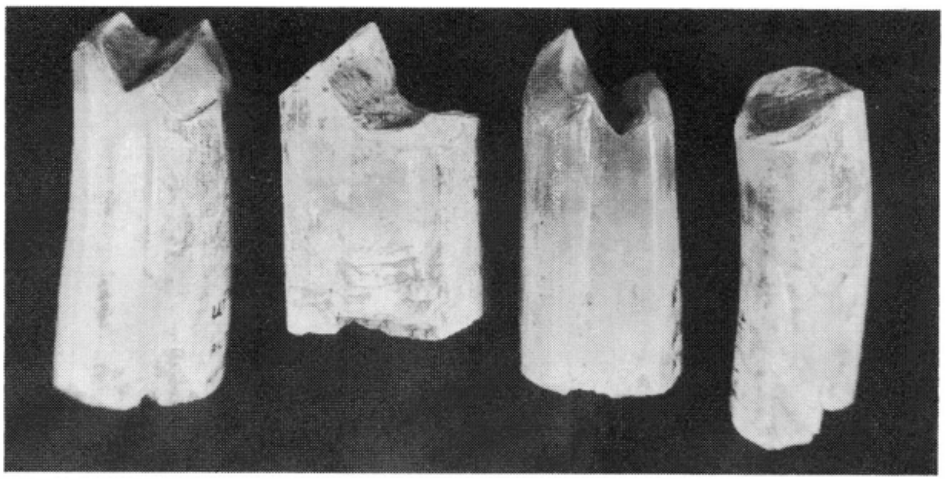

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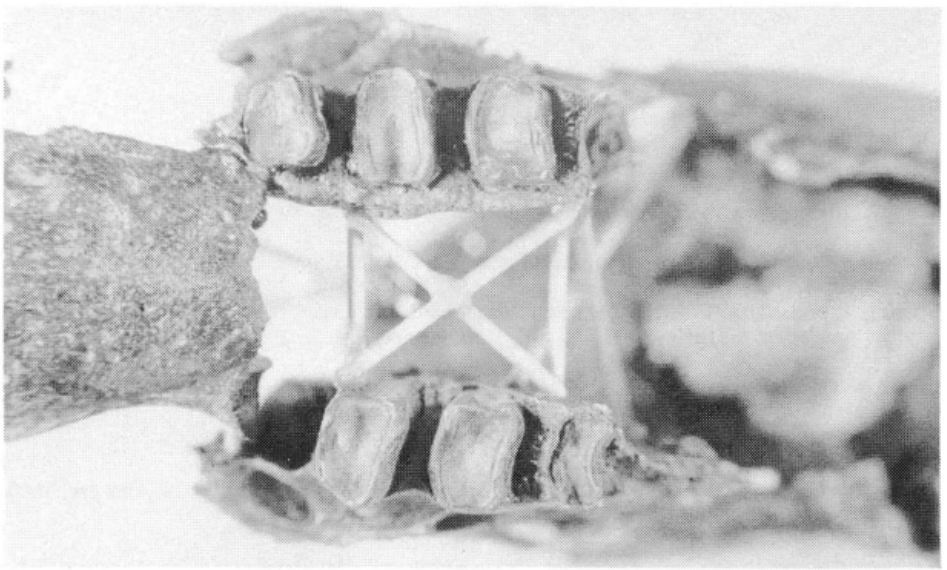

Figure 28.

Figure 29.

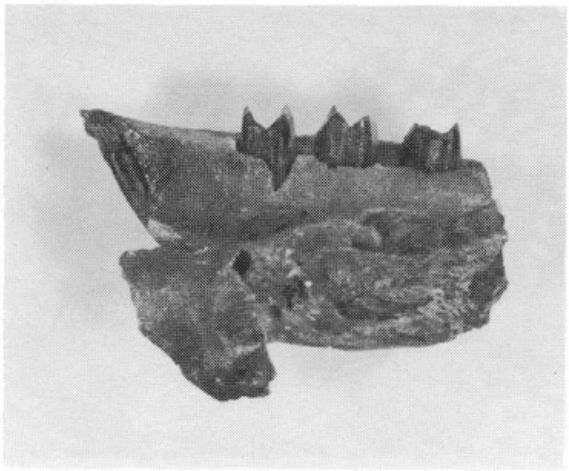

Figure 30.

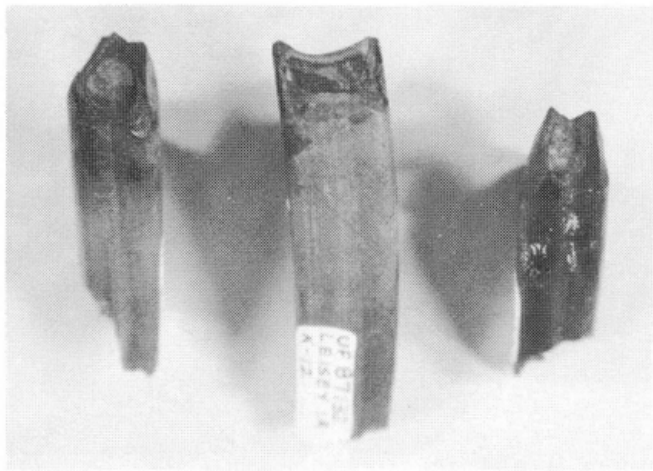

Figure 31.

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FLORIDA PALEONTOLOGICAL SOCIETY, INC.
APPLICATION FOR MEMBERSHIP

Mail completed form to: Florida Paleontological Society
Florida Museum of Natural History
University of Florida
Gainesville, FL 32611

NEW_____ RENEWAL_____ MEMBER NUMBER (From Label)_____

NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP CODE _____ TELEPHONE (___)-___-____

TYPE OF MEMBERSHIP

1. INDIVIDUAL ACTIVE ($15.00)_____
2. SUBSCRIBER ($15.00)_____
3. INSTITUTIONAL ($15.00) _____
4. GIFT (Mark Type) _____
5. FAMILY (3 or more. $25.00)_____
6. COUPLES ($20.00) _____
7. SUSTAINING ($50.00) _____
8. ASSOCIATE (Under 18 $5.00)_____

FAMILY AND COUPLES PLEASE LIST NAMES OF ALL APPLICANTS IF NEW.
PLEASE COMPLETE PERSONAL FACT SHEET BELOW IF NEW OR CHANGES HAVE OCCURRED SINCE PREVIOUS YEAR.

NOTE!!! MEMBERSHIPS ARE FOR A CALENDAR YEAR AND ARE DUE NO LATER THAN JANUARY 1 EACH YEAR! PLEASE RENEW ON TIME!

BIOGRAPHICAL FACT SHEET

1. NUMBER OF YEARS OF INTEREST IN PALEONTOLOGY __
2. WHICH BEST DESCRIBES YOUR STATUS: COLLECTOR__ OCCASIONAL DEALER __ FULL TIME DEALER __ PROFESSIONAL POSITION __ JUST STARTING __
3. PRIMARY AREAS OF INTEREST:

	VERTEBRATE	INVERTEBRATE	BOTANY	MICRO
PLEISTOCENE	__	__	__	__
PLIOCENE	__	__	__	__
MIOCENE	__	__	__	__
OLIGOCENE	__	__	__	__
EOCENE	__	__	__	__
EARLIER	__	__	__	__

4. LIST ANY PREFERRED TYPES (Horses, Sloths, Echinoids etc.)_____

5. LIST ANY PUBLISHED WORKS ON PALEONTOLOGICAL SUBJECTS.

6. DO YOU BUY _____ TRADE _____ FIND _____ FOSSILS?
7. LIST ANY SKILLS OR ABILITIES THAT MAY BE OF USE TO THE SOCIETY'S PROJECTS (RESTORATION, PREPARATION, COMPUTER USE, GRAPHICS SKILLS, SPEAKING, PHOTOGRAPHY, PUBLIC RELATIONS, WRITING, FUND RAISING ETC.)

8. LIST ANY UNUSUAL SPECIMENS FOUND, CIRCUMSTANCES UNDER WHICH THEY WERE LOCATED AND THEIR DISPOSITION.
PLEASE USE AN ADDITIONAL SHEET IF REQUIRED! THANK YOU!

Payments, contributions or gifts to the Florida Paleontological Society are not deductible as charitable contributions for federal income tax purposes. Dues payments may be deductible by members as ordinary or necessary business expenses. We recommend that you consult with your tax advisor.

FLORIDA PALEONTOLOGICAL SOCIETY, INC.

As stated in the Articles of Incorporation, "The purposes of this Corporation shall be to advance the science of Paleontology, especially in Florida, to disseminate knowledge of this subject and to facilitate cooperation of all persons concerned with the history, stratigraphy, evolution, ecology, anatomy, and taxonomy of Florida's past fauna and flora. The Corporation shall also be concerned with the collection and preservation of Florida fossils." (Article III, Section 1).

CODE OF ETHICS

ARTICLE IX

Section 1.	Members of the Florida Paleontological Society, Inc., are expected to respect all private and public properties.
Section 2.	No member shall collect without appropriate permission on private or public properties.
Section 3.	Members should make a sincere effort to keep themselves informed of laws, regulations, and rules on collecting on private or public properties.
Section 4.	Members shall not use firearms, blasting equipment, or dredging apparatuses without appropriate licenses and permits.
Section 5.	Members shall dispose of litter properly.
Section 6.	Members shall report to proper state offices any seemingly important paleontological and archaeological sites.
Section 7.	Members shall respect and cooperate with field trip leaders or designated authorities in all collecting areas.
Section 8.	Members shall appreciate and protect our heritage of natural resources.
Section 9.	Members shall conduct themselves in a manner that best represents the Florida Paleontological Society, Inc.

ANNUAL DUES for the FPS are $5.00 for Associate Membership (persons under age 18) and $15.00 for Full Membership (persons over age 18) and Institutional Subscriptions. Couples may join for $20.00, and Family memberships (3 or more persons) are available for $25.00. A Sustaining membership is also available for $50. Persons interested in FPS membership need only send their names, addresses, and appropriate dues to the Secretary, Florida Paleontological Society, Inc., at the address inside the front cover. Please make checks payable to the FPS. Members receive a membership card, the FPS newsletter, the Papers in Florida Paleontology, and other random publications entitled to members.

NEWSLETTER POLICY: All worthy news items, art work, and photographs related to paleontology and various clubs in Florida are welcome. The editors reserve the right not to publish submissions and to edit those which are published. Please address submissions to the Editors, Florida Paleontological Society, Inc. Newsletter, at the address inside the front cover.