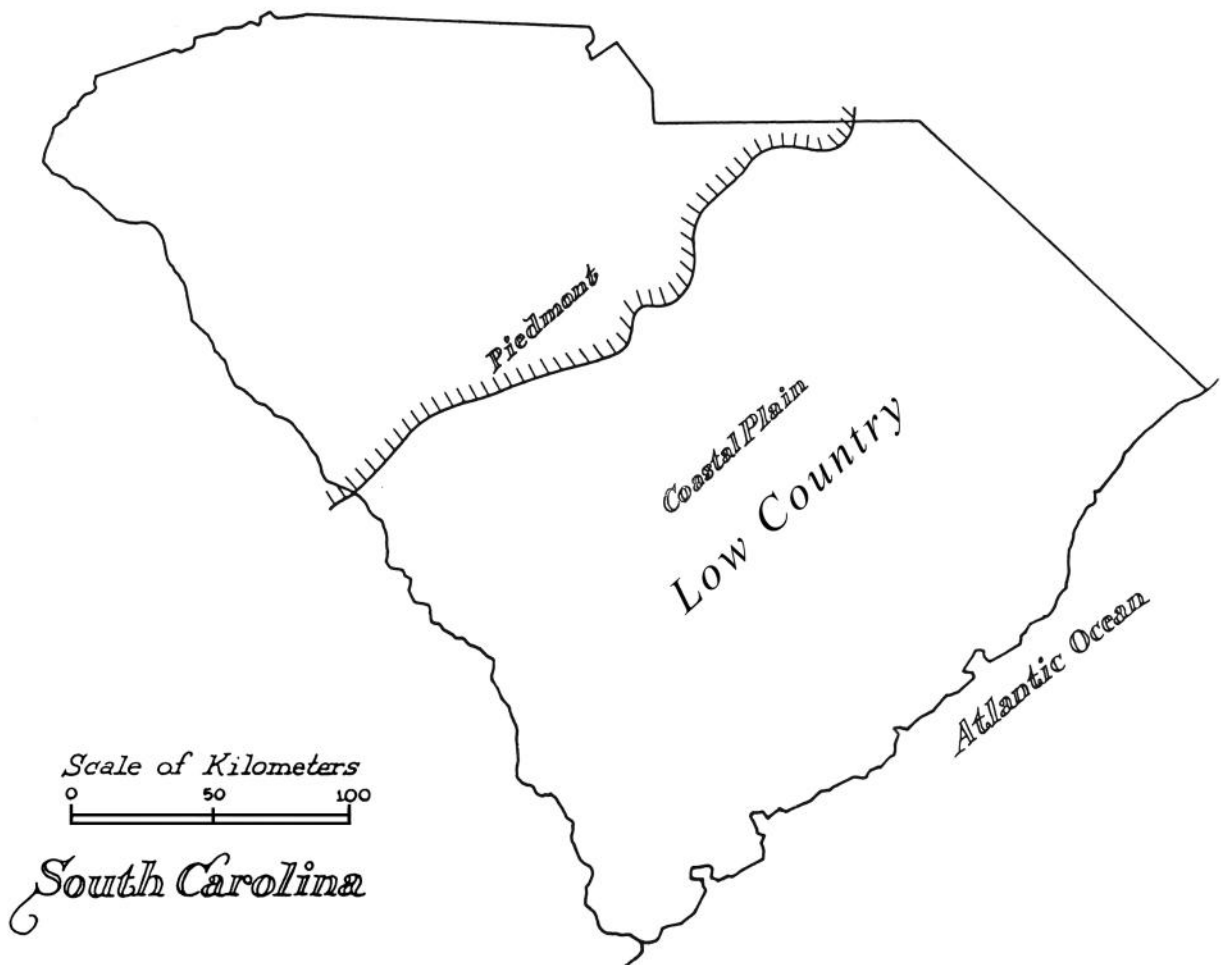


**HISTORY OF THE SOUTH CAROLINA
PALEONTOLOGICAL COLLECTIONS
In The Science Museum of Minnesota
1980 – 2011**

Bruce R. Erickson



MONOGRAPH VOLUME 9: PALEONTOLOGY

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VOLUME 9: PALEONTOLOGY

The Science Museum of Minnesota
120 West Kellogg Blvd.
Saint Paul, Minnesota 55102
USA.

NOVEMBER 30, 2015



Frontispiece: Prospecting exposures of the Ashley and overlying Chandler Bridge formations along Goose Creek, Charleston County, South Carolina. A solution pit (bone trap) in the Ashley deposits is pointed out by the author, Curator A. Sanders at left.

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HISTORY OF THE SOUTH CAROLINA

PALEONTOLOGICAL COLLECTIONS

In The Science Museum of Minnesota 1980 – 2011

By Bruce R. Erickson

**Fitzpatrick Chair of Paleontology
The Science Museum of Minnesota**

PROLOGUE

The Science Museum of Minnesota (SMM) established its long duration research connection in South Carolina with study of living crocodylians in their natural habitat. It should be noted here that this South Carolina connection was fundamental to the interpretation of our most important research on the Wannagan Creek Fauna of North Dakota (late Paleocene), Fossil Lake Wannagan, and its reptilian inhabitation. See Erickson: 1979, 1999, 2012.

A few regular field seasons in North Dakota and at another lengthy field project in Wyoming where I was investigating a suite of Jurassic dinosaurs, were shortened to allow time to initiate studies of the living crocodylians (alligators and crocodiles) along the southeastern coast of the U.S. from Florida Bay to the alligator's northern range limit at the Cape Fear River in North Carolina.

In June of **1980** I became a temporary resident at Hobcaw-Barony – an erstwhile Rice and Indigo Plantation near Georgetown, South Carolina (Map Loc. 1). The property was eventually consolidated into a 17,500 acre area as a hunting retreat and home early in the century by stockbroker/statesman Bernard Baruch. It is now operated by Clemson and the University of South Carolina as an area for marine biology and coastal research (Erickson, 1998).

While at Hobcaw the extant alligator population was my main focus. This involved flushing young alligators of their stomach contents for diet specimens; denning and nesting behavior; learning that alligators “surf” when no crocodiles are present to harass them; and foot tracks and tail drags in mud and sand are the most important environmental indicators of their behavior. Hobcaw-Barony is a natural swampland with some 60 or more “gators”, not counting hatchlings. Although some 60 million years removed from the population found at Fossil Lake Wannagan, their habitat and biology is similar, therefore meaningful comparisons can be made.

During this time at Hobcaw resident biologist Bruce Lampright and I collected fossils from various locations along the Waccamaw River (Map Loc. 2) and the especially productive stream beds at Kingstree (Map Loc. 4) where we recovered dinosaur specimens that are among the first records of dinosaurs from South Carolina. Here along Clapp Creek the Cretaceous Donoho Formation is overlain by the Williamsburg Formation (Black Mingo, Paleocene), both of which would involve future collaborative studies with the Charleston Museum and the South Carolina State Museum in Columbia.

The method of recovering fossil material in these beds employed the use of sieves. The process was assisted by young local individuals who invariably showed up shortly after our arrival at the site each season to begin sieving stream bank deposits for fossils. Those individuals who assisted us had never been inside a museum, however, I regard them as valuable “field volunteers” for the museum.

On my first visit to the Charleston Museum in **1983** I met curator Al Sanders and its collections of vertebrate fossils. Sanders' work was concentrated on Tertiary whales from the Carolinas. The discoveries at Wannagan Creek preceded my visit and resulted in the invitation

to describe the fossil reptiles from several areas in the collections at ChM. Over the next 20 some seasons I conducted field and museum research on those and other collections mostly during February, March and often beyond when it was either too wet or cold out west to do effective quarry work at our other sites in North Dakota and Wyoming.

I continued study at Hobcaw-Barony during this time as well as elsewhere on living “crops”. One such relevant location was Dauphin Island at the mouth of Mobile Bay, Alabama. In 1985 Paleobotanist Robert Melchior, faculty member at Bemidji State University and Research Associate at SMM joined me for a field conference “Peat Accumulating Environments” bordering Mobile Bay hosted by the University of Alabama. The flora here is unique and in several ways reflects the paleoenvironment of our Fossil Lake Wannagan site in western North Dakota. Bottom samples were collected for comparison of the peat/lignite deposits at Wannagan. The crops here however were elusive!

It was inevitable that alligator investigations took me to Spring Island in Beaufort County, South Carolina (Map Loc. 5) where Bruce Lampright was soon to become the resident biologist. The Island’s proximity to a rich fossil bearing location on the Colleton River was a bonus to the work on gators. Other alligator sites were Map Location 6 and the Santee Delta in Georgetown County.

My preliminary field report on the alligator population of Spring Island follows:

Spring Island’s Alligators 1992

By Bruce R. Erickson

A preliminary survey of alligator habitat on Spring Island, Beaufort County, South Carolina during late February, 1992, indicates that a sizable group of active “gators” *Alligator mississippiensis* inhabits the island and surrounding wet areas. Numerous nesting sites, some with intact nests of the previous season, and more numerous dens, both active and abandoned, are prime habitat features. Sites are located near the north and south ends of the island and apparently exist in many other places.

The relatively high overbank setting is ideal for the development of such structures. Marsh and tidal flats that surround virtually the entire island are the alligator’s domain but not suitable for nesting because the nest must be located above high tide levels. The existing conditions at Archaic Pond on the southwest edge provide a good example of prime habitat. Skeletal remains of a 4-5 foot gator observed at Rice Gate Pond on the southeast side of the island as well as fish scales, whose owner provided a meal for at least one alligator, further enhance the notion of a well-established population.

Winter months are well suited for investigating the gator’s environment largely because of the reduced vegetative cover and relative inactivity of the animals. By April, however gator activity will increase dramatically on Spring Island with the beginning of courtship. Nest building will follow by June and hatching will occur during late July throughout August.

During this year new nests will be constructed and former nests restored by the alligators for use again. On some occasions more than one female will utilize the same nest mound but will excavate a separate egg chamber for deposition of eggs which may number from 15-50 at one time.

A systematic survey of all of the preferred nesting sites on the island would yield an approximation of the total number of nesting females, give or take a few which may share a common nest mound. Given the extensive open marsh areas around the island, adult male alligators will probably be less than half the number of nesting females and the number of immature of both sexes could vary appreciably. An estimate of hatchling mortality is not feasible without intensive field investigation, however, as with alligators in most places, mortality will likely be very high. The alligator population number may be guessed at in this way. It should be noted that the size of the population will vary considerably from time to time especially if very young hatchlings and yearlings are taken into account.

Although a freshwater reptile, the American alligator *A. mississippiensis* frequents tidal areas here as elsewhere in the low country from the Cape Fear River in North Carolina to the northern part of Florida. I suspect that the population here has been stable for some hundreds of years in the absence of crocodiles which normally occupy tidal niches. Unlike Florida with its crocodiles, at least in its southern reaches, and large scale development

in other areas, the Spring Island gator population most likely increased during the last twenty years due to loss of habitat elsewhere in the area.

Even though fossil alligators and crocodiles of the coastal plain are my principal research interests, I would be remiss if I did not comment on the occurrence of a certain other fossil assemblage on Spring Island. This assemblage consists, not only of alligator fossils, but rather of many burrows that have been preserved as tube-like structures in the Pleistocene sandstone layers which immediately underlie the surface soils of the island. The location of this burrow site is situated at what will become the 13th hole of the golf course currently under construction.

The third distant location to observe and document crocodile occurrences involved a return trip to Australia but not until **2001**. This investigation was focused on *Crocodylus johnstoni* (freshy) and *C. porosus* (salty). The smaller fresh water form inhabits rivers and billabongs when they overflow during the “Wets”. The much larger IndoAustralian crocodile (salty) ranges as far offshore as the Fly River in New Guinea. Its preference for marine to marginal-marine environments today closely resembles that of the American crocodile, *Crocodylus acutus* and the Oligocene fossil *Gavialosuchus carolinensis* as well. The occurrence of *Gavialosuchus* in the marine Eggenburgian (Lower Miocene) deposits of Austria is also a reasonable likelihood of its marine behavior.

The work of collecting fossils and associated paleontological evidence became part of the routine while at Hobcaw in **1981** and **1982** and for many years later.

COLLECTING IN THE LOW-COUNTRY

The Low-Country of South Carolina extends 100 miles inland from the ocean shore to the piedmont at the foot of the Appalachian Mountains. The fossils of the Low-Country range in age from the Late Cretaceous Black Creek Formation through the Pleistocene. Without deserts and Badlands the rock layers containing fossils are mostly covered by vegetation, and outcrops of those sedimentary deposits are limited to minor exposures in overbanks, stream beds, and “barrow pits” a ditch for “fill” or one developed for drainage alongside of a roadway.

Most fossils are found by amateur collectors with collections of their own. I met and collected with a number of local collectors having valuable knowledge of new exposures that often contain undisturbed specimens such as the deposits near Kingstree, South Carolina where fossils are frequently found *in situ*.

On several occasions we recovered specimens from tidal rivers such as the Colleton near Spring Island, Beaufort County (Map Loc. 5). Here specimens are “grubbed” from the soft bottom sediments by the hands of scuba divers whose main concern is low visibility and river currents. Specimens brought up from the bottom of the channel are mostly large shark teeth of *Carcharodon*, a fossil prized by commercial collectors, mammal bones like sloth and elephant, and an occasional large crocodile jaw or limb bone. Generally those specimens show little erosion and are needed for study.

The majority of bones from the Low-Country are found as separated elements; therefore, few need little more than a light plaster and burlap field jacket for protection during transportation to the laboratory.

During numerous trips along the Intracoastal Waterway (Waccamaw R) between Myrtle Beach and Charleston many fossils were encountered often as isolated specimens or more often as clusters of many conspecific specimens. This made collecting a selective process. For example the bivalve *Mercinaria canepatchensis* is usually found as a single valve; however, during maximum low tide deeply buried, complete specimens such as that in figure 1 are exposed and collected as articulated specimens with both valves.

Another rarely intact fossil from the Late Pleistocene Canepatch Formation of Horry County near Myrtle Beach (Map Loc. 2) is the anastomosing form of the coral taxon *Septastrea marylandica* (Fig. 1).

Other “River Occurrences” from Late Oligocene strata of Charleston County include well-preserved vertebrae of the gigantic scombroid (bill fish) *Xiphiorhynchus* sp., tympanic bulla, pteriotic boxes, and vertebrae of odontocete whales (Fig. 2).

At Hobcaw “gator” nests, dens, and holes were revisited to observe the changes from one season to the next. Few significant changes occurred over time until **1989** when Hurricane Hugo came ashore and altered this marshland and created new features to examine. The alligator population probably remained about the same as before flooding. With uprooting of trees, and deposition of new sand in the supralittoral zones most of the nest sites were destroyed, however, development of new nest sites suggests that about the same number of adult alligators was present as before “Hugo”. Not since tropical storm “Dennis” in **1981** had most of the known nests here been lost.

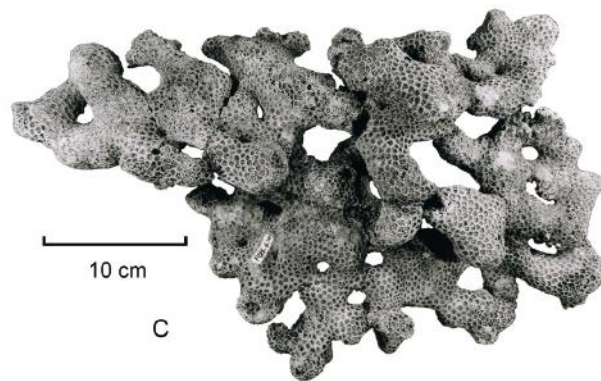
Hurricane Hugo improved collecting on some barrier island beaches that usually receive a daily supply of a few fragmentary fossils brought up from underwater outcrops of fossil-bearing sediments. This often meager supply of bone fragments is increased by storm tides. Some residents on barrier islands such as Edisto Island (Map Loc. 3) have assembled large



A
10 cm



B
10 cm



10 cm
C

FIGURE 1. Invertebrates of the Low-Country; A, complete specimen of *Mercenaria canpatchensis* SMM P81.19.3, Intracoastal Waterway, Horry Co., So. Car.; B, cluster of *Mercenaria* sp. Shells SMM P 2013.3.1, No. Myrtle Beach, So. Car.; C, *Septastrea marylandica* coral SMM P85,6.30, Waccamaw River, Horry Co., So. Car.

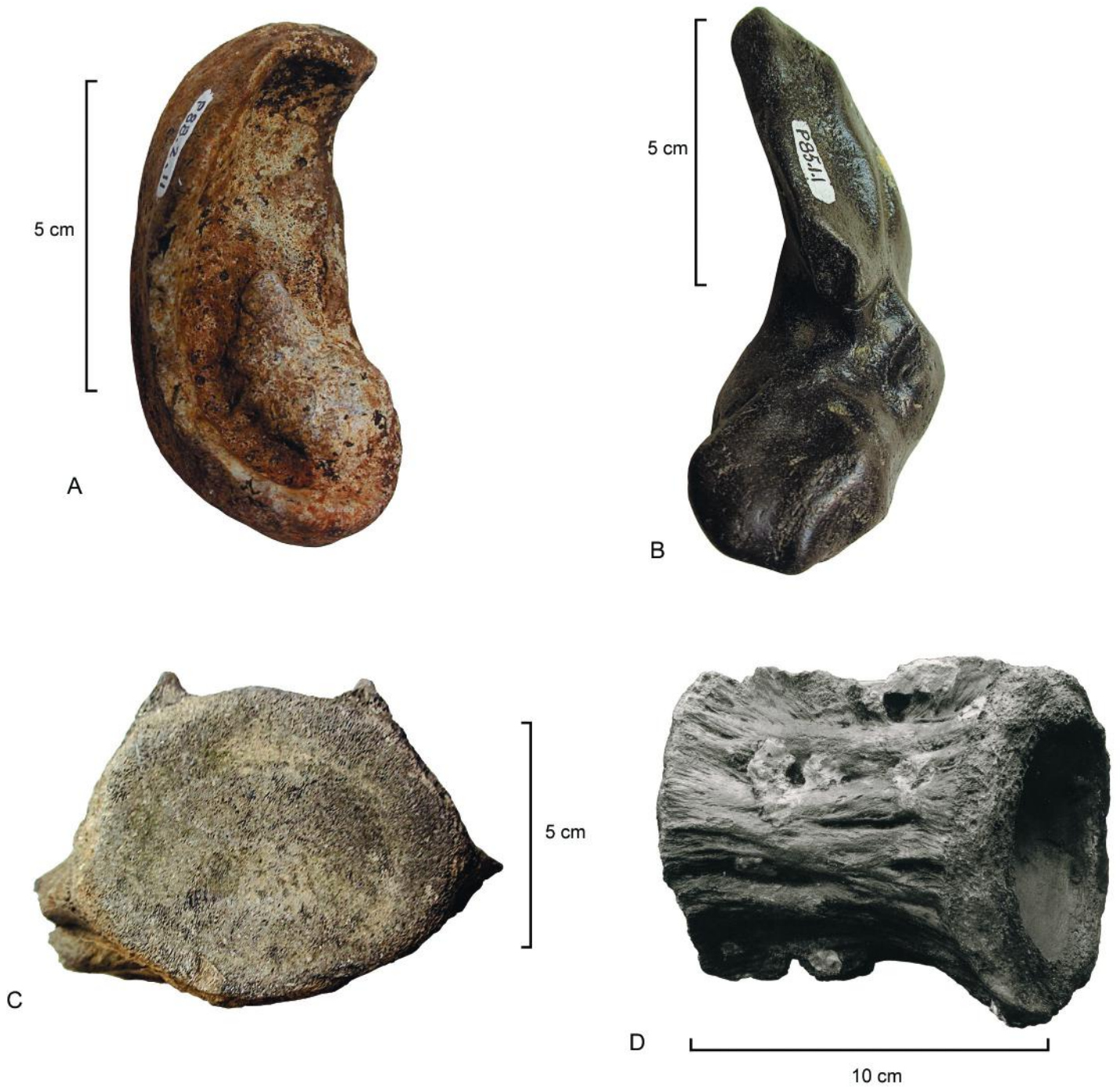


FIGURE 2. Vertebrates of the Low-Country; A, tympanic bulla of Late Oligocene whale SMM P88.2.11; B, pteriotic of Oligocene whale SMM P85.1.1; C, vertebral centrum of squalodont whale SMM P82. 7. 81; D, vertebra of Scombroid (bill fish) SMM P97.11.2 C, Charleston Co., So. Car.

collections of Pleistocene fossils from these offshore beds after a storm that also have been an important source of specimens for the Charleston and State Museums.

1986 was the beginning of preliminary notes on the Late Oligocene crocodile, *Gavialosuchus* n.sp. (undetermined at that point). The site of its discovery is at the contact of the Ashley and Chandler Bridge formations in Dorchester County (Map Loc. 7). The nearshore, basinal, back-bay-environment of the Chandler Bridge proved to be most productive of vertebrates: sharks, rays, crocodiles, sirenians, whales, in part due to the many large and small depressions left by dissolved phosphate nodules which acted as “traps” in the Ashley for specimens from the overlying Chandler Bridge sediments. Without having been trapped those specimens (especially complete skeletons) would have been disarticulated and scattered by water currents. An example of a “trapped” specimen is illustrated in figure 3. Making a field jacket for this specimen was relatively easy as its bones were concentrated in the depression more or less intact.

During the following season bones of this new crocodile skeleton were transported to SMM where they were removed from their field jackets and prepared for study. In the preparation process two identical casts were made of the entire skeleton – one for each museum, ChM and SMM. Research Associate Tom Sawyer is shown with the nearly completed skeleton in the laboratory at SMM (Fig. 4).

During the study of *Gavialosuchus* n. sp. it was necessary to examine the “Type species” of *Gavialosuchus* which is housed in the Krahulets Museum in the town of Eggenburg, Austria.

Since its original description (Toula and Kail, 1885) some damage to the skull of the “Type” occurred. For its restoration we brought the skull to the Institut Fur Palaontologie at the University of Vienna where I worked on its repair with the assistance of Prof. Dr. F. Steininger who also accompanied me to the field site near Horn, Austria to examine the location where *Gavialosuchus eggenburgensis* was found in 1850 in the Eggenburg Formation during excavation of the right-of-way for the

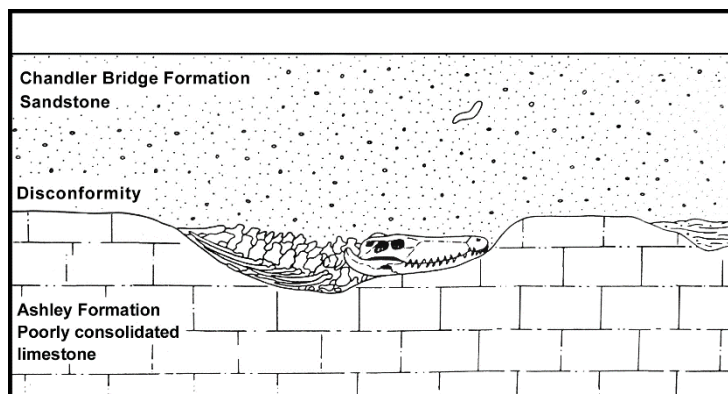


FIGURE 3. Diagrammatic section of the Ashley/Chandler Bridge contact with skeleton of *Gavialosuchus carolinensis* “trapped” and mostly intact in a pit from a dissolved phosphate nodule. Archives of SMM.

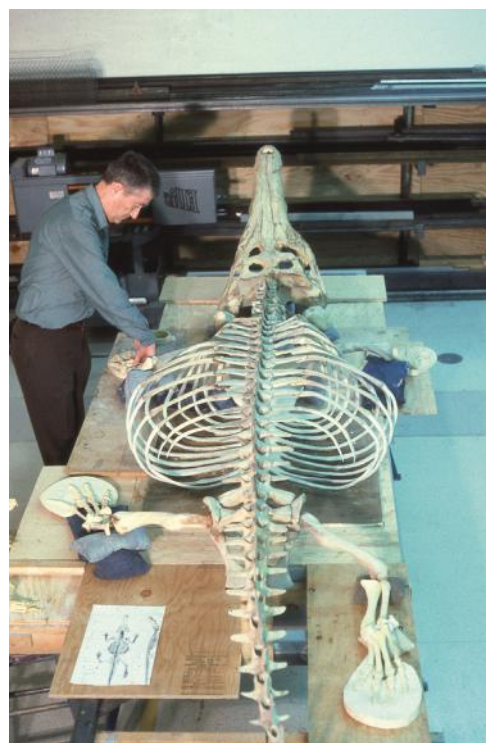


FIGURE 4. Research Associate Thomas Sawyer with completed skeletal mount of *Gavialosuchus carolinensis* in the laboratory at SMM prior to its description as a new species in 1996.

Franz Joseph Bahn which also carries the “Orient Express” (Fig. 5). Eggenburg is a little town with medieval walls with one devoted to an image of the celebrated, giant crocodile *Gavialosuchus eggenburgensis* watching over the town (Fig. 6). The South Carolina form *G. carolinensis* was described by Erickson, and Sawyer, 1996. Its skeleton is exhibited at SMM.

Elsewhere, The Ashley and Chandler Bridge formations of South Carolina continue to yield unknown and little known vertebrate taxa (Map Loc. 7, 10). A complete skeleton of the sea turtle *Carolinochelys wilsoni* from the Chandler Bridge was found as a fragmented specimen by the Charleston Museum. When it was prepared at SMM characters of its shell and skull were found to be markedly similar to those of the living loggerhead turtle *Caretta caretta*. This suggests a strong relationship of those two turtles. The mounted skeleton of *Carolinochelys* is shown in figure 7 using its front flippers for propulsion and its hind flippers for steering. Those sea turtles likely inhabited similar environments in the same coastal region of South Carolina, but for wave swash one would have left a similar trackway in Chandler Bridge sediments as one did on present-day beaches of a South Carolina barrier island (Fig. 7). Collections and observations continued annually between **1990** and **2011**. Bones of *Carolinochelys* and the dugong *Crenatosiren* are not rare in these beds. The great abundance of whale material in the Chandler Bridge Formation has provided the Charleston Museum with numerous fragmentary skeletons and years of work with their descriptions. Curator Sanders tells me that there are 20 some whale taxa yet to be determined. With the large number of stranded skeletons there exist hundreds of separated bones scattered throughout the deposits. Some of these can be assigned to recognized taxa. Odontocete (toothed whales) are most abundant but generally poorly known, therefore, their



FIGURE 5. Timothy R. Erickson in 1987 at the “Type Locality” where *Gavialosuchus eggenburgensis* was collected for the Krahelets Museum Eggenburg, Austria in 1850.

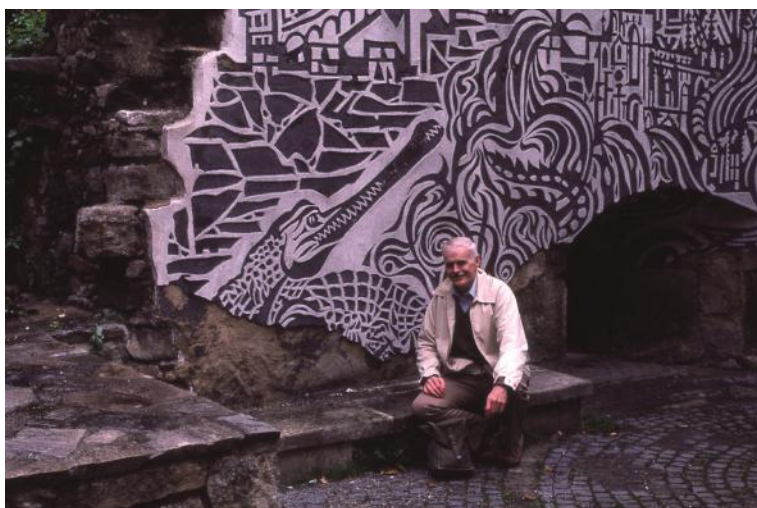


FIGURE 6. The author in 1987 at the historic medieval wall in Eggenburg, Austria commemorating the ancient crocodile *Gavialosuchus* watching over the town.



FIGURE 7.A, mount of *Carolinochelys* at SMM;B, Trackway of the living loggerhead, sea turtle *Caretta caretta* on North Island, Baruch Plantation (Hobcaw-Barony) South Carolina.

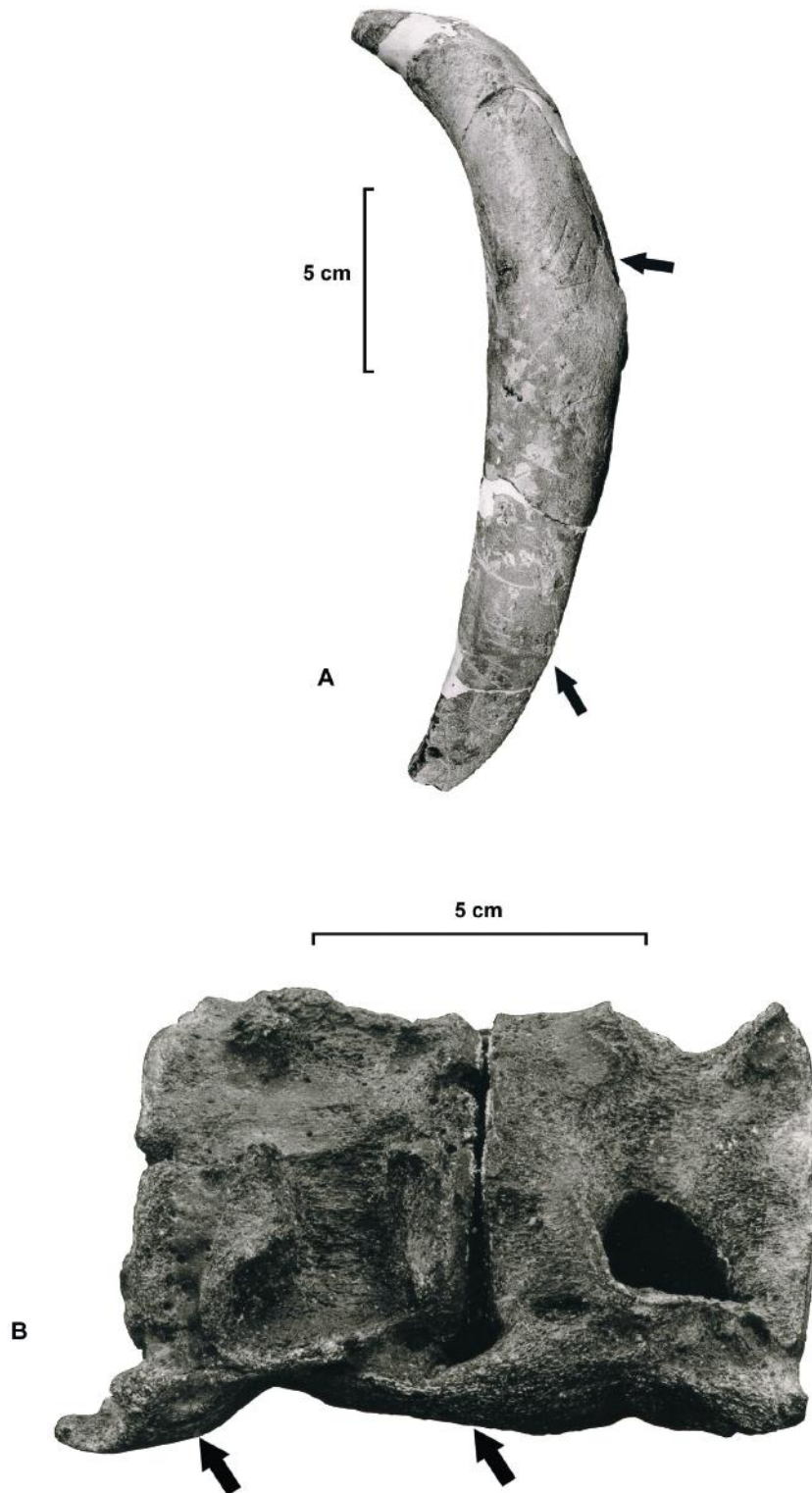


FIGURE 8. A single pachyostotic, thoracic rib of the fossil dugong *Crenatosiren* sp. SMM P90.26.2. Showing evidence of bioerosion (gnawing) by scavengers (arrows); B, Whale vertebrae showing pathologic condition *Spondyloarthropathy* (arrows indicate bridging of intervertebral space).

isolated bones have valuable scientific information for the scholar. Remains of primitive sirenians such as the dugong or sea cow *Crenatosiren* are occasionally found in these deposits. Figure 8 shows one of its ribs with characteristic pachyostosis as well as evidence of scavenging (arrows). Individually, specimens also often show bone modification such as various kinds of fractures ranging from splintered bone and perforating fractures (punctures) to such inflammatory conditions as *spondyloarthropathy* (see Sawyer and Erickson, 1998) where the abnormal condition may bridge intervertebral spaces (Fig. 8).

My field notes of 1999 indicate how the bones of a beached whale skeleton are moved with tidal regression. Figure 9 shows that the smaller bones become concentrated by wave swash behind the larger bones such as the skull and girdle elements. As with modern whales Oligocene species were often beached as evidenced by their remains along strand lines of former beaches in Dorchester County. One of these beached whales is a primitive form about the size of the modern pilot whale *Globicephala* and belongs to the suborder Odontoceti (toothed whales) and the extinct family Agarophiidae. The skeleton of a specimen of a once stranded whale is shown in figure 10 after it was articulated in the paleontology laboratory at SMM in 2007. Beached skeletons along strandlines of the Chandler Bridge suggest that they also were involved in mass strandings such as present-day Pilot Whales are (Fig. 11).

An evening stranding during February 1993, of a pigmy sperm whale *Kogia simus* on Folly Island near Charleston provided a unique opportunity for me to acquire first hand knowledge of the conditions attendant to a stranded whale. After we completed all of the necessary measurements and tissue samples were taken the Marine Mammal Laboratory performed the necropsy (post-mortem examination) and determined that this whale died from

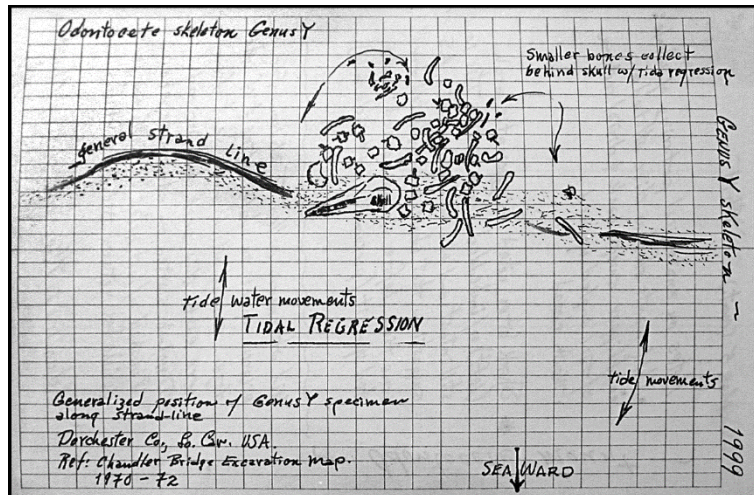


FIGURE 9. Field notes of a disarticulated whale skeleton found along a strand line of the Chandler Bridge Formation in Dorchester County, South Carolina.

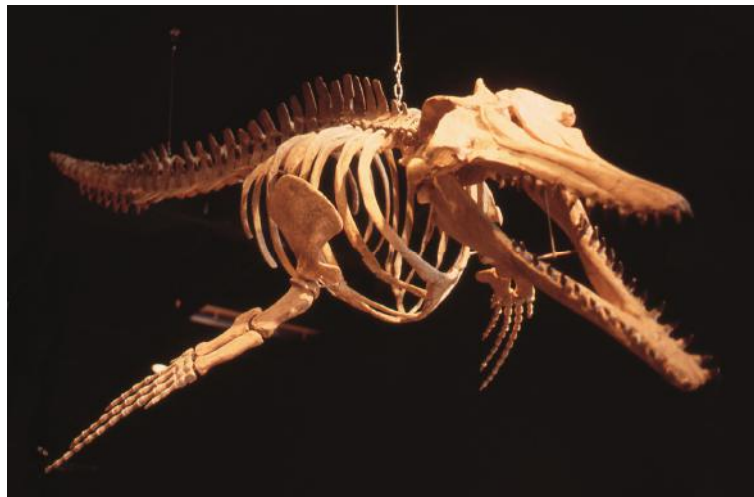


FIGURE 10. Mounted skeleton of late Oligocene Odontocete (toothed whale) in the Science Museum of Minnesota.

suffocation as do most stranded whales. It is likely therefore that the stranded Chandler Bridge specimens discussed above also died of the same cause.

Another important locality Wando Terminal, Charleston (Map Loc. 11) is a large shipping port for ocean-going freighters. Here the harbor bottom sediments are dredged periodically resulting in extensive spoil piles containing Miocene and Pliocene fossils. Those spoil piles continually erode and yield fossils. Although mainly a source for invertebrates many shark and whale elements were collected by prospecting those spoil piles during the 80's and 90's by Bruce Lampright (Hobcaw), Robert Spading and myself.

The single most important specimen found here is the cranium of a new species of sulid (Booby). The generic name given to this bird fossil, *Bimbisula* is derived from the Gullah word *Bimbi* meaning "dawn" and *sula* "Booby" = "Dawn Booby" (Benson and Erickson, 2013). The word "bimbi" was used in this combination because of our interest in the West-African-derived-Gullah, with reference to the region of its discovery in Gullah-speaking South Carolina.

The Gullah are today the Sea Island Folks who inhabit some thirty or more Sea Islands along the coast of South Carolina and Georgia where their distinctive Creole language and culture can be found (Branch, 1995; Opala, 2000).

A second fossil bird acquired from the Charleston Museum was an unprepared cast to be used for exhibit purposes. This bird is a "pseudodontorn" in reference to the bony projections that line the jaw margins and probably functioned much like true teeth. It is thought to have been the largest flying seabird with a wingspan of about 18 feet.

The original specimen was damaged by crushing during preservation of its thin-walled, hollow bones. Initial reconstruction of the skull was incomplete and required additional modification at SMM for exhibit use rather than for scientific study.



FIGURE 11. Mass Stranding of about 65 pilot whales *Globicephala macrorhynchus* along a South Carolina marine beach during 1944 (photo archives of the Charleston Museum).

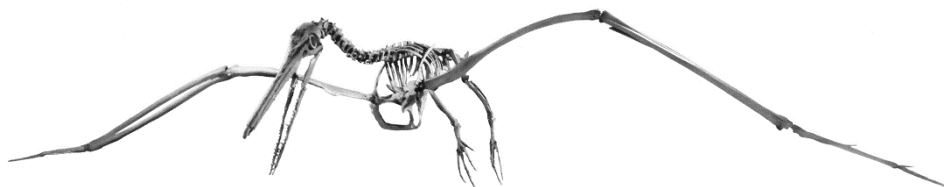


FIGURE 12. Restoration of the bony-toothed flying bird (pseudodontorn) in the Science Museum of Minnesota.

During preparation of this very large flying bird it became apparent that the task of articulating its bones required some special knowledge of the attitude of such a skeleton during flight. To achieve an acceptable mount Spading filmed and photographed many dozens of pelicans which were an abundantly available living relative. To satisfy lingering questions about wing movements in flight, five skeletons of the pseudodontorn were assembled – each in different attitudes as learned from Pelicans. By mutual agreement with ChM all of those casts were produced for exhibit and exchange. Figure 12 shows one skeleton in flight.

Another river location visited by Lampright and myself was on the Colleton River off Port Royal Sound, Beaufort County, South Carolina (Map Loc. 5). By this time 1990 Lampright was moving to Bluffton where he became the resident biologist at the Coastal Zone Education Center. From his new post we had the opportunity to investigate this newly discovered site on the shore of the Colleton River near Spring Island (mentioned earlier) where a huge burrow field of an estimated 12,000 square meters containing some 500,000 specimens of the trace fossil *Ophiomorpha* had been established probably for a great length of time. *Ophiomorpha* is the burrow of a small arthropod similar to the Ghost Shrimp. This site needed documentation as well as sample collecting because it was soon to be lost to commercial development. As with many places in the Carolinas coastal paleontology is becoming greatly limited. Our effort at the burrow field resulted in a joint publication (Erickson and Sanders, 1991).



FIGURE 13. Albert Sanders in the *Ophiomorpha* burrow field on the Colleton River off Port Royal Sound, Beaufort Co., So. Car. (Loc. 3).

Ophiomorpha “chimneys”, as they are called, are exposed at the surface (Fig. 13). They are not uncommon as they occur from the Cretaceous to the Present in many marine, shoreline deposits. Collecting the fragile *Ophiomorpha* chimneys involved special methods. The chimneys at this site are composed of unfilled hollow tubes of sand grains held together by secretion of the inhabitants. By way of maintaining the chimney’s integrity, the hollow center was filled with cotton after the tube walls were stabilized with a penetrant stabilizer before removal from the matrix.

Several copies (casts) of the fossil skeletons discussed above were eventually installed as the major components of the paleontology exhibits at the Charleston Museum. ChM had no facilities for the development of those skeletons, whereas SMM had ample means to prepare and mount vertebrates of various kinds. An agreement between SMM and ChM allowed that SMM would prepare and install, over a period of several seasons, all of the fossil skeletons in the ChM. During this time undeveloped specimens were transported to St. Paul where they were prepared (in some cases removed from plaster field jackets); cast, and articulated. By this agreement SMM acquired some special fossils for study and exhibit and ChM various specimens for their

exhibit program. A composite skeleton of the dugong *Crenatosiren* was assembled to illustrate its occurrence in the Chandler Bridge deposits (Fig. 14).

A few scattered locations that are relatively dry much of the time - such as a site in the Chandler Bridge Formation in Dorchester County near the Ashley River produced the large leatherback sea turtle shown in figure 15 - are also affected by high water. In this case the fortuitous preservation of the carapace which is composed of thousands of very small bony plates embedded in a leathery skin suffered little damage due to compaction of sediments that held them in place. The skull and mandible however, were lost during preservation. The nuchal notch (arrow in figure 15) indicates the general location for the missing skull which must have been swept away by water currents.

The two meter long carapace is similar to that of the living leatherback *Dermochelys* with its longitudinal ridges. Live weight of the living form is 1200 pounds. Two curators A. Sanders (left) and B. Erickson (rt.) contemplate their next move in the removal of this large fossil (Fig. 15).

Among other localities, a site not previously mentioned is Stokes Quarry near the town of Florence in Darlington County (Map Loc. 9, 12). It is of special interest because it is one of the last sites visited as well as that it produced several fragmentary scraps of dinosaurs and other Cretaceous reptiles. Originally Stokes Quarry was a sand pit that exposed sediments of the Cretaceous Coachman Formation overlain by early Pliocene marine deposits with a rich assemblage of marine mollusks that drew private collectors (Schwimmer et al. 2015). As typical of an excavation in the Low-Country it soon became water filled. As a result most of the fossils were necessarily recovered from spoil piles on the edge of the pit.

Other than Stokes Quarry evidence of dinosaurs was found at Kingtree, one of our first localities collected (Map Loc. 4), Burches Ferry (Map Loc. 9), Tuberville, and Little River (Map Loc. 2). All of the dinosaur material is scrappy and can be assigned to Theropod, Hadrosaur, and Dinosauria indet.

This brief account discusses the most significant locations and results of the Paleontology Departments field research in the Low-Country of South Carolina, USA, between 1980 and 2011. Much of this work is not presented chronologically because of our irregular field schedule.

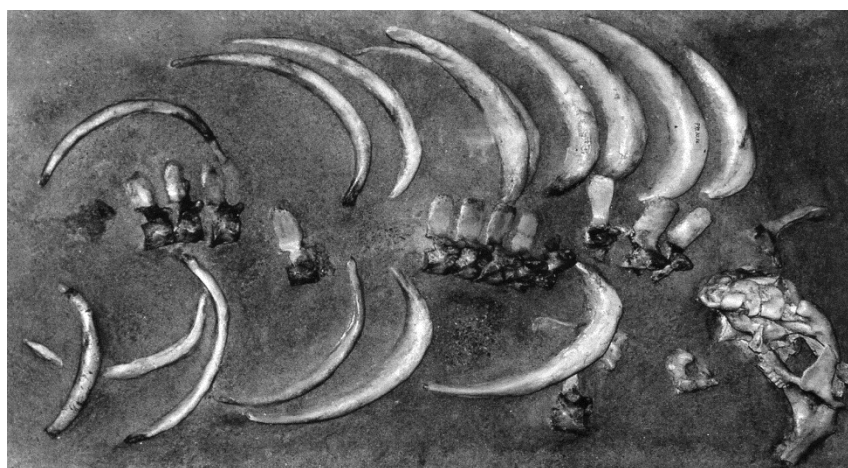


FIGURE 14. Composite skeleton of the dugong *Crenatosiren* indicating its occurrence in the Chandler Bridge deposits.



FIGURE 15. Albert Sanders (left) and Bruce Erickson (rt.) collecting large leatherback sea turtle for the Charleston Museum. With this specimen a field jacket of burlap and plaster was needed to remove it.

ACKNOWLEDGEMENTS

Field research in the Low-Country involved the efforts of numerous individuals who are cited here as Field staff: Robert Spading, Tom O'Brien; Field associates: Bruce Lampright, Robert Melchior, Al Sanders, Doug Hanks, Richard Wolszon, Lee Hallgren.

Skeletons developed for the Charleston Museum were accomplished by Robert Spading, Scott Thomas, Tom O'Brien, Doug Hanks, Richard Wolszon, Ron Mjos.

Richard Benson and Becky Huset read the manuscript and offered valuable suggestions for its improvement. Lois Erickson provided Manuscript editing and specimen analysis.

Mark Ryan contributed figures 1 abc; 2 abcd; 7, 8, 10, 12, 17; Tim Erickson did redacting of all figures. This research was supported by the Philip W. Fitzpatrick Paleontology Research Fund.

Special thanks are due to all of the above.

EPILOGUE

Some years before contemplating field studies in South Carolina the paleontology department staff Tom O'Brien, Robert Spading, and myself spent the cold seasons of 1974-1978 investigating living crocodylians in coastal swamps of the Florida Bay area which has the largest population of the American crocodile. By 1980 interest had shifted to the American Alligator and its habitat in South Carolina which resulted in several seasons of investigation at the Hobcaw-Barony near Georgetown and the rivers and waters near Charleston.

By 1983 many opportunities for building special collections of fossils became available especially with our new affiliation with the Charleston Museum and its fine collection of "cross". For about two months each year during the next 25 years were devoted to collaborative collecting and studies with the Charleston Museum. The specimens collected included invertebrates and vertebrates with a range in time from the late Cretaceous to the late Pleistocene. A total of over 400 fossil specimens were recovered for SMM's collections as well as casts of 5 major skeletons for our exhibit halls.

Much of the Low-Country fossil material is derived from underwater sources either brought ashore by the Surf, by dredging operations, or by diving or collecting at low tide. "River Sites" as they might be called such as those on the Colleton and Waccamaw rivers, the intracoastal waterway and Chandler Bridge and Clapp Creeks yielded many important fossil specimens, some of which are reported herein.

The stream Clapp Creek (Map Loc. 4) is an example of river site collecting where specimens are recovered from

stream banks and bottom sediments by sieve (Fig. 16). Collecting in most low-country areas rarely involves more than hand excavation. Regulations for the restoration of an abandoned site do not apply; therefore, we were spared the costly restoration of sites elsewhere.

Casts of 4 skeletons collected by ChM and developed at SMM—noted above as part of the exchange agreement between SMM and ChM—were installed in ChM during the following schedule: 1), 1995, *Gavialosuchus* ChM PV4279; 2), 1997, *Pseudodontorn* ChM PV4768; 3), *Odontocete* (Whale) ChM genus Y; 4), 2002, *Crenatosiren* ChM 538/2016.

A fifth cast of a small dinosaur *Thescelosaurus* from SMM collections was also installed in 2000. Recent discoveries of dinosaur material in South Carolina (Weishampel et al. 1996; Schwimmer et al. 2015) add to its relevance at ChM.



FIGURE 16. SMM Research Associate Robert Melchior (SMM) and Bruce Lampright (Hobcaw) collected specimens from sieve by hand picking. Kingstree site, Williamsburg Co., So. Car. Site 4 where the first dinosaur remains were found in 1985.

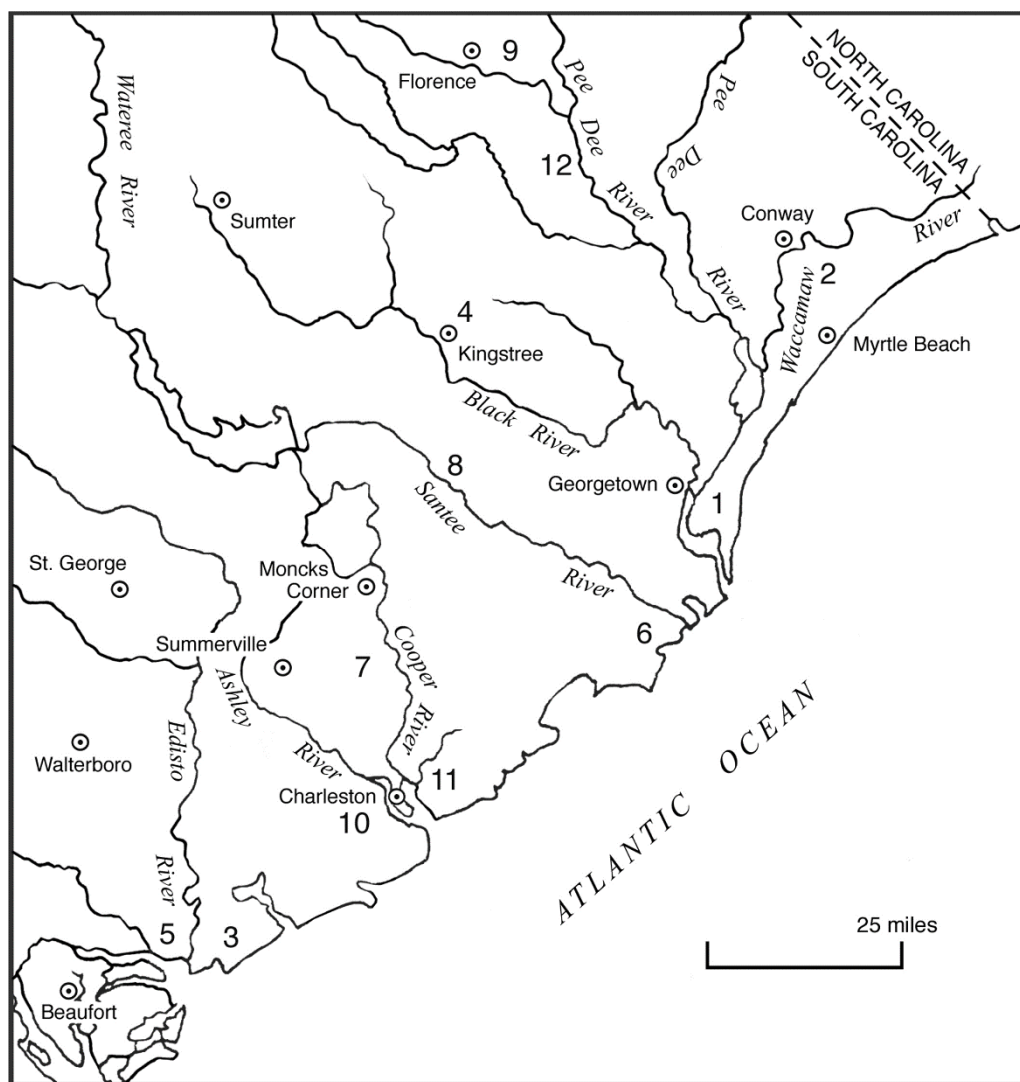


FIGURE 17. Map of localities in the Low-Country from which the collections were found and or living reptiles were studied.

- LOC. 1. Hobcaw-Barony (Baruch Plantation, Georgetown County).
- LOC. 2. Waccamaw R. sites, Horry and Georgetown Counties, (Myrtle Beach, Little River).
- LOC. 3. Port Royal/ Edisto Island, Charleston and Beaufort Counties.
- LOC. 4. Kingstree/Clapp Creek, Williamsburg County.
- LOC. 5. Spring Island/Colleton R. sites, Beaufort County.
- LOC. 6. Santee delta (Kinloch Plantation), Georgetown County.
- LOC. 7. Dorchester sites, Dorchester County.
- LOC. 8. St. Stephen, Berkeley County.
- LOC. 9. Florence sites, (Stokes Quarry Burches Ferry), Florence and Darlington Counties.
- LOC. 10. Goose Creek (Crowfield Plantation), Charleston County.
- LOC. 11. Wando, Berkeley County.
- LOC. 12. Black Creek, (Quinby) Darlington and Florence counties.

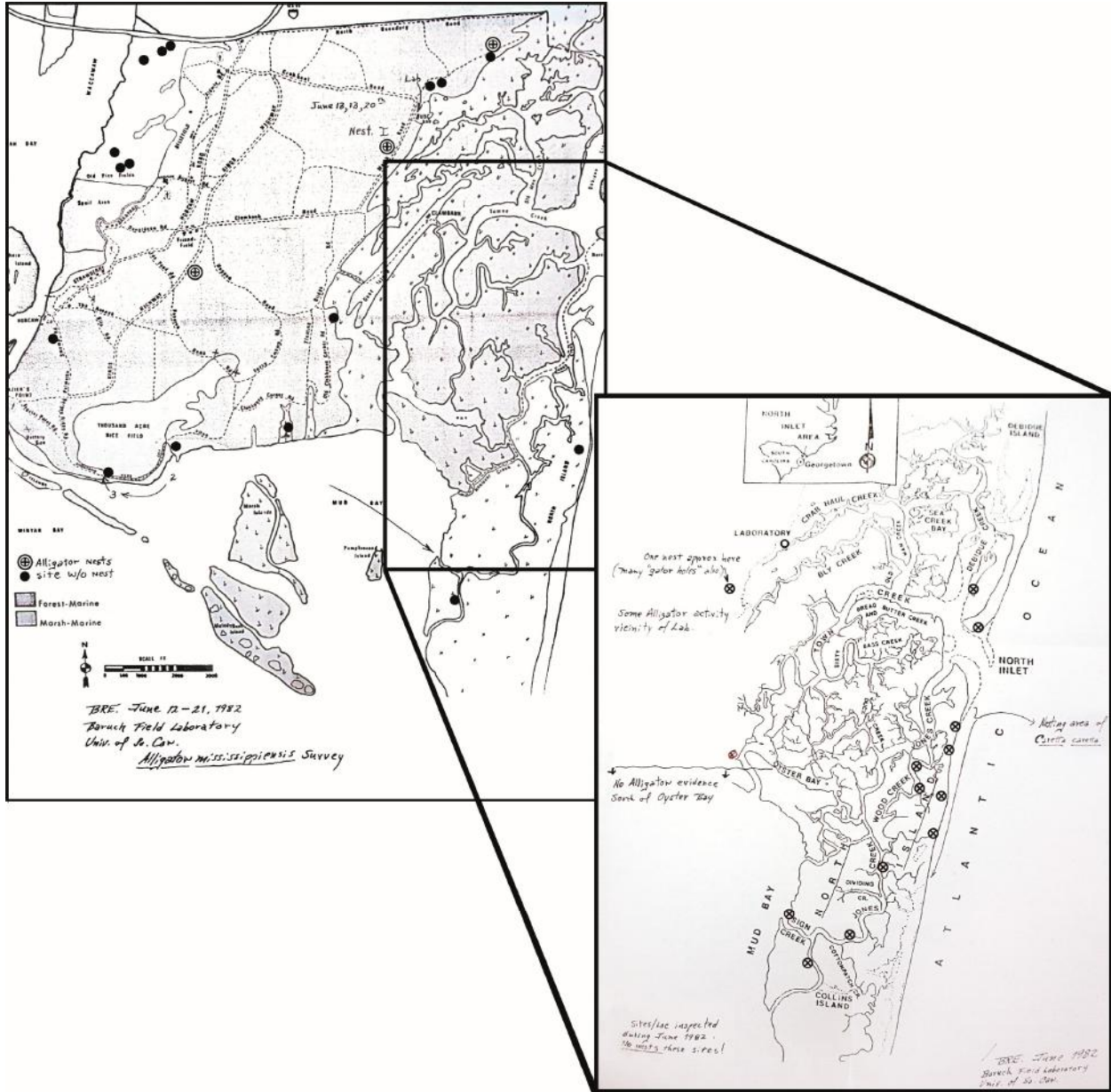


FIGURE 18. Map with field notes of Alligator and sea turtle sites Hobcaw-Barony 1980-1983, (Field note 6, 1982).

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