GREAT WHITE SHARKS:
Using the Present to Reconstruct the Past

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Visitors to the Calvert Marine Museum and local fossil collectors are always impressed by the giant five-to-six-inch-long teeth of the fossil Great White Shark *Carcharodon megalodon*. This “megatooth” shark reached a total length of over forty feet (the size of a large bus) and was the most impressive predator in the ancient sea that covered the Chesapeake region during the Miocene Epoch, ten to twenty million years ago. The museum has exhibited a reconstruction of the jaws and teeth of the megatooth for several years, and we are now planning a spectacular new display—an entire megatooth skeleton, which will be part of the new permanent fossil exhibition “A WINDOW IN TIME: Maryland in the Miocene,” scheduled for completion in 1995. This much larger fossil hall will explore how the abundant Miocene fossils of our region, including megatooth remains, help us understand what Southern Maryland was like millions of years ago.

Anyone familiar with sharks or who has collected fossil shark teeth will realize that our megatooth project is complicated by one simple fact: shark’s skeletons are made of cartilage, not bone, and cartilage is softer and much less likely than bone to be preserved in fossil form. The fossil record of sharks consists mainly of teeth, which are covered by a hard layer of enamel, and occasional vertebrae (segments of the backbone) that have extra calcification. Cartilaginous shark skeletal parts are very rare in Miocene-age deposits. To interpret what the entire megatooth skeleton would have looked like, we have to follow an approach that paleontologists have used for many years—we will study the skeletal anatomy of a close living relative, in this case *Carcharodon carcharias* (the species of Great White Shark living in today’s oceans), as a guide for reconstructing the skeleton of the Miocene megatooth. While *Carcharodon carcharias* reaches a recorded length of “only” twenty-one feet (about half the estimated length of its fossil cousin), we believe that its skeleton provides important clues on the appearance of the megatooth’s missing parts.

The first step in this process is to make a detailed examination of the skeletal anatomy of *Carcharodon carcharias*. Unfortunately, none of the museums in our area, or anywhere in North America, have complete prepared skeletons of this very large shark. Therefore, we traveled this past spring to the Shark Research Center at the South African Museum (SAM) in Cape Town, South Africa. We went to the SAM for two primary reasons: (1) the waters off of southern Africa are rich in sharks, including Great Whites, and the SAM has a large collection of freshly caught specimens for study; and (2) the SAM Shark Research Center is headed by Dr. Leonard Compagno, one of the world’s leading authorities on Great Whites and shark skeletal anatomy, who has enthusiastically joined with us on this collaborative project. Dr. Compagno has written extensively about Great White Sharks; among his credits is serving as a technical advisor for the movie *Jaws*.

Many of the Great Whites and other sharks in the SAM collection have been obtained through the Natal Sharks Board (the “shark police”), a government agency that is responsible for protecting swimmers in Natal Province from shark attacks along the Indian Ocean coastline of South Africa. The

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Natal Sharks Board maintains a system of protective nets strung along the coast, and when sharks occasionally become entangled in the nets, they are collected and used for scientific studies at museums and universities. The Natal Sharks Board is also very concerned with promoting shark conservation because populations of Great Whites and other species have been declining in recent years.

The first of our three weeks at the SAM was spent cleaning and preparing the cartilaginous skeleton of a freshly preserved ten-foot-long Great White. The SAM has a well-equipped wet laboratory for this kind of work, which was very messy, and sometimes gruesome, but important for our project. We prepared the skeleton by first carefully heating the various parts in a large cooker filled with simmering water; this “hot maceration” technique allows closely adhering muscle and connective tissue to be more easily removed from the cartilage. Once the skull, jaws, gill supports, backbone, and all of the fins were thoroughly cleaned, we placed the skeleton in a solution of isopropyl alcohol to preserve it without distorting its shape. Preventing distortion is very important: CMM’s megatooth jaw reconstruction, which was cast from molds developed by the Smithsonian, was based on dried Great White jaws and is somewhat inaccurate because cartilage becomes distorted as it dries out.

The next step was to record detailed measurements and the appearance of the primary skeleton that we worked on. We also examined several other Great White specimens to gain additional information on particularly complicated areas, such as the portion of the skeleton that surrounds the gill openings, and took X-rays of shark heads to see exactly how the jaws connect to the skull. We filled a notebook with detailed measurements, took twenty rolls of film, and shot nearly two hours of video footage. The photographs, slides, and videotape record not just the skeleton itself, but the methods we followed and techniques used in different stages of the project. We plan to use some of this footage in the new CMM fossil exhibit so that visitors can explore the process of researching and building the reconstruction as well as see the finished product.

Our final week in Cape Town was primarily spent drawing the different parts of measurements and drawings of Great White Shark skeletal parts, from project notebook.
of the skeleton. Photos and slides are very important, but drawings can be used to show certain kinds of detail that are not easy to capture on film, and they are also a good place to record specific measurements. The atlas of drawings, supported by information from the photographs, slides, and X-rays, will be modified and "scaled up" to serve as a blueprint for the megatooth reconstruction. We believe that the megatooth was not only much bigger, but also somewhat huskier in overall appearance than its living counterpart. This means that the megatooth skeletal parts are not only larger but also differ in proportion from those of the living Great White.

The total length for the megatooth skeleton will be about thirty-seven to thirty-eight feet—this is based on the size of the jaws and teeth we now have on exhibit, which will be modified and incorporated into the final exhibited specimen. No other museum has ever mounted a shark skeleton of this size. We are confident that it will be a very exciting component of the new exhibit, providing CMM with a means of teaching visitors about shark anatomy and the process that paleontologists follow to reconstruct ancient animals from fossil bits and pieces. We were very fortunate to have the opportunity to travel to Cape Town to work on this project, and we are grateful to Dr. Compagno and other staff members at the South African Museum for their wonderful cooperation and friendship.

We are also very pleased that further collaboration between our museums will be supported by a grant from the American Association of Museum's International Partnerships Among Museums (IPAM) program. IPAM is intended to foster cooperation between museums in different parts of the world, facilitating contacts that might otherwise be very difficult. We hope that our participation in the IPAM program will foster an increased spirit of cooperation and goodwill between ourselves and our African colleagues.

One final note—visitors to the museum should keep their eyes open as we begin construction of the new fossil exhibition this year. As much as possible, the different stages of building the exhibition, including reconstructing the megatooth skeleton, will be open to view as work proceeds over the next couple of years, and visitors will have a chance to evaluate different components of the new hall as they are implemented. Please plan to come by regularly to check our progress on this exciting project!
Summer

CMM boatwright Jack Krolak putting the finishing touches on the extension to the Patuxent Small Craft Guild Shed. The extension was built to cover the 1936 draketail workboat while she is being restored. It is also intended that this will be the first in a three-stage enlargement of the Guild Shed that will provide more room and better conditions for boat construction, boatbuilding classes, and maintaining the small craft collection.

Photo by Richard Dodds

Modelmakers Alex Eichholz (left) and Jimmy Langley (right) show off an example of a sailboat model that will be constructed in this fall's children's model building course. See calendar for more details.

Photo by Richard Dodds

In preparation for the restoration, museum staff (on scaffold) remove biennually accumulated debris. Workers examine exterior wall clearances.

Summer campers with CMM interpreter Sue Solomons.
CMM volunteer Kim Nesci shows a horseshoe crab to two visitors to the Estuarium's popular touch tank.

Laurie Dowell, CMM interpreter (partly hidden), and museum volunteer David (Chuck) Holcomb use a minnow trap to show life of the saltmarsh to children from Kiddy Care of Prince Frederick.
MEMBERSHIP CRUISE

The interest of museum members in the moonlight cruise in August was not washed out by a little rain. The original date of Saturday, August 15, was rainy, but the cruise was rescheduled for the following Saturday, August 22, and sailed on a beautiful — although moonless — evening. Seventy-three members and friends enjoyed the trip on the Capt. Tyler, with a view of Solomons harbor and dance music. The food was provided without charge by the Boathouse Cafe, a new venture at the Calvert Marina. Angela Phelan, president, in making this gift, commented: "We are delighted to be a part of this beautiful community." The museum appreciates her support, as well as that of its many members.

PARDON OUR CONSTRUCTION!

The article on page 3 on the Great White Shark describes some of the planned work on the museum’s new paleontology exhibit. Visitors will find this work under way in the exhibit area that serves as the access to the estuary exhibit, a gallery used since the opening of the building in 1989 for several maritime and natural history exhibits. These earlier exhibits will be moved to other parts of the museum.

In addition, the next three months will see more activity around the renovation work on the Administration Building. There may be occasional closings of the museum entry from Route 2 (Solomons Island Road), necessitating temporary entry through the Lore Street exit. Unfortunately, the condition of the driveway from Route 2 may be less than desired — ruts and a few potholes. Although efforts will be made to keep the driveway accessible, no permanent improvements (paving) will be possible until the renovation work is completed.

We ask your patience during these important improvements to the museum.

GOOD NEWS FROM THE DEVELOPMENT OFFICE!

In August, the Potomac Electric Power Company (PEPCO) made a wonderful contribution to CMM, “buying” a tank in the Estuarium for $20,000. Earlier in the summer Southern Maryland Electric Cooperative (SMECO) completed its pledge of $20,000 to “purchase” another Estuarium tank. Now six of the fifteen tanks have been "sold."

Members and friends gave to the 1991 Year-End Appeal and “Feed the Fish” campaigns a total of $16,000. Thanks to our generous supporters we are within striking distance of our goal to raise $150,000 by June of 1993. This goal, set in the spring of 1991, was motivated by a generous $150,000 matching grant bond bill approved during the 1991 Maryland legislative session for the express purpose of completing the Estuarium and beginning the design of the paleontology exhibit. To date we have raised $120,000.

VOLUNTEER COUNCIL ANNUAL MEETING

Museum volunteer members of the Volunteer Council met in the auditorium on September 23 to conduct the annual business meeting, to enjoy an interesting slide program on an around-the-world cruise, and to socialize at a wine and cheese get-together. The chief business of the meeting was hearing brief reports on the year’s activities and electing council officers for the coming term. Outgoing president Paul Adams described a productive year, with many new volunteers, new opportunities, and some notable accomplishments from volunteer efforts. Next year’s leadership will be: Don Brown, president; Dorothy Ordwein, vice-president; Cindy MacArthur, corresponding secretary; Paul Berry, treasurer/recording secretary. A special recognition was the presentation of volunteer emeritus status (and a special badge) to Martha Tongue, Solomons resident and long-time museum supporter.

Officers of the council are joined by committee chairs to form the executive committee, which normally meets the second Tuesday afternoon of each month. All volunteers are invited to attend. Please call Layne Bergin, volunteer/special events coordinator, to confirm time and date.
HOLIDAY BUYING AT THE MUSEUM STORE

The museum’s store is stocked for the fall and holiday season with a large variety of books, nautically inspired gifts, and several special holiday items. Plan to visit CMM this fall to view the exhibits, enjoy the events listed in the fall calendar, and shop for the season at the store. You’ll do yourself a favor, and also help support the work of the museum (store profits are returned to the museum through the Calvert Marine Museum Society).

Museum exhibits can only scratch the surface of the many fascinating aspects of the maritime history of the Patuxent River and the Chesapeake Bay, of the diverse natural history of the area and its waters, and of the special appeal of the Miocene fossils that abound in our area. Visits to the exhibits can stimulate an interest in a further pursuit of many of the topics displayed, an interest that can be easily satisfied by books. The museum store carries a fine selection of books that appeal to all ages, including several that have been produced by the museum.


The work of the bay watermen is presented in Larry S. Chowning’s Harvesting the Chesapeake: Tools and Traditions, Tidewater Publishers, $28.95 (1990, 284 pp.), and, of course, the work of CMM’s Paula Johnson, Working the Water: The Commercial Fisheries of Maryland’s Patuxent River, University Press of Virginia and Calvert Marine Museum, $19.95 and $35.00 (1987, 218 pp.). The personal reminiscences of CMM’s “Pepper” Langley are in I Remember, $9.95 (1990, 115 pp.). In addition to these newer books, the store carries many older works on the bay by Marion Brewington, Robert Burgess, and others.

Two beautiful books relating to natural history are John M. Levinson and Somers G. Headley’s Shorebirds: The Birds, the Hunters, the Decoys, Tidewater Publishers, $49.95 (1991, 144 pp.), and John W. Taylor’s Birds of the Chesapeake Bay, Johns Hopkins University Press, $34.95 (1992, 83 pp., illustrations and text by author). Paleontology is represented by Jasper Burns’s Fossil Collecting in the Mid-Atlantic States, Johns Hopkins University Press, $18.95 (201 pp.).

Again, there are older standard books available.


Among non-book items, the store offers crystal Christmas ornaments and elegant blue and white porcelain collectors’ plates that feature the museum’s logo and Drum Point Lighthouse in gold, both specially packaged for gift giving. Nautically inspired gifts include seafood cookbooks, calendars, prints and posters, mugs, mobiles, windchimes, coasters, tiles, jewelry, decoys, pewter cups, ship model kits, and children’s toys. There are bound to be a number of items to fill those difficult places on your shopping list.

In visiting CMM and the store this fall, be sure to bring your membership card for free admission and to present in the store for a ten percent discount. Members will also receive a free shipping bag in which to carry purchases. (Note: MasterCard and Visa are accepted by the store for purchases over $15.00.)
VOLUNTEER SPOTLIGHT —

Jeane Bare, Museum Store

It's probably difficult for new museum members and staff to imagine a time when our entire gift shop consisted of a single glass shelf at one side of the lobby! What was for sale? Shark teeth jewelry, made locally, stationery, postcards, and a few books were the total inventory.

Jeane Bare remembers it well, because “sometimes I was over there all by myself!” A friend of former store manager Kay Wood, Jeane started volunteering to mind the store on Sundays in 1981. This was in the Solomons schoolhouse building where often the volunteer on duty ended up being docent, information host, and salesperson all in one. They were quiet times, though, with few visitors.

As the museum grew, expanded, and improved, so did the store. Jeane has stayed with us for the changes: cash registers instead of a drawer, better merchandise, and lots of room for display. Store manager Dee Danzig says: “Jeane is also a member of the store purchasing committee, which selects items to be sold. With her help, and that of our other store volunteers, we’ve been very successful in our sales.”

“We’re behind the museum,” says Jeane, speaking for herself and husband Don. Retiring to Southern Maryland from Vienna, Virginia, the Bares feel lucky to have the museum in their backyard.

“Being a volunteer is super,” she says, adding that she hopes to be able to find even more time to give.

And what of husband Don? Well, it so happens that he volunteers, too — to the tune of eight years of service on the museum’s Board of Governors. This former government audit manager is the one who now keeps all the money straight as the board’s treasurer.

Whatever your interest, there is probably a volunteer position to fit. Call Layne Bergin, volunteer coordinator, at (410) 326-2042 to find out how to join the CMM crew. Nice people like Don and Jeane Bare can’t be wrong!