A Torpedo Whale vs. a Whale Torpedo
By Stephen J. Godfrey
CMM Curator of Paleontology

I have seen something else under the sun: The race is not to the swift or the battle to the strong, nor does food come to the wise or wealth to the brilliant or favor to the learned; but time and chance happen to them all. Ecclesiastes 9:11

(Editor's Note: The recently discovered Miocene whale skull, a significant find, revealed a classic conflict between two marine competitors, a whale and a shark. Dr. Godfrey describes this confrontation.)

An arms race is driven by fear and necessity, as one side one-ups the other by devising a new strategy or weapon to win the battle. This endless race evokes images of the Spy vs. Spy cartoons in MAD magazine, and although these now famous cartoons by the late Cuban native Antonio Prohias poke fun at the pit-falls of such an unchecked race, they point to the life or death reality of Predator vs. Prey. Animals that are preyed upon employ an impressive array of physical and behavioral adaptations to minimize the success of predators — growing larger, running faster, living in herds, developing camouflage, possessing stingers, secreting toxic chemicals, etc. Successful lineages of predators counter these adaptations by growing still larger, running still faster, and/or becoming smarter; thus the race goes on. Any genetically based adaptation that would favor either the predator or its potential prey will almost certainly take hold within a species, but there do not seem to be any guarantees of success. Necessity does not guarantee that genetic changes will arise when they are needed most. Predators can't always keep up with the new strategies prey devise, and, conversely, prey can't always outwit predators.

Throughout the Miocene Epoch (23.8 to 5.3 million years ago), the waters that covered southern Maryland witnessed the rise of several groups of marine macro predators. One group, the single-prey macro predators, devour one individual at a time. This does not imply that they hunt only one species; it simply means they hunt their prey one at a time. The now extinct fifty-foot-long giant white shark, Carcharodon megalodon, was, as far as we know from the fossil record, one of the most massive single-prey macro predators this world has ever known. (Living male sperm whales are even larger, reaching lengths of sixty-five feet.) Although the size of C. megalodon overshadows several other kinds of prehistoric giant predatory sharks, the presence here of these other large sharks is evidenced by their teeth found along Calvert Cliffs and elsewhere. One of these single-prey macro predators, of special interest to our present study, is the huge mako shark, Isurus hastalis.

At the other end of the giant predatory spectrum are the multi-prey macro predators. These carnivores devour more than one prey at a time. The living one-hundred-foot-long great blue whale is a good example. These whales feed almost exclusively on small shrimp-like crustaceans known as krill. During the summer feeding season they gorge themselves, gulping an estimated forty million kilo a day, equivalent to four (3.6 metric tons) or more tons of food each day! The multi-prey macro predator group includes a variety of baleen or filter-feeding whales: the extinct cetotheres (literally “whale-beasts”), as well as the living families of baleen whales — the rorquals, the right whales, and the gray whales.

During the Miocene, the filter-feeding cetotheres whales were macro predators, but they themselves also were prey for the single-prey macro predatory sharks. It is clear from the number of shark-tooth-marked fossil whale bones that Miocene whales were heavily preyed upon by a variety of large-body predatory sharks. Today, however, the relatively smaller sharks do not attack huge baleen whales, but they do scavenge whale carcasses. So were the giant extinct sharks just scavengers? No large carnivorous animal alive today feeds exclusively on carrion. Single-prey macro predators are big because their large size enables them to successfully hunt Continued on page 5
CMM LOSES TWO EARLY SUPPORTERS

Melvin A. Conant, museum supporter, advisor, board member, donor, and volunteer for nearly thirty years, died at his home in Lusby on December 11. After a distinguished career in private industry, government, and his own consulting firm, he retired in 1995 and moved to the Lusby area where he could enjoy his interest in maritime matters, especially the museum’s Patuxent Small Craft Guild and Solomons Island Model Boat Club, as well as the Great Schooner Model Society, which he founded.

Mel had a long-standing interest in yachting, ships, and ship models, being actively involved during his early career in the New York and Seawanhaka Corinthian Yacht Clubs, the Cold Spring Harbor Whaling Museum (board chairman), and the South Street Seaport Museum (founding trustee). When he moved to Washington, he became interested in CMM, serving during the 1970s on an advisory committee and then on the first official Board of Governors in 1979. His donations to the museum’s collections included fifteen maritime watercolors by Commander E. C. Tufnell, R.N., and a select collection of books on boatbuilding. Mel cooperated with CMM’s master carver “Pepper” Langley on the book I Remember, stories about the Langley family and early life in Solomons. As a volunteer, Mel enjoyed explaining to visitors his love of Baltimore Clippers and of models – especially those he raced in the Solomons Island Model Boat Club with “Pepper” – and telling about the many aspects of maritime life of which he had extensive knowledge. Mel set up a series of classes for the Mariner’s Guild, early teenagers too young to be full volunteers, and in 1998 he served on a museum committee developing a program on “African American Mariners and Their Legacy.” His association with CMM will be greatly missed.

Another early supporter of CMM, G. Walther Ewalt, died at age 100 in December. Because of his association with the Calvert County Historical Society, he was named to the society’s committee on the marine museum – the group responsible for the museum from its opening in 1970 until 1979 when Calvert County assumed responsibility. When the Board of Governors was established in 1979, Mr. Ewalt was its vice chairman until 1981. He was later the president of the historical society. His early association with CMM was quite significant in its development.

CMM TO PARTICIPATE IN WOODENBOAT MAGAZINE’S FAMILY BOATBUILDING WEEKEND

Blend one large stack of wood with an ample assortment of simple hand tools, stir in six eager families over one weekend, and you have a recipe for an unforgettable boatbuilding, team-building, family-bonding experience!

Last year’s Patuxent Small Craft Center’s offerings produced ten canoes and lots of proud, smiling faces. This year the PSCC will be expanding its horizons by joining with WoodenBoat magazine’s annual family boatbuilding event. During one week in July, hundreds of families around the world will be building and launching their own boats, a kind of international boatbuilding festival.

CMM will be doing its part by offering six families the opportunity to strengthen their bonds as they spend the weekend of July 24 and 25 building a handsome wooden rowboat. The construction of the boat involves the use of simple hand tools, and no boatbuilding experience is needed. Groups may consist of up to four individuals aged 11 and up, with at least one adult. Larger groups may be accommodated by working in shifts. The cost of each boat is $750 ($800 for nonmembers). This cost includes all the materials (but no paint) and oars for a twelve-foot, flat-bottomed rowboat. Construction starts Saturday morning and ends Sunday afternoon with a group launching.

“Building Community Through Boats” is one of the themes encouraged by the WoodenBoat organizers. They suggest finding local sponsorship to fund scholarships to cover a portion of the cost for families who might not otherwise be able to participate. If your church, business, or civic organization is interested in sponsoring a family, please contact us.

For an application for boatbuilding weekend, call Melissa McCormick on 410-326-2042, ext. 41. Applications must be received by June 24.
WATERSIDE 2004 WELCOMES
BONNIE RAITT – JUNE 6, 2004

On Sunday, June 6, Ralph’s Dodge-Jeep and Cumberland & Erly, LLC, present Waterside 2004 with the legendary singer/guitarist Bonnie Raitt. The show kicks off at 7:30 with special guest, The Holmes Brothers. Tickets are $50 premium and $40 reserved. A nine-time Grammy winner, Raitt will rock the Washington Gas Pavilion with hits like “Something to Talk About,” “Thing Called Love,” and “I Can’t Make You Love Me.”

Members – Order your tickets before the general public sale! Members’ sales start April 19 at 9:00 a.m. Tickets can be reserved via the flyer inserted in this Bugeye Times. Please see the flyer for additional ordering information. Members may reserve up to eight tickets. If you need further information, please contact the Development Department at 410-326-2042, ext. 16, 17, or 18.

Waterside 2004 sponsors include: Ralph’s Dodge-Jeep; Cumberland & Erly, LLC; Solomons Landing; Booz-Allen-Hamilton; Coors, Coors Light & Killian’s; G&H Jewelers; Quick Connections Answering Service; Holiday Inn Select Solomons; Mom’s in the Kitchen Catering; Bay Weekly; Southern Maryland Newspapers; SMECO; Comcast; DM Group; Papa John’s Pizza; and RadioShack (Charlotte Hall, Dunkirk, and Prince Frederick).

LEROY THOMAS CONCERT
A FUN TIME FOR ALL!

Nearly a full house packed the CMM auditorium for a Valentine’s performance with LeRoy Thomas & The Zydeco Roadrunners. This lively event brought guests out of their seats and onto the dance floor in the museum lobby. With such instruments as accordions and washboards, CMM felt more like a street in New Orleans during Mardi Gras.

MERLE HAGGARD TO PERFORM
AT CMM ON JULY 18

Waterside Music Series expands in 2004 with an additional summer concert on July 18 by country legend Merle Haggard. With a new album entitled “Haggard Like Never Before,” Merle is ready to hit the road.

Widely regarded as country music’s greatest living recording artist, Haggard has been producing quality music for nearly forty years. Rather than slowing down, he is currently in one of his most productive phases to date, producing new music at a prolific rate and playing about 150 tour dates per year. Says Haggard, “This is a really good period for me. I’m in good health, I’m enjoying myself, and my urge to make music is as strong as it’s ever been. As long as I feel like I can still do this, I will. I’m just trying to stay alive and stand my ground.”

Members will receive an advance order form for Haggard tickets in the mail. Members’ sales begin June 16 at 9:00 a.m. Please check on www.calvertmarinemuseum.com for the latest information on this and other Waterside events, or contact the Development Department at 410-326-2042, ext. 16, 17 or 18.
WINTER LIGHTS – 2004

One of the main events of the winter was the seventh annual Winter Lights celebration on January 17 and 18. Sponsored by the museum, with support from the Chesapeake Chapter of the United States Lighthouse Society, this event drew visitors from a wide area. The museum’s Drum Point Lighthouse was open, but Cove Point could not be opened because of the cleanup from Hurricane Isabel. Along with exhibit booths, there were two activities of special interest – the gingerbread lighthouse contest and a special photo exhibit.

CHESAPEAKE ANTIQUE BOAT AND MARINE ENGINE SHOW

The fourth Chesapeake Antique Boat and Marine Engine Show will be held on Saturday, May 1, from 10 a.m. until 5 p.m., and on Sunday, May 2, from 10 a.m. until 3 p.m. As in the past, the event will be held on the grounds of the museum, and is sponsored in part through the generous support of Washburn’s Boat Yard of Solomons.

The museum plays host to collectors of antique and classic boats, as well as owners of pre-1975 outboard and inboard engines, marine steam engines, and model engines. For the first time it is hoped to have a representation of Cruis-Along boats, built in Solomons after the Second World War. Other events of the weekend include the Volunteer Council yard sale on Saturday and model skipjack races on Sunday.

350TH SEAHORSES UNVEILED ON MAY 1

There will be a ceremony at 11:00 a.m. on May 1 on the lawn of the museum to unveil two of the seahorses that were created by students as part of the county’s celebration of its 350th anniversary. As described in the Winter 2003-2004 issue of the Bugeye Times, CMM and Annmarie Garden prepared twenty-five large fiberglass seahorses and distributed them to county schools as part of an art project. These were then decorated by students for display during 2004. There will be a map available as a guide to the location of the seahorses throughout the county. A website featuring the winning school designs can be found at: www.annmariegarden.org. Click on “Seahorses by the Bay.”

SUPPORT THE YARD SALE ON MAY 1

The Volunteer Council is holding its YARD SALE this year on Saturday, May 1, beginning at 8:00 a.m., at the Washington Gas Pavilion on the museum’s parking lot. Proceeds of the sale will go toward maritime educational programs and activities for the Patuxent Small Craft Center.

To donate items (in good condition) for the yard sale, call Annie at 410-394-1493, but please do not include clothing, hardbound books, or large furniture.
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larger prey than they could otherwise subdue, thus obtaining a greater return on a larger victim for essentially the same effort. This is not to say that single-prey macro predators will not chow down on free food in the form of a carcass when it’s available. Although in some cases fossil shark tooth marks on fossil whale bones may only represent evidence of prehistoric scavenging, it is reasonable to suggest that large prehistoric sharks did attack and prey upon smaller whales.

Miocene whales, however, did not find fulfillment when eaten by sharks! They did not work hard to gorge themselves and fatten up only to seek out and then deliberately sacrifice themselves for the good of giant single-prey sharks. So what “arms race” options did Miocene whales develop in order to attempt to foil shark predation?

The Prey: The Torpedo Whale from St. Mary’s County.

By now, the story is well known of how the combination of coastal erosion by Hurricane Isabel, Jeff DiMeglio’s keen fossil-finding eye, and the search and rescue team on a UH-3H Sea King helicopter from NAS PAX River helped us obtain an eight-million-year-old fossil whale skull from a bluff in St. Mary’s County. (If you missed the story, go to NEWS: “January 29th, 2004: 8 Million-Year-Old Fossil Whale Skull Found at www.calvertmarinemuseum.com.”) In life, the St. Mary’s whale, here dubbed “torpedocetus,” would have been about eighteen feet long, a calculation based on its five-and-a-half-foot-long skull. When compared with the largest-ever living animals, the giant blue whale, torpedocetus would have been small for a baleen whale; however, during the Miocene Epoch it would have been above average in length. The newly found whale skull is now being prepared while on display at the Calvert Marine Museum and, although encrusting sediments still obscure portions of the skull, it is possible to outline its general proportions (Figure 2B). (Note: Figure 2B will likely be modified as more detailed information on the configuration of the bones of the skull becomes available.)

The whale skulls in figure 2 are drawn to the same scale and are shown as they would appear if viewed from above. Figure 2A is that of Aglæocetus patulus, an extinct cetotherid whale that was collected from the Calvert Formation along Calvert Cliffs, and figure 2C is a drawing of the smallest of the living rorquals, the Minke whale. Clearly, the most conspicuous difference between the skulls of torpedocetus (Figure 2B) and the other two is how narrow it is from side to side, almost torpedo-like. Although the specific identity of this whale has yet to be determined, when compared with other North Atlantic Miocene whales, it is unique in its gracile skull proportions. But why was torpedocetus so slender?

The density of water is 784 times greater than air, which is why fast-moving aquatic organisms have to be streamlined. A more slender body serves to reduce the overall drag of the density of water places on an aquatic organism, thus permitting faster locomotion through water. Although we can’t be certain that because of its more slender skull “torpedocetus” was a faster-swimming whale than its contemporaries, all other things being equal, the chances are good that it was. Increased speed is believed to be one of the ways in which baleen whales one-upped macro predatory sharks.

Are there any drawbacks to a whale becoming increasingly slender? Yes — torpedocetus would not have been as able to tolerate cold water as would a more rotund whale. It’s a surface-area-to-volume ratio problem. Slender and elongate warm-bodied animals lose heat more rapidly than more rotund critters of equal volume because they have a much larger surface area for heat loss. Modern bowhead whales, for example, inhabit cold arctic waters year-round because their rounded bodies maximize volume while minimizing surface area through which heat can dissipate. Small and slender torpedocetus was probably not suited for life near the poles, where calving in arctic waters would have been out of the question; the tiny, blubberless calves would have died of hypothermia in no time.


As we were quarrying torpedocetus from the wet, muddy sediments in St. Mary’s County, a large mako shark tooth (Isurus hastalis) was found lying against the whale’s shoulder bone. At 2-7/8 inches long (see figure 3), this upper right lateral tooth implies the coexistence of a mako that would have been between twenty-five and thirty feet long, bigger than any living great white shark. Later, when sediments were removed from near the bony vertex above the braincase, a smaller, lower left lateral mako tooth was also found. Both mako teeth are consistent with deriving from sharks of similar size, and, in fact, there is no reason to believe that they could not have come from the same individual.

It is possible, of course, that these two teeth just happened to drop out of disparate shark mouths as they swam over the decaying whale that lay on the bottom of the Miocene Atlantic Ocean eight million years ago. After all, sharks shed their teeth continu-
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ously to ensure that their jaws will always be rimmed with sharp cutters! There are, however, indications that strongly suggest that luck played no part in bringing these mako teeth together with the whale skull. A series of deep gouges located on the back left-hand side of the skull are like other recorded tooth marks preserved on fossil whale bone (figure 3), and the size and spacing of the gouges are consistent with the tooth marks of a giant mako.

Among living sharks, makos are the fastest of the fast; and although the giant mako from the St. Marys Formation may not have been as fast a swimmer as the living makos, there is no reason to believe that it, too, was not one of the fastest sharks then alive. This whale torpedocetus (i.e., the giant mako shark) would have had two of the best predatory strategies working for it: giant size and speed. So did it “out-spy” torpedocetus? At this juncture, my money is on the shark (figure 4). The force needed to deeply gouge the skull bones was probably applied during a powerful deathblow to the whale’s head. This, in addition to its huge size and presumed speed, suggest that its teeth were not shed because it was scavenging an already dead whale; rather, it successfully hunted and killed this torpedocetus.

Who Won the War?

The problems with an arms race are many. If you’re not running the same race as your opponent, or if they change the rules, and you don’t or can’t change fast enough, you’re pretty much doomed to lose the battle. Paleontologists generally agree that from the middle of the Miocene Epoch to

the end of the Pliocene Epoch (a period of about ten million years), those progenitors of the groups of baleen whales that are still alive today (the rorquals, the right whales, and the grey whales) literally out-maneuvered the giant predatory sharks on several fronts—whale evolution simply outpaced that of the giant predatory sharks. Firstly, these baleen whales continued to increase in size. At nearly twenty feet long, torpedocetus is a good-sized Miocene baleen whale; but if it were still alive, it would be the smallest of the baleen whales. Secondly, with improved musculature and fluke structure, baleen whales became better swimmers and consequently were harder to catch. Thirdly, and probably most importantly, baleen whales moved from living year-round in local areas to becoming migratory. Their summer feeding range took them into the Polar Regions, thus putting them out of reach of the single-prey macro predators for large portions of the year.

So, did whales win the war? From the perspective of the single-prey macro

Figure 3. Here, the largest mako tooth that was found with torpedocetus is held just above three deep gouges located on the back left-hand side of the whole skull. These shark tooth marks were probably made by the huge mako that is presumed to have killed torpedocetus. (CQM photo by Stephen Caddell)

Figure 4. Predator vs. Prey. The twenty-eight-foot-long mako before it ploughs into torpedocetus! (Drawn by Tim Scheiner)
predatory sharks they did, but as long as there are predators and prey on Earth, the war will never end. During Miocene times, killer whales were nowhere on Earth—they had not yet evolved—and the large dolphins living at that time had elongate jaws ill suited for hunting whales. Ironically, following the demise of the single-prey macro predatory sharks (perhaps helped along by the rise of the killer whale), the only predator that baleen whales had to contend with was one of the toothed whales—the killer whale, Orcinus Orca, the largest member of the dolphin family. And so the arms race continues.

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Acknowledgments.

My sincerest thanks go out to all who had a hand in the successful retrieval of the fossil baleen whale skull from St. Mary’s County: Jeff DiMeglio and Sarah Gullick for discovering the skull and bringing it to our attention; the chain of command at NAS Patuxent River and their Search and Rescue Team; and, especially, the property owners (who wish to remain anonymous), for without their generosity and hospitality, none of this would have happened. Of the many Calvert Marine Museum staff and volunteers who helped in this endeavor, Bill Counterman, Anna Fuller, Pam Platt, Pat Fink, and Grenda Dennis went “above and beyond the call of duty.” Tim Scheier applied his usual skill in drafting figures 1 and 4—many thanks. Editorial and technical comments by Pat Fink, Paul Berry, and Bill Counterman improved this effort. This article would not have been possible without funding from the Board of Calvert County Commissioners, the citizens of Calvert County, and the Clarissa and Lincoln Dryden Endowment for Paleontology at the Calvert Marine Museum.

A word of warning!

Digging in the cliffs is dangerous and is prohibited on all state and federal lands. On private land, permission must be obtained from the owners before digging. If you see a skull, bone, or unusual fossil in the cliffs, please report it to the Calvert Marine Museum (410-326-2042). The museum appreciates getting this information, and, if justified by the importance of the find, will make every effort to obtain the necessary permission and have trained personnel collect the specimen, giving full credit to the finder.

Whale Migration

Many of the modern baleen whales migrate from one geographic area to another at predictable times of the year. Whales time their migration to take advantage of an abundant food supply in polar waters during the summer and then migrate to warmer waters in the winter to calve and mate. In general, modern whales tolerate cold water well because of their large size, decreased breathing rates (which adds to their ability to retain body heat by reducing the number of times they breathe out warmed air), insulating layer of blubber, and heat-saving countercurrent circulatory system. During the winter months, they move towards warmer equatorial waters in part to conserve energy—they lose less heat to the environment in warmer water. In addition, newborn whale calves are relatively small with a high surface-area-to-volume ratio and almost no insulating blubber. If they were born in cold arctic waters, they would almost certainly die from hypothermia. By birthing in warmer waters, females help their calves put most of their energy into growing larger.

MUSEUM STAFF CHANGES

There have been a few changes this spring. Visitors will see Bob Laughery on alternate weekends as the weekend coordinator, replacing Tom Ostertag who left after a decade of association with the museum. Tom’s replacement at the Admissions Desk will be Elizabeth Stapt. Jolene Schafer, exhibits graphics technician, has left the staff to join her new husband who is in the U.S. Air Force in Alaska.
VOLUNTEER SPOTLIGHT—

Volunteer of the Year 2003: Tom Younger
By Leslie King, Volunteer Coordinator

It was the day before Hurricane Isabelle made her presence known and a day when Tom Younger helped affirm my belief in volunteers. All staff members were securing our facilities. As part of the Red Team, captained by Jimmy Langley, I found myself along with several other employees at Cove Point helping take down exhibit panels. Holding signs in place while they were unscrewed from their mounts, I would pass them along to Tom Younger, who in turn put them inside one of the buildings. This small-seeming moment of realization made my day brighter. Here was a volunteer who instead of spending the week caring for his own property, chose to give the best hours of the day to the museum. Wow, I thought, what amazing dedication. (Please also note — there were several other volunteers also on hand for hurricane preparations.)

So, it did not surprise me that Tom Younger received several nominations from the staff for the Volunteer of the Year Award. Combining the explanations for why Tom should receive this award, the ballot read:

Tom helps with any sort of exhibits workshop and/or model-making tasks with the most willing and pleasant attitude and is invaluable to the museum. He has gone “millions” of extra miles to volunteer whenever and wherever he can be of assistance — no questions asked. He is very helpful and kind to everyone he comes in contact with, and has a great attitude about the museum and what it stands for. You can find him at CMM most days, and he supports many of our after-hours events. You will always find him with a smile and a thank you. Tom is the exhibit liaison for the Volunteer Council.

Although he and his wife Sandy have only been official volunteers since 2001, Tom has volunteered 1324.5 hours. This does not count the ten or so years before when he began helping “Pepper” Langley in the model shop or being an active member of the Solomons Island Model Boat Club. He is also a second generation volunteer at CMM, following in the footsteps of his father, Richard Younger. Tom’s attachment to the site also goes further than his volunteer activities: he attended school here when the administration building was an academic facility.

This retiree from the Patuxent River Naval Air Station and past U. S. Air Force service member looks at the Thomas Johnson Bridge as I interview him for this article. For a moment the bridge is gone. He recalls the days when Sandy and he had to take Leon Langley’s “ferry,” Miss Solomons, across to St. Mary’s County, where a bus would pick the passengers up and take them to the base. He laughingly tells about winter mornings when the passengers and crew had to rock the boat in order break the icewater impeding their passage. As they looked back at the shore, the watermen followed the tracks left by the ferry.

Following these lines, Tom comes from a long line of watermen. It isn’t just a love of the area that keeps him here in Calvert County. It’s more apt to say that the bay and its history are in his blood. Though both Tom and Sandy experienced living other places during their military careers, they have found themselves tied to the waters of the Chesapeake Bay. This is home. They are of the seemingly rare breed of people who have chosen to remain in Calvert County throughout their lives.

Before joining the military, both worked at the M. M. Davis Shipyard, as had generations before them. Tom delights in telling people about the notorious now-defunct business. With such a background and stories of past generations of Calvert County Youngers, he offers a first-person account of the area. He is extremely dedicated and is a big believer in preserving the past for future generations. How else will our children’s children know anything about what has passed before them?

So, Tom, thank you for all that you bring to the museum... and all your help and kindness. May you always look forward to your time here, as much as staff, visitors, and other volunteers look forward to time with you.