



Spring Calendar

Quarry trips: Trip dates and sign up procedures will be coming soon. Check email for announcements.

March

- 8 **Holden Beach** collecting trip- Check email for details.
- 9 **Old Dock** collecting trip- Check email for details.
- 16 **Greens Mill Run** collecting trip- Check email for details.
- 17 **NCFC Meeting-** NCMNS, 11 West Jones Street, Raleigh. 1:30 pm, Level A conference room and via zoom. Speaker is Anna Jordan, College of William & Mary. The talk is titled "A Pleistocene mammal assemblage from sinkholes within the Castle Hayne Formation."

April

- 20 **Swift Creek** collecting trip- Check email for details.
- 27 **Old Dock** collecting trip- Check email for details.
- 28 **Holden Beach** collecting trip- Check email for details.

May

- 19 **NCFC Meeting-** NCMNS, 11 West Jones Street, Raleigh. 1:30 pm, Level A conference room and via zoom. Speaker to be announced. Check email for details.
- 25 **North Carolina Fossil Festival-** Aurora, NC. Check email for details. Volunteers and displayers needed.

President's Message

Recently, a list of recent NCFC Outreaches was assembled by our new Outreach Coordinator, Tony Shaver. I must admit I felt a little bit of pride in our organization when I saw it. It was a very impressive list of school visits, community events, and fossil fairs. Our folks have really been busy, and this list is growing every day! I began to think about all the different audiences that attend these events. There are the eager youngsters that are obsessed with dinosaurs and who drag their parents to every possible event, dreaming of becoming paleontologists when they grow up. There are the adults that never lost that childhood enthusiasm, some who have become collectors themselves, with varying levels of knowledge. There are the curious, who may have a passing interest in fossils but little knowledge or

experience beyond movies or the internet, which can be full of misinformation. They often leave the events with a new interest based on our presentations. Then, there are the experienced and knowledgeable collectors and professionals, who come seeking networking opportunities and hoping to find new collecting venues. These are the folks that grab our attention, too, as they have a lot to teach us! In addition, school groups are gaining enrichment to their classroom curriculums by the in-person visits from our club members who bring displays and lots of first-hand knowledge to share. That is something our folks love to do- share their personal expertise and enthusiasm, and this is evident when new members join the NCFC at these events, or when kids go home and tell Mom and Dad all about the paleontologist that visited their class at school. Our influence is pretty widespread and makes a lot of difference.

While not everyone has the time or ability to go out and do these events, we all can have the ability to make an impact through showing respect and responsibility in regards to safety and collecting etiquette. I often hear members explaining the importance of safety equipment, not collecting alone, and following rules at collecting sites. While we cannot supervise the actions of non-members, being advocates for these behaviors ourselves can go a long way to encourage others to do the same. Our collecting future is affected by everyone that goes out to hunt, whether they are a part of our group or not. What we do can make a difference. Outreach does not have to be an event; it is simply educating others when and where it is appropriate. This is something we do every time we have a conversation with someone about our passion for fossil collecting, so, in case you didn't know, you are doing outreach a lot more than we record for our reports, just in a more informal setting.

Keep up the great work! You are an amazing group and I am so proud to be a part of the NCFC!

Terry Denny
President, NC Fossil Club

Recent NC Fossil Club Trips- Old Dock and Holden Beach

submitted by Linda McCall

Old Dock

Field trips to Old Dock were held on November 8th and December 2nd, 2023. Six members attended the Nov. 8th trip and 7 attended the Dec 2nd trip. The weather proved wonderful for both trips - with warm temperatures and no rain. The collecting site is small, but still produces wonderful things. Murex gastropods, fish skull caps, giant *Mercenaria* and *Glycymeris* bivalves, spiny oysters and dozens of other bivalves and gastropods, coral, bryozoan and more are collected each trip. In addition, the rare complete sand dollar, shark tooth and whole urchin occasionally turn up as well. Dated at 2 million years old - these fossils are remarkably well preserved - some even retaining color, color patterns or fluorescing under black light. We take time out at the end of each collecting trip to clear any encroaching plants and are slowly increasing the size of the collecting area. Tended carefully, this site should be able to provide collecting opportunities for years to come.



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Holden Beach

Field trips to Holden Beach were held on Nov 9th and Dec 3rd, 2023. Four members attended the Nov 9th trip and 7 attended the Dec 3rd trip. The Nov 9th trip was great, with warm weather and great tides. Unfortunately the tides on the Dec 3rd trip were not in our favor, and there was little rock on the beach. It's always luck of the draw. Holden Beach is still producing great things. Dredging has thrown up a lot of Cretaceous age Peedee Formation rock along with the sand, and between the two trips, mosasaur teeth, turtle bits, shark teeth, puffer fish mouth plates, echinoids, bone frags, *Exogyra* oysters and ammonite chunks were found. It's never a dull day on the beach!



New Martin Marietta Collecting Rules

Dear NCFC Members,

Great News!

After much negotiation, Martin Marietta (MM) has granted the North Carolina Fossil Club limited access twice-yearly to five quarries (Fountain, Clark's, Onslow, Belgrade and Castle Hayne) for field trips. Our newly negotiated access is contingent on strict adherence to a revised, comprehensive set of rules designed to enhance safety. Therefore, the following new rules will immediately apply to ALL MM Quarry trips. (All field trip procedures to other sites will remain unchanged.)

1. **There will be a maximum of 20 people allowed on each trip** regardless of the quarry.
 - a. Anyone not on the approved list will be denied access.
2. **A maximum of 5 vehicles will be allowed into the quarry per trip**, all others will be left in the designated parking area. Two of these will be trip leader vehicles and the trip leader(s) will select the remaining 3 (or 4 if only one trip leader is present).
 - a. All vehicles entering the collecting areas must be high clearance and capable of carrying 3 additional passengers and their gear.
 - b. There will be 4 participants per vehicle entering the quarry.
 - c. The 5 vehicles accessing the quarry must have their wheels chocked the entire time with their parking brake engaged.
3. **No participants under 18 years of age will be allowed.**
4. You **MUST** provide your own **safety gear**, including all the following **REQUIRED GEAR**.
 - a. Hard Hat
 - b. High visibility (Hi-viz) shirt and / or vest. (Orange or safety yellow)
 - c. Safety Glasses. Even if you wear prescription glasses, have safety glasses with you. Each quarry will decide if you must wear them or not.
 - d. Sturdy, closed toe shoes. Boots preferable. No tennis shoes, etc.
 - e. Gloves recommended but not required.
5. **If you show up without all the respective safety gear you will not be allowed in** and will be banned from future MM trips for 6 months. You just cost someone their slot.
 - a. If you need to cancel a MM trip you are signed up for - do it as soon as possible. There will be a waiting list.
 - b. If you habitually cancel within 24 hours of a MM trip, you will face consequences, including being banned from future MM trips for up to 6 months.
 - c. **If you NO SHOW** for a MM trip, you will be banned from attending future MM trips for 6 months.
6. **YOU MUST STAY IN THE QUARRY COLLECTING AREA THE ENTIRE TIME OF THE TRIP.** This is a hard and fast Martin Marietta Rule. If you cannot stay the entire time, do not ask for a spot. (Remember, you are either riding with someone else, or you are transporting 3 other people.) You can't leave to go to the bathroom or go up to the office to go to the bathroom or leave early for any reason other than an emergency.
7. Report all injuries to a trip leader, no matter how minor.
8. **All Martin Marietta rules, and quarry specific rules must be followed explicitly.** Any violations will be immediately dealt with. Consequences can include anything from a verbal reprimand all the way up to a 6-month ban from future MM trips. A lifetime ban from MM trips can occur for serious, dangerous behavior that jeopardizes NCFC future access.
9. **NO pictures** are allowed to be taken inside of the quarry without prior permission from the quarry manager and the NCFC board. This includes pictures of your fossils on the ground. Picture time after the trip at the parking area will be done if we are granted permission at the quarry. All pictures must have the location metadata removed.
10. **No Social Media** posting before, during or after a trip that gives ANY details that could identify a Martin Marietta Quarry. You may say, "I found these fossils in the Castle Hayne Formation of NC." You may not say I found these in a quarry that contains Castle Hayne Formation. Please ensure that Martin Marietta cannot be tied to any post. Again, all location metadata must be scrubbed.
11. You will be required to **sign waiver documents** for Martin Marietta and the NCFC before any quarry entry.

Photos from the Schiele Museum Fossil Fair, Gastonia NC. February 24, 2024. Several NCFC members displayed.

Photos by Linda McCall



Fossils in the news

This Japanese 'dragon' terrorized ancient seas

A mosasaur called the Wakayama 'blue dragon' ruled prehistoric waters

Article by Michael Miller can be found here: <https://www.uc.edu/news/articles/2023/12/uc-paleontologist-describes-wakayama-blue-dragon-that-ruled-prehistoric-waters-off-japan.html>.

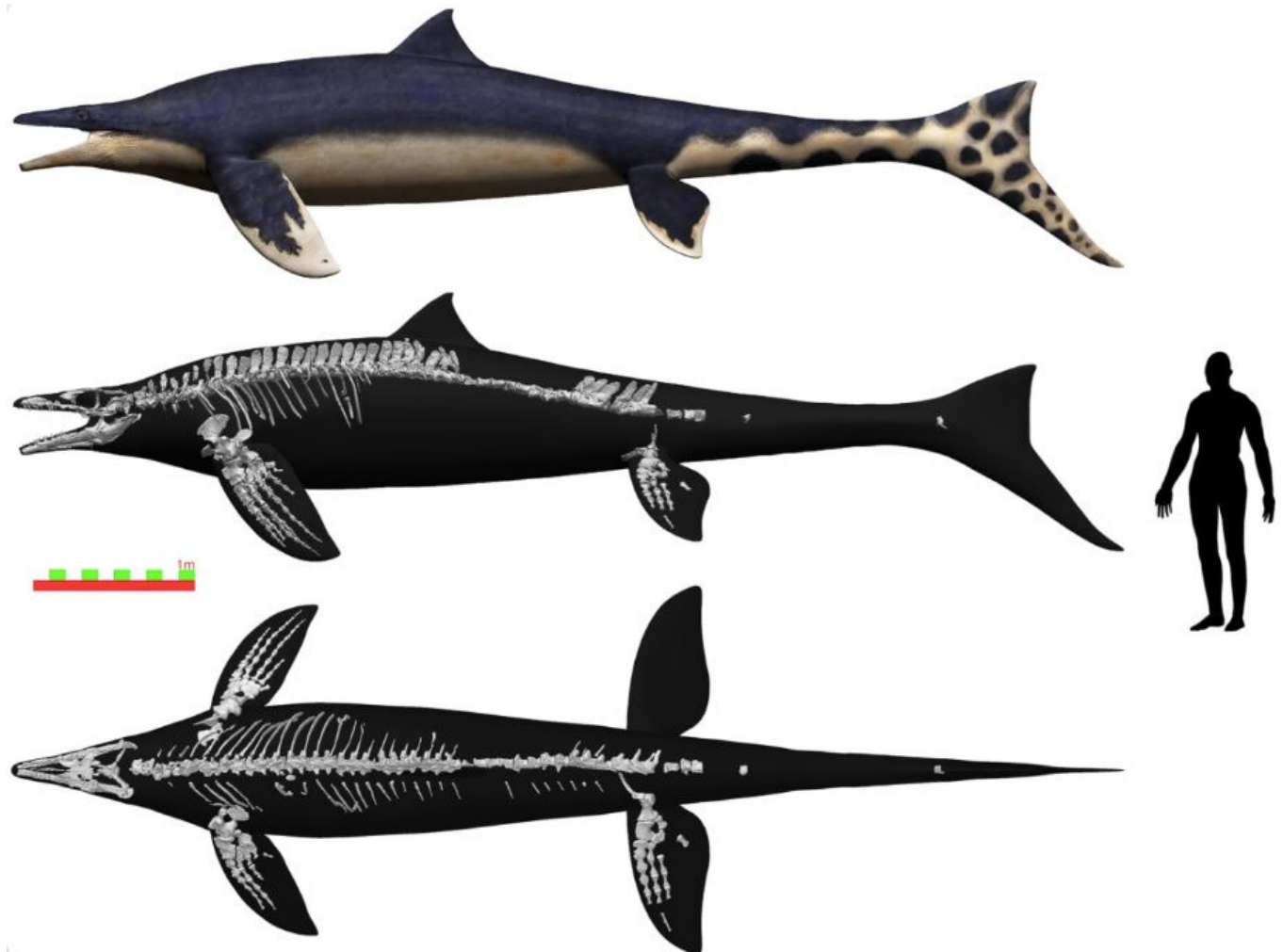
Researchers have described a Japanese mosasaur the size of a great white shark that terrorized Pacific seas 72 million years ago.

Extra-long rear flippers might have aided propulsion in concert with its long finned tail. And unlike other mosasaurs, or large extinct marine reptiles, it had a dorsal fin like a shark's that would have helped it turn quickly and with precision in the water.

University of Cincinnati Associate Professor Takuya Konishi and his international co-authors described the mosasaur and placed it in a taxonomic context in the *Journal of Systematic Palaeontology*.

The mosasaur was named for the place where it was found, Wakayama Prefecture. Researchers call it the Wakayama Soryu, which means blue dragon. Dragons are creatures of legend in Japanese folklore, Konishi said.

"In China, dragons make thunder and live in the sky. They became aquatic in Japanese mythology," he said.



The Wakayama Soryu was about the size of a great white shark and lived more than 72 million years ago during the age of *Tyrannosaurus rex* and other late-Cretaceous dinosaurs. Illustration/Takumi

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The specimen was discovered along the Aridagawa River in Wakayama by co-author Akihiro Misaki in 2006. Misaki was looking for fossils of invertebrates called ammonites when he found an intriguing dark fossil in the sandstone, Konishi said.



UC College of Arts and Sciences Associate Professor Takuya Konishi has studied mosasaurs for more than 15 years. Photo/Joseph Fuqua II/UC

Misaki continued looking for ammonites before curiosity got the better of him and he returned to the dark bone. Closer examination revealed it was a vertebra, part of a nearly complete mosasaur captured in the hard sandstone.

The specimen is the most complete skeleton of a mosasaur ever found in Japan or the northwestern Pacific, Konishi said.

“In this case, it was nearly the entire specimen, which was astounding,” Konishi said.

He has dedicated his career to studying these ancient marine reptiles. But the Japanese specimen has unique features that defies simple classification, he said. Its rear flippers are longer than its front ones. These enormous flippers are even longer than its crocodile-like head, which is unique among mosasaurs. “I thought I knew them quite well

by now,” Konishi said. “Immediately it was something I had never seen before.”

Mosasaurs were apex predators in prehistoric oceans from about 100 million years ago to 66 million years ago. They were contemporaries of Tyrannosaurus rex and other late Cretaceous dinosaurs that ruled the Earth. Mosasaurs were victims of the same mass extinction that killed off nearly all dinosaurs when an asteroid struck what is now the Gulf of Mexico.



A mosasaur analyzed by University of Cincinnati paleontologist Takuya Konishi had a dorsal fin like that of a great white shark that allowed it to maneuver with precision in the water. Photo/Grisha Shoolepoff

The Wakayama Soryu has some features similar to mosasaurs found in New Zealand and other features comparable to mosasaurs found in California, he said.

It had nearly binocular vision that would have made it a lethal hunter, he said.

Researchers placed the specimen in the subfamily Mososaurinae and named it Megapterygius wakayamaensis to recognize where it was found. Megapterygius means “large winged” in keeping with the mosasaur’s enormous flippers.

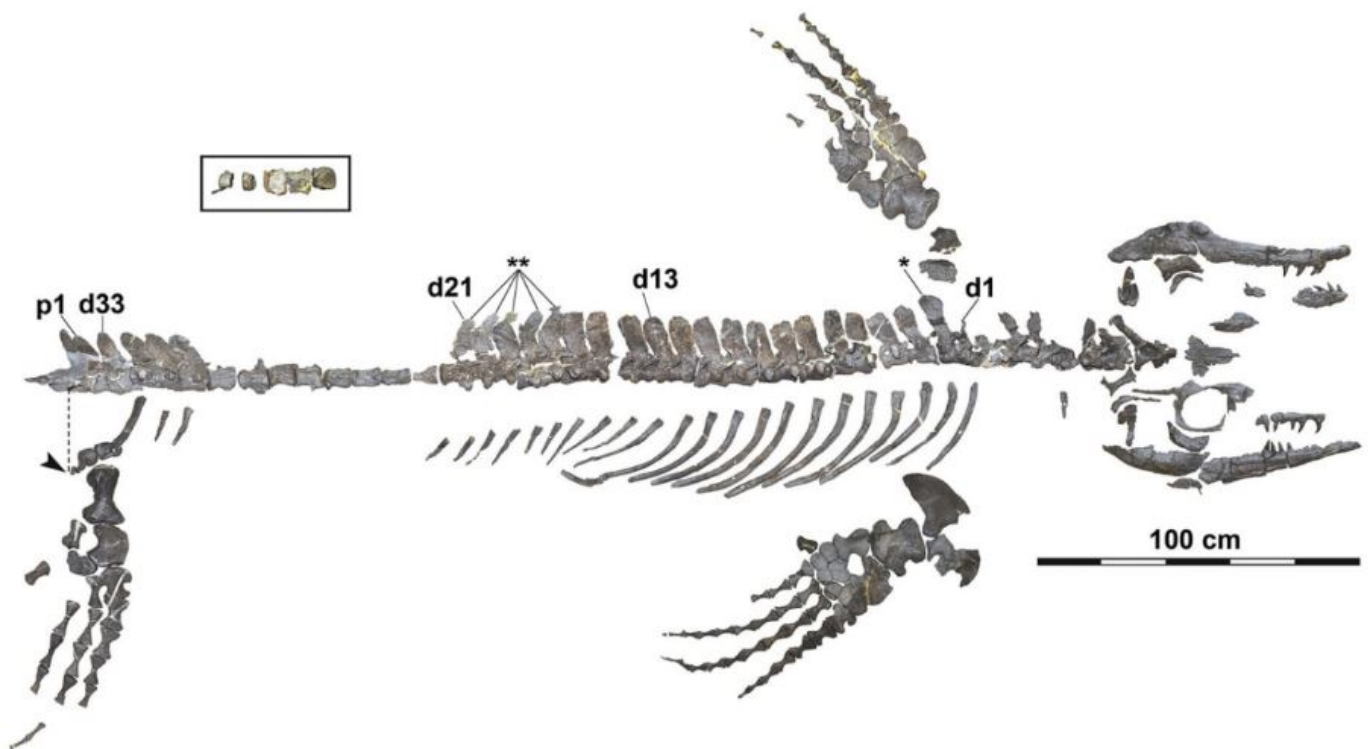
Konishi said those big paddle-shaped flippers might have been used for locomotion. But that type of swimming would be extraordinary not only among mosasaurs but among virtually all other animals.

Another prehistoric marine reptile called the plesiosaur used its paddle fins for propulsion, but it didn’t have a long rudderlike tail, he said.

“We lack any modern analog that has this kind of body morphology — from fish to penguins to sea turtles,” he said. “None has four large flippers they use in conjunction with a tail fin.”

Researchers speculated that the large front fins might have helped with rapid maneuvering while its large rear fins might have provided pitch to dive or surface. And presumably like other mosasaurs, its tail would have generated powerful and fast acceleration as it hunted fish.

“It’s a question just how all five of these hydrodynamic surfaces were used. Which were for steering? Which for propulsion?” he said. “It opens a whole can of worms that challenges our understanding of how mosasaurs swim.”



A mosasaur discovered in Japan was the most complete skeleton ever found in Japan or the northwestern Pacific.
Graphic/Takuya Konishi

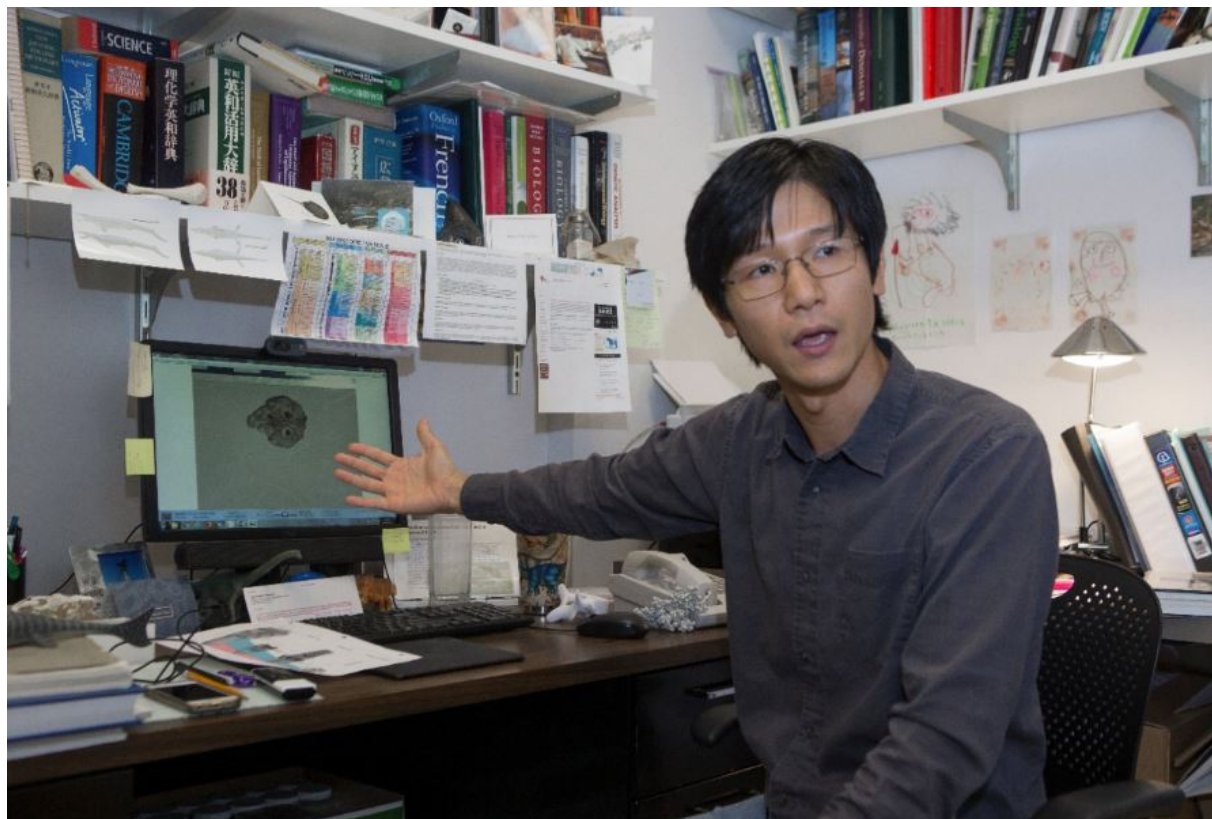
Unique to mosasaurs, the Wakayama Soryu apparently had a dorsal fin, based on the orientation of the neural spines along its vertebrae. The orientation of these spines is remarkably similar to that of a harbor porpoise, which also has a prominent dorsal fin, the study found.

“It’s still hypothetical and speculative to some extent, but that distinct change in neural spine orientation behind a presumed center of gravity is consistent with today’s toothed whales that have dorsal fins, like dolphins and porpoises,” he said.

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A team of researchers spent five years removing the surrounding matrix of sandstone from the fossils. They also took a cast of the mosasaur in place to provide a record of the skeletal orientation of the bones before they were excavated.

The preparation of the fossil was supported by grants from Japan's Ministry of Health, Labour and Welfare, and the National Sciences and Engineering Research Council of Canada, which helped researchers compare the newly described specimen with mosasaurs from around the world.



**UC Associate Professor Takuya Konishi is an expert on ancient marine reptiles such as mosasaurs.
Photo/Joseph Fuqua II/UC**

That giant extinct shark, Megalodon? Maybe it wasn't so mega

Article by Ari Daniel can be found here: <https://www.npr.org/2024/01/26/1226649080/that-giant-extinct-shark-megalodon-maybe-it-wasnt-so-mega>



Jack Cooper stands in front of a partially reconstructed Megalodon specimen at the Royal Belgian Institute for Natural Sciences (RBINS) in Brussels.

Julian K. Lubeek

The megalodon went extinct 3.6 million years ago, and is thought to be the largest shark that ever swam the Earth. But there's debate over what it looked like. Most scientists have described it as a bigger version of today's great white shark, a depiction that has informed its appearance on the silver screen like in the 2018 film "The Meg."

A research team now suggests the giant shark may have been more slender than scientists thought, according to a new publication in *Palaeontologia Electronica*. If that's true, it would alter our understanding of how it behaved in its ancient environment — and what mark it may have left on the ocean ecosystem of today.

"As one of the largest carnivores that ever existed," explains Kenshu Shimada, a paleobiologist at DePaul University, "deciphering the biology of Megalodon is critical to understand the role large carnivores play in the context of the evolution of marine ecosystems and how its extinction influenced the development of the present-day ocean."

A toothy question mark

Phillip Sternes grew up outside of Chicago. There wasn't a drop of salt water in sight. But he remembers he was five or six when he first encountered Megalodon in the movie "Jaws."

"I watched it over and over on a videotape countless times," he recalls. "There's actually a scene where Chief Brody's flipping through the book and then he sees a picture of the Megalodon."

Sternes began to devour books on sharks and he watched Shark Week religiously. It was only a matter of time before he became a shark researcher himself. He's currently a PhD student at the University of California, Riverside. When Sternes was getting into the field, he learned that what Megalodon looked like was an unresolved question. The problem was the lack of fossil evidence — just a smattering of scales and vertebrae, and tons of teeth. Nothing more.

"You literally will pick every single detail you can out from that limited fossil evidence to try to figure out what the heck did the shark look like," says Sternes.

For years, researchers assumed that Megalodon was just a bigger version of the modern-day great white — a predatory shark at the top of its food chain with large serrated triangular teeth.

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In the 1990s, a team calculated the relationship between the largest vertebra of a great white shark and its total length. "Basically, if you found a great white [shark's] vertebra," says Sternes, "you could plug it into that equation and you can predict the length of the shark just from the vertebra. Simple."

Researchers applied the same logic to a vertebra from the most complete Megalodon fossil there is. The result was that the specimen would have been some 30 feet — double or triple the length of a typical great white.

But then, a couple years ago, a different group lined those same vertebrae up to make a computer model of Megalodon. The spine alone measured about 36 feet and the animal some 52 feet.

Sternes and his colleagues smelled something... fishy.

"So I'm like, 'OK, there's a huge discrepancy going on right there,'" he says. "The spine is longer than what was originally predicted for the total length of the shark itself."

A great white shark is big and bulky, says Sternes. So if Megalodon were that long, he's doubtful its spine could have supported a great white's thicker body shape. "You got to think about swimming," he says, "structural support underwater, just maintaining the actual body shape, because everything rides on the spine."

Sternes and his colleagues concluded that Megalodon must have been more slender. This means it would have still been a fearsome predator, but it would have had a longer digestive canal and cruised more slowly "with occasional 'burst swimming' for capturing prey," says Shimada. That would have allowed the giant shark to process its food for a longer period of time and absorb additional nutrients.

Biting back

Jack Cooper says the new publication doesn't supply sufficient evidence to support a more svelte Megalodon. He's a graduate student in paleobiology at Swansea University in the UK. He's part of that other group that measured the spine and came up with the longer estimate of Megalodon's length.

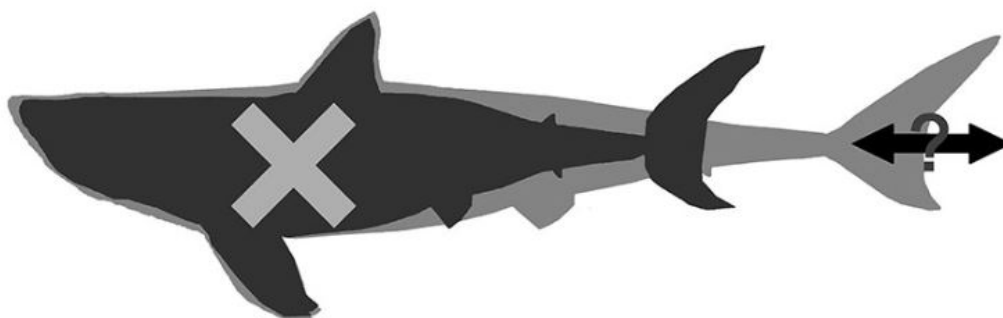
Cooper says the new publication presents an argument his group already considered. "It does reaffirm that we would need to find a complete skeleton to know for sure what Megalodon looks like," he says. "But if you're going to present an alternative hypothesis, you should use a lot of statistical work to try to make your case."

New fossils suggest kelp forests have swayed in the seas for at least 32 million years

Cooper agrees this is an important riddle to solve, once more fossil evidence becomes available. That's because Megalodon likely kept its most essential organs warmer than the surrounding seawater, which would have allowed it to swim further and faster.

Knowing its size and body shape tells us how much it likely had to eat to maintain such a lifestyle. "And that can tell us quite a lot about what made it vulnerable to extinction about 3 million years ago," says Cooper.

At the end of Megalodon's reign, sea levels were changing, ruining coastal habitats. This would have meant less food, possibly contributing to the giant shark's extinction. Cooper says the reasons behind Megalodon's vanishing could help us respond to the plight of today's sharks, many of which are endangered on a planet again in flux.



Previous and new schematic interpretations of †*Otodus megalodon* body form. A dark grey silhouette depicting the previously reconstructed †*O. megalodon* body form by Cooper et al. (2022) based on the extant white shark, superimposing a light grey outline showing the newly interpreted body form of †*O. megalodon* which is more elongated than the extant white shark. Note: it must be emphasized that this illustration should be strictly regarded as schematic as the exact extent of body elongation, the shape of the head, and the morphology and positions of the fins remain unknown based on the present fossil record.

2024 Membership Application - North Carolina Fossil Club



Name (1) _____ email _____

(Primary adult member -18 or older for Single/HH Membership)

Name (2) _____ email _____

(Secondary adult member - 18 or older for HH Memberships)

Address _____

City, State, ZIP _____

Phone (____) _____ - _____

First names of minor (<18) children: _____

Current members need to only complete name, any changes and sign the Liability Statement.

Select **One** Type of Membership

(Enclose check or money order

for the indicated amount.)

Individual (new) \$20.00

Individual (renewal) \$15.00

Household (new) \$25.00

Household (renewal) \$20.00

Children of NCFC members who are dependent minors (<18) and living at home may accompany parents on any trip *except those with specific age restrictions*.

Memberships are effective from January through December of the year (or portion of the year) of the date of application. For example, persons joining in August will need to renew their membership 5 months later in January.

The Fossil Club's newsletter, JANUS, is published four times a year and is available only online for members. You may read it online or download it from the website

NCFC Liability Statement

The Undersigned hereby acknowledges his/her understanding that fossil collecting is an inherently dangerous activity which can result in serious bodily injury or death, and/or property damage and hereby confirms his/her voluntary assumption of the risk of such injury, death or damage.

The Undersigned, in return for the privilege of attending field trips related to the collection of and/or study of fossils, or any other event or activity conducted or hosted by the North Carolina Fossil Club (NCFC), hereinafter collectively and individually referred to as "NCFC Events", hereby releases the NCFC, NCFC Members of the Board, NCFC Event leaders or organizers and hosts, landowners and mine or quarry operators from any and all liability claims resulting from injury to or death of the undersigned or his/her minor children or damage to his/her property resulting from any cause whatsoever related to participation in NCFC Events.

The Undersigned agrees to comply with any and all rules and restrictions which may be communicated to the undersigned by the NCFC Event leader and/or landowner and mine or quarry operator and acknowledges that failure to comply will result in immediate expulsion from the premises.

The Undersigned acknowledges that this release covers all NCFC Events and will remain in effect at all times unless or until it is revoked by written notice to the current President of the NCFC and receipt of such revocation is acknowledged.

The Undersigned further attests to his/her intent to be legally bound by affixing his/her signature to this release.

Name _____ Signature _____ Date _____

Name _____ Signature _____ Date _____

Privacy Policy: The NCFC collects contact information for purposes of contacting you regarding your membership, collecting trips you may have signed up for and for other members who may wish to contact you. Your contact information is also included on a membership list published on a secure location on the NCFC website and is available to other current NCFC members. If you do not wish for your contact information to be included on the published membership list, please send an email to membership@ncfossilclub.org with "membership list opt out" in the subject line. Please note while you will continue to receive information (electronic and paper) from the club; other members, including trip leaders may not have access to your contact information.

Mail To: North Carolina Fossil Club, P.O. Box 25276, Raleigh, NC 27611

NORTH CAROLINA FOSSIL CLUB, INC.

(Founded 1977)

Members of the Board

PRESIDENT	Terry Denny	(919) 779-9499	Garner, NC
VICE PRESIDENT	Linda McCall	(512) 422-2322	Reidsville, NC
IMMEDIATE PAST PRESIDENT	Ramona Krailler	(804) 704-9657	Durham, NC
TREASURER	David Sanderson	(919) 274-1254	Cary, NC
SECRETARY	Diane Willis	(919) 967-1008	Chapel Hill, NC
MEMBERSHIP CHAIR/WEBMASTER	Mike Bruff	(984) 212-6232	Clayton, NC
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	Emily Bruff Simpson (2025)	(xxx) xxx-xxx	xxxxxxx, NC
	Jim Tunney (2024)	(919) 319-1353	Cary, NC
	Judy Witowski-Argentine (2024)	(609) 234-6502	Raleigh, NC
GENERAL CONTACT	paleoNC@ncfossilclub.org		

NORTH CAROLINA FOSSIL CLUB

CODE OF ETHICS AND CONDUCT

1. Please conduct yourselves in a manner that best represents the NCFC.
2. Please make a sincere effort to keep informed of all laws, regulations and rules regarding collecting on private and public lands.
3. Never use the name of the Club to gain access to lands, or scientific sites actively under study by paleontological professionals for personal gain or profit.
4. Please act responsibly and safely on all club outings so as not to bring other members or yourself into harm or danger. Parents are responsible for their children and making sure their children follow all quarry, etc. rules. Firearms are prohibited from all Club functions.
5. Always respect and cooperate with the field trip leader or designated authorities in collecting areas. Do not bring along anyone not signed up for the trip, or any non-member to a trip without clearing it with the field-trip leader first.
6. Never collect a site immediately prior to a scheduled field trip thereby preventing fair collecting opportunities for the rest of the members of the Club. "Scouting" ahead of time by the field trip leader is fine.
7. You are encouraged to contact the appropriate professionals upon discovery of what you consider to be scientifically significant fossils. This includes excavation, preparation, and documentation of the fossils in question. You are encouraged to consider donating such fossils to appropriate facilities.