

Highlights

- **Large Crocodile Jaw Fragment From Calvert Cliffs**
- **Rare Cockleshell from the St. Marys Formation**

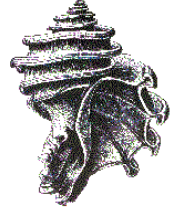
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The Newsletter of
Calvert Marine Museum
Fossil Club

Volume 20 • Number 2
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Whole Number 67

The ECPHORA



Upcoming Paleontology Public Lectures

Saturday, September 10th, **Dr. Patricia H. Kelley**, Professor of Geology, Department of Earth Sciences, University of North Carolina at Wilmington, will speak at 2:30 pm in the Museum's Auditorium on:

"The arms race from a snail's perspective: evolution of carnivorous moonsnails and their victims." ☞

Isabel's Gift...Opened

The newest exhibit at the Calvert Marine Museum, "**Isabel's Gift, A Fossil Whale from the St. Marys Formation**" opened on Saturday, June 11th. Be sure to see the beautiful whale skull, the associated fossils, the *Death Scene Investigation*, and our multimedia presentation! ☞

The Paleontology Portal has Arrived!

This award-winning Web site (<http://www.paleoportal.org/>) provides immediate access to paleontology in the United States through interactive geologic maps and time scales, an image gallery, distributed paleontological collections data searches, and more.

The Paleontology Portal is produced by the Society of Vertebrate Paleontology, the Paleontological Society, the U.S. Geological Survey, and the University of California Museum of Paleontology, in collaboration with the Paleontological Research Institute, the Fort Worth Museum of Science and History and the Denver Museum of Nature and Science, which serve as hubs for the project. The National Science Foundation under award no. 0234594 funds the project. ☞

250 Million-year-old Amphibians from the Sahara Desert.

Paul Murdoch sent in this link to a report of several new crocodile-like amphibians being found in Permian-age rocks from the Sahara Desert. Learn more at:

<http://dsc.discovery.com/news/afp/20050411/tetrapod.html> ☞

Crocodile Find from Calvert Cliffs

George F. Klein

Recently, **Bill Counterman** discovered fragments of a crocodile (*Gavialosuchus antiqua*) lower jaw along Calvert Cliffs. The re-assembled jaw section measures approximately 38 centimeters (15 inches) in length and has eight complete or partial tooth sockets (Figure 1). One socket has the root of a tooth still in place, whereas the other sockets are empty. The section is from the right side of the animal.



Figure 1: Photograph of the jaw section of CMM-V-3096.

Knowing of my interest in fossil crocodiles, Bill told me of the find and allowed me to photograph the specimen. Later, while reviewing my photos, it occurred to me that I might be able to estimate the overall size of the crocodile by using Figure 2 and some published body-length correlations based on living crocodilians.

In Figure 2 (Ref. 1), I've marked off, with the two-headed arrow, what I believe to be the length of Bill's find. The distance between the anterior-most and posterior-most preserved tooth sockets is approximately 25 cm (9.8 inches). Since Figure 2 is a drawing of a similar jaw of known length, I determined the overall length of the new partial lower jaw by scaling it to this drawing. The estimated length of Bill's crocodile lower jaw (to the

joint with the skull) would have been just over 86 cm or about 34 inches. This length is also approximately equal to the crocodile's overall skull length.

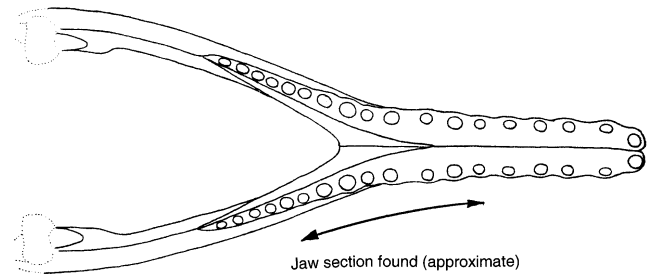


Figure 2: Drawing of the lower jaw of *Gavialosuchus*. The length of the arrow indicates that portion of the jaw that Bill found.

I'm sure many readers recall the spectacular find, dubbed "Supercroc", made by paleontologist **Paul Sereno** and his team while on an African expedition in 2000. They found the skull of this giant crocodile (*Sarcosuchus imperator*) in the country of Niger. (Note: *Sarcosuchus* is not a true modern crocodile but is very closely related. See Ref. 2). Paul and his lab estimated its overall length by taking skull and body measurements of today's Gaviel (*Gavialis gangeticus*) and Salt Water Crocodile (*Crocodylus porosus*), (Ref. 2). Then they established a correlation between skull length and overall body length, as shown in Figure 3.

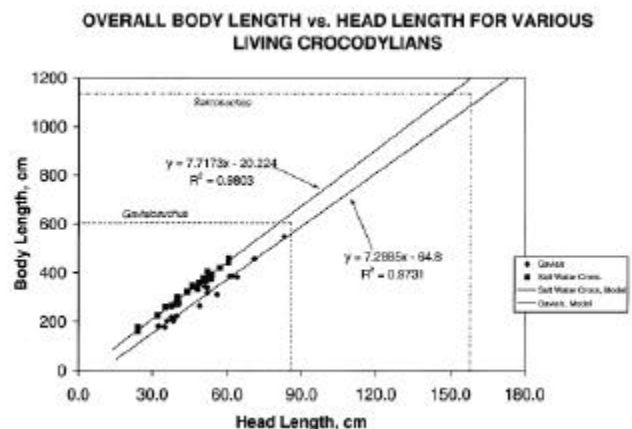


Figure 3

Sereno then assumed that the same correlation would hold true for *Sarcosuchus* and

estimated a body length from the length of the skull (i.e., they extrapolated).

In the world of crocodilian skulls and snouts, the living Alligator has perhaps the widest snout. Salt Water Crocodiles that live in the Pacific region including northern Australia have a narrower snout. Gavials, from India, have a very slender rostrum and feed primarily on fish (Figure 4 (Ref. 3)).

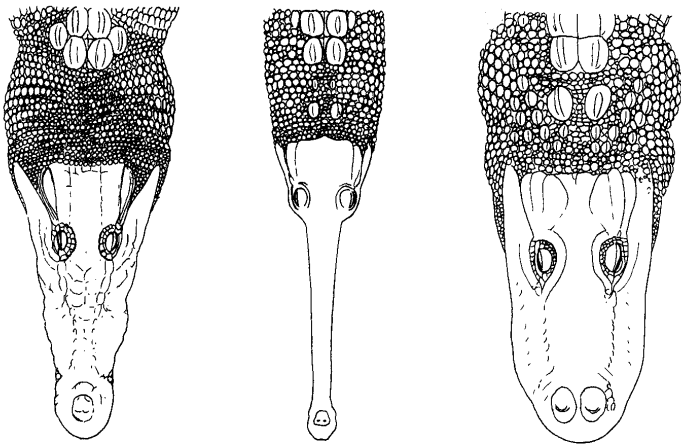


Figure 4: (L to R) Snouts of the Salt Water Croc, Gavial, and Alligator

Figure 3 is my re-plot of the data obtained by Paul Sereno. The data points shown represent actual skull and body length measurements of Gavials and Salt Water Crocs. The lines represent equations fitted to the data sets, the lower line for Gavials and the upper line for Salt Water Crocs. Because *Sarcosuchus* had a snout that was somewhat narrow, Sereno estimated its length as midway between a Salt Water Crocodile and a Gavial. The *Sarcosuchus* skull that he found was an amazing 160 cm (5'-3") long. Referring to Figure 3, the estimated overall body length for the "Supercroc" would have been about 11.65 meters or 38.3 feet!

This technique to estimate body length will also work on the *Gavialosuchus* jaw section that Bill found. *Gavialosuchus* had a relatively narrow skull, narrower than that of a Salt Water Crocodile but definitely not as slender as a Gavial's. Referring once again to Figure 3, a skull length of about 86 cm would correlate to a crocodile with an overall body length of about 606 cm or 20 feet! This almost certainly exceeds the size of any crocodile alive today.

Weight estimates are somewhat more difficult, but there is some data shown in Ref. 3, for Salt Water Crocodiles. Using Microsoft Excel®, I re-plotted the data as specified by the following equation:

$$W = 8.7463 \times 10^{-7} L^{3.25}$$

Where W is the crocodile's weight in kg, and L is its length in cm. Note that L is raised to the power 3.25. In estimating the weights of living animals, the correlations that scientists develop must include a dimension of the animal, usually length, raised to approximately a power of 3, i.e., a "cubic function". This is because the volume of an animal is a function of three dimensions - length, width, and height and the weight of an animal is proportionate to its volume. The slight difference (3.25 vs. 3) for the exponents may be due to errors present in the length and weight measurements.

Solving the above equations gives a body weight for Bill's crocodile of 937 kg or 2065 lbs: slightly over a ton.

In a previous article in *The Ecphora* (October 2004), I mentioned that the largest *Gavialosuchus* skull found was from a phosphate mine in Florida and measured 4'-4" (132 cm) in length. Repeating the calculations above indicates that this animal was about 31 feet or 9.5 meters long and weighed 8800 pounds or 4.4 US tons!

Maryland fossil hunters should feel proud of *Gavialosuchus*, the state's own "Supercroc".

Finally, congratulations to Bill on a terrific find!

References

- (1) Auffenberg, W. "Additional Specimens of *Gavialosuchus Americanus* (Sellards) From a New Locality in Florida" *The Quarterly Journal of the Florida Academy of Sciences* Vol. 17, No. 4 p.185 (Dec. 1954).
- (2) Sereno, P, et al "The Giant Crocodyliform *Sarcosuchus* from the Cretaceous of Africa" *Science* Vol. 294, p. 1516 (16Nov2001).
- (3) Crocodiles Inside Out: A Guide to the Crocodilians and the Functional Morphology by: Richardson, K.C. and G.J.W. Webb, S.C. Manolis Surrey, Beatty and Sons (2002). ☒

Editor's Comment: **Stephen Godfrey** carved the missing bones for **Paul Sereno's** "SuperCroc" *Sarcosuchus imperator*. Read an interview with the Skeleton Carver at:

<http://www.supercroc.com/features.htm>

Fascinating Fossil Finds

Giant Thresher Shark, *Alopias grandis* (Leriche, 1942) From Calvert Cliffs

Thresher sharks (family Alopiidae) are immediately recognizable because they sport a tail with an incredibly long dorsal lobe (Figure 1).



Figure 1. Thresher shark. Notice the very long dorsal lobe of the tail fin. By Jolene Schafer © CMM 2005.

Recently, **Dr. Robert Hazen** donated a superb *Alopias grandis* tooth, found as float, to our permanent collection (Figure 2). That this rare tooth originated from within Calvert Cliffs is not in doubt, what remains unresolved is what exactly is *Alopias grandis*? Is it a valid species of extinct thresher shark, or are these large highly asymmetrical teeth just transitional or lateral mako teeth?

Kent (1994) doubted that this kind of tooth was even alopiid. He argued that they are simply upper lateral teeth of the mako shark, *Isurus hastalis*. **Bill Heim** and **Jim Bourdon** at www.Elasmo.com illustrate several *A. grandis* teeth but refrain from taking sides in the debate, claiming that not enough teeth have been found to resolve the matter.

It is my understanding that **Dr. Bretton Kent** is revisiting the identity of the tooth bearer. His in-depth study of this kind of shark tooth will shed badly needed light on these rare sharks.

Reference

Kent, B. W. 1994. *Fossil Sharks of the Chesapeake Region*. Egan Rees & Boyer, Maryland. 146 pp



Figure 2. **Dr. Robert Hazen** donated this lovely *Alopias grandis* tooth. It measures 4.5 cm diagonally. This tooth does not have serrations or the ginzu-like shoulder design seen in some specimens like one figured at www.Elasmo.com. Scale bar is in centimeters. Scanned by S. Godfrey.

Stephen Godfrey ☞

Tentaculites from New York State



Tentaculites collected from the Gallupville area,
New York State. Photo by Grenda Denis. ☞

An Unusual Cockleshell from the St. Marys Formation

As **Flo Streaan** was preparing the large and well-preserved scapula that was collected with a cetothere whale skull from the St. Marys Formation, she unearthed the partial bivalve shell seen in Figures 1 & 2.

The shell (a single valve) caught the eye of **Pat Fink** (CMM Collections Manager) because it did not match any of the known clams from Zone 24 of the St. Marys Formation. (Some of the molluscan diversity from this horizon is on display as part of the new paleontology exhibit entitled “**Isabel’s Gift, A Fossil Whale from the St. Marys Formation.**”)

This cockleshell (CMM-I-3167) most closely resembles *Planicardium* (*Cerastoderma*) *virginianum* (Conrad, 1839) a cardiid (Cardiidae: cockles and giant clams) from the Pliocene, Yorktown Formation, of Virginia and North Carolina (Gardner, 1943). The asymmetrical (rhomboidal in outline) shell displays at least 13 very low, broad, flat-topped ribs, each of which is finely striated.



Figure 1. CMM-I-3167 exterior view of a right valve of *Planicardium* sp. from Zone 24, Windmill Point

Member of the St. Marys Formation. Scale is in centimeters. Scan by S. Godfrey.



Figure 2. CMM-I-3167 interior view of a right valve of *Planicardium* sp. from Zone 24, Windmill Point Member of the St. Marys Formation. Scale is in centimeters. Scan by S. Godfrey.



Planicardium (*Cerastoderma*) *virginianum* (Conrad, 1839), (Schneider, 2002). Exterior of holotype, a right valve from the James River near Smithfield,

Va.; "length about 4 inches." (After Conrad. Scanned from Gardner (1943)).

Planicardium virginianum (Conrad, 1839) differs from CMM-I-3167 in that it displays 26 broad, flat-topped ribs, twice the number seen in the St. Marys form! In this St. Marys cockle, both the ribs and interstices (grooves between the prominent ribs) are wider than in the Yorktown Formation *Planicardium*.

Notice that some of the shell's original color-banding pattern seems to be preserved (Figure 1)!

Many thanks to Pat Fink for bringing this lovely cockleshell to my attention!

References

Gardner, J. 1943. Mollusca from the Miocene and Lower Pliocene of Virginia and North Carolina. Part 1. Pelecypoda. United States Department of the Interior, Geological Survey, Professional Paper 199-A, 310 pp.

Schneider, J.A. 2002. Phylogeny of cardiid bivalves (cockles and giant clams): revision of the Cardiinae and the importance of fossils in explaining disjunct biogeographical distributions. *Zoological Journal of the Linnean Society* **136** (3): 321-369.

Stephen Godfrey ☼

Late Miocene Fossils from the Western Region of Abu Dhabi.

<http://www.adias-uae.com/fossils.html>

At this website view photos from an exhibition of Late Miocene Fossils from the Western Region of Abu Dhabi. There are plenty of terrestrial mammals including a few oddball antelopes, three-toed horses, and the lower jaw of an extinct four-tusked elephant, *Stegotetrabelodon*. There are also some nice photos of footprints, tusks, ribs, and skull fragments.

Club website: <http://www.calvertmarinemuseum.com/cmmfc/index.html> Club email: CMMFossilclub@hotmail.com

This Miocene-related link was sent in by **Bruce Hargreaves**. ☼

Well-Preserved Dolphin Skull from the Calvert Formation



CMMFC member and prep lab volunteer, **John Nance**, holds the jacketed skull and lower jaws of a dolphin (CMM-V-2279) from Calvert Cliffs. John prepared this specimen from Zone 14 of the Calvert Formation. The skull and jaws are seen here in ventral view. Notice that the lower jaw has shifted off to the right side of the skull. The skull was collected by **B. Counterman, S. Godfrey, P. Murdoch** and **S. Werts** in 2002. Photo by S. Godfrey. ☼

Shark Attack in South Africa, Lucky Surfer Survives!

<http://abcnews.go.com/International/wireStory?id=627014> ☞

Fossil Collecting in New York State

The June trip to the Albany area afforded me the opportunity to collect in my beloved home state in an area where I had lived plus the chance to go on a two-day adventure with one of my oldest and dearest friends from first grade. This year we celebrate a 54-year-old friendship.

More importantly, we were in the company of some wonderfully interesting people and three very well mannered and helpful young men. Our leader, **Dick Staley**, delivered what he had promised. We were treated to the magnificence of John Boyd Thatcher Park, tufa in Ilion Gorge, the long deserted Chenango Canal, natural potholes and awesome collecting sites. Thank you, **Dick Staley** and to the group---thank you one-and-all for a wonderful weekend.



Figure 1. John Boyd Thatcher Park. Haile's cavern and the overhang are at Minelot Falls. The Lower Bear Path on which we had been walking is the remains of the Indian Ladder Sandstones and Brayman Shale, which are Upper Ordovician and Upper Silurian, respectively. The undercut has been

formed due to the very soft nature of the Rondout dolostone and waterlime (Upper Silurian). Above the undercut are the Manlius and Coeymans Limestones, which are Upper Silurian and Upper Devonian, respectively. Fossil representation in the various beds is as follows: Indian Ladder Sandstone: bryozoans, brachiopods, and trilobites. Photo by Grenda Dennis.



Figure 2. John Boyd Thatcher Park. Photo by Grenda Dennis.



Figure 3. John Boyd Thatcher Park. Photo by Grenda Dennis.

Grenda Dennis ☞

CMMFC Members Enjoy Fossil Festival and PCS Mine Trip

Several CMMFC members attended this year's **Aurora Fossil Days Festival** held over Memorial Day weekend in Aurora, N.C.

Bruce and **Marilyn Hargreaves** manned an information table containing Calvert Marine Museum brochures, fossil club membership applications, plus two small display cases containing examples of **Paul Murdoch's** Calvert Cliffs fossil collection. (Thanks Paul!) Bruce estimates that about 30 people visited the modest display (including **Pat Fink** who stopped by with hubby. Nice to meet you!).

The CMMFC representatives joined several other fossil clubs and organizations from throughout the country including the Smithsonian Institution, Virginia Museum of Natural History, American Fossil Federation, Special Friends of Aurora the Aurora Fossil Museum, The Aurora Fossil Club, and the NC Fossil Club - to name a few.

As in previous years, the downtown area projected a festive carnival atmosphere replete with "tooth booths," funnel cake campers, and various trinket and gizmo hawkers. One organization erected a 20-foot replica of a relative of the famous Cretaceous theropod, *Tyrannosaurus rex*, inside a large tent and surrounded it with authentic looking Cretaceous plants and shrubs.

Beginning Saturday afternoon, the museum auctioned off more than 290 items, including fossil teeth, jaw sections and complete skeletons of marine and terrestrial mammals, fish, plants, and etc. The event generated more than \$21,000 for the museum. As always, the megs commanded top price. One 6-inch unrestored specimen sold for close to \$600. A complete stingray fossil in pristine condition sold for \$1,500. Several items went for bargain rates, including a beautiful sea scorpion with both claws intact that sold for \$400. (The auctioneer said that it should have sold for \$900.)

On Sunday, the volunteers were rewarded with an exclusive "hunt" in the PCS phosphate mine. About 65 men and women crammed into two buses and headed out to an area of the pit where, under bright sun and the usual scorching reflective heat,

Club website: <http://www.calvertmarinemuseum.com/cmmfc/index.html> Club email: CMMFossilclub@hotmail.com

they "pounded the Pungo" until 3 p.m. Many people came home happy. One woman found a 3 1/2 mako, said to be the largest ever found there. Another man found a nice *Paratodus benedeni*. Those who hunted near the back of the pit found some nice size megs, including one individual who found three 5-inch anterior uppers, beautiful specimens indeed! **Bruce Hargreaves** finally was rewarded with a 4-inch lower anterior, plus a super *C. chubutensis* and a nice *C. auriculatus*. **Paul Murdoch** found a dinged 2.75" *C. chubutensis*, a 1.5" *C. chubutensis* just missing the very tip, a partial *Squalodon* incisor, a pathological double tipped dusky, a ray scute, two 2" makos, a huge *G. cuvier*, and a bunch of the usual suspects. He also trudged out a bucket of porpoise vertebrae for the kids to "rediscover" this summer.

Bruce Hargreaves ✉

Monterey Aquarium Releases Great White Shark

<http://abcnews.go.com/Technology/wireStory?id=632252>

Paul Murdoch sent in both this and the following links. Many thanks once again! ✉

Captive Great White Kills Tank Mates

<http://dsc.discovery.com/news/briefs/20050307/shark.html> ✉

UPCOMING FIELD TRIPS AND EVENTS

Saturday, July 9th: SharkFest at the Calvert Marine Museum. Help is welcome as usual. Call Stephen @ 410 326-2042 ext. 28

Saturday, September 10th: Free Public Lecture by **Dr. Patricia H. Kelley**, Professor of Geology, Department of Earth Sciences, University of North Carolina at Wilmington, will speak at 2:30 pm in the Museum's Auditorium on: "**The arms race from a**

snail's perspective: evolution of carnivorous
moonsnails and their victims." ✕

CALVERT MARINE MUSEUM FOSSIL CLUB MINUTES

From the April 23, 2005, Meeting

The spring meeting of the CMM Fossil Club was held Saturday, April 23, 2005.

President **Grenda Dennis** called the meeting to order at 12:45 p.m.

Kathy Young gave the treasurers report. She got data from **Gale Parks**, the museum's account clerk. The club has a balance of \$4,375.95 as of February.

Pam Platt gave membership information. The club now has 7 new members, 20 life members, 85 regular members, and *The Ecphora* is sent to 107 addresses.

Kathy Young gave field trip information. Call her if you want to go to Lee Creek. Some slots may have recently opened. Details of the New York trip will be in the next *Ecphora*.

Paul Murdoch reminded all of the Aurora Fossil Festival and Auction on May 28. He asked if anyone could display fossils there to represent our club. Exhibitors get a special Sunday trip to the mine. This year marks the 125th anniversary of the town of Aurora, so there will be a big celebration.

Stephen Godfrey announced that the St. Marys Formation whale skull exhibit entitled "**Isabel's Gift**" would open on June 11, 2005. Everyone present was invited to see how the skull was being prepared for display.

Grenda Dennis reminded everyone that 2006 would mark the 25th anniversary of our club. **Kathy Young** asked that we look for old photos of club members and back issues of *The Ecphora* so copies of these could be made available at our celebration.

Grenda Dennis announced that the nominating committee recommended the following slate of club officers and volunteers:

Bruce Hargreaves for President

Kathy Young for Vice President

Grenda Dennis for Treasurer

Flo Streaan for Secretary

Club website: <http://www.calvertmarinemuseum.com/cmmfc/index.html> Club email:
CMMFossilclub@hotmail.com

Pam Platt for Membership

Stephen Godfrey will continue as Editor of *The Ecphora*.

Bruce Hargreaves had a 5' baleen whale lower jaw in his trunk and all were invited to view it.

Most stayed to attend the Public Lecture on Fossil Beaked Whales from Calvert Cliffs by **Anna Fuller**.

Minutes submitted by **Flo Streaan**. ✕

Possible Great White Shark Attack in New Jersey!

New Jersey's a dangerous place...if the chemicals don't get you, the sharks will. Read about a surfer that appears to have been bitten by a small great white shark:

http://abclocal.go.com/wpvi/news/06082005_animal_njshark.html

Paul Murdoch sent in this tid-bit for our enlightenment. Many thanks! ✕

Bryozoans from New York State



Bryozoans collected from New York State. Photo by Grenda Denis. ✕

Editor's Column

On behalf of every member, I would like to thank our outgoing Officers for their service to the club! We are also delighted with those who were elected to be our Fossil Club's fearless new leaders.

Many thanks to those who contributed to this issue, including **Bill Counterman** for helpful content and editorial comments, and **Paul Murdoch** for his most helpful logistic support.

CMMFC
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2005 Elected Officers & Volunteers*	Names	Email
President	Bruce Hargreaves	mooseman65@erols.com
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Treasurer	Grenda Dennis	venusdolni@earthlink.net
Secretary	Flo Strean	N/A
Membership Chairperson	Pam Platt	platt@umbc.edu
Editor*	Stephen Godfrey	Godfresj@co.cal.md.us
Fall Trip Leader*	Kathy Young	k.a.y@erols.com
Spring Trip Leader*	Robert Ertman	Robert.Ertman@usda.gov

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