

M.A.P.S *Digest*

Official Publication of
Mid-America Paleontology Society
<http://www.midamericapaleo.org>

Volume 42, Number 1
Jan.-Mar., 2019



“A LOVE OF FOSSILS BRINGS US TOGETHER”

Calendar

2019

January 12

The January MAPS meeting will be held in Room 125 of Trowbridge Hall, Univ. of Iowa. MAPS member John Catalani will present the program: "Ordovician Nautiloid Faunas of Laurentia" at 1:00 p.m. The regular MAPS meeting will be at 2:00 p.m.

March 23-24

CVRMS Gem, Mineral, and Fossil Show combined with the MWF and AFMS Shows.

Hours: Sat.: 8:30 am-6:00 pm;
Sun.: 9:30 am-5:00 pm.

Theme: Geodes

Location: Hawkeye Downs, Cedar Rapids

March 29-31

MAPS EXPO XLI

Location: Sharpless Auctions
Exit 249 I-80
Iowa City, Iowa

Theme: Trilobites

Keynote Speaker: Dr. Jonathan Adrain

Topic: TBD

Contributions to Digest Needed

The Digest editors encourage the members to submit articles for publication in the Digest issues. The Digest is for the members and should reflect their interests. If you have specimens that you collected and would like to share with other members or would like to describe a favorite collecting site, please write an article in Word, Times New Roman size 12 font, single spaced with one inch margins, and send to the editors. Photos and diagrams can be e-mailed separately or incorporated in the article.

John: Fossilnautiloid@aol.com

Chris: CDCozart@aol.com

Call for Papers

The theme for the **2019 EXPO** is the **Trilobites**. Any paper dealing with trilobite biology, evolution, taxonomy, or site-specific paleontology would be appreciated. The papers should be in Word, Times New Roman, size 12 Font, single spaced with one inch margins, and e-mailed to one of the Digest Editors by the **first week of February 2019**. Diagrams/Photos can be sent separately or imbedded in text.

John: Fossilnautiloid@aol.com

Chris: CDCozart@aol.com

DUES INFO

Please send your \$20 2019 MAPS dues to:

Dale Stout
2237 Meadowbrook Drive S.E.
Cedar Rapids, Iowa 52403

About the Cover

Mosasaur discovered in the Cretaceous Niobrara Chalk by MAPS member Tom Williams while on a PaleoProspectors Trip near Chadron, Nebraska. The fossil was subsequently excavated and prepared by Steve Nicklas of PaleoProspectors. See Tom's Mosasaur article this issue.

**Mid-America Paleontology Society Board Meeting
April 6th, 2018. MAPS Expo, Sharpless Auctions, Iowa City**

Board Members present: Marv Houg, Dale Stout, Jim Preslicka, Doug DeRosear, Chris Cozart, Bob Rondinelli, Tom Williams, John Catalani, Karl Stuekerjuergen, Tiffany Adrain (scribe).

Marv called the meeting to order at 1.35 pm.

Minutes from the January 2018 meeting were circulated. John moved to approve the minutes, Chris seconded. Minutes were approved.

Treasurer's Report. Jim has paid Sharpless and Bill Desmarais (security), and still needs to pay AJ for security. Digest and Expo cards are paid for, table fees have been deposited. As the written report was not available at the time, Chris moved to incorporate it into the meeting records later. Marv seconded. Motion carried.

MAPS Charitable Status: Bob reported on his research into 501(c)(3) status. MAPS used to be 501(c)(4), but 501(c)(3) is better because charitable donations to MAPS are then tax-deductible. Bob has talked to an attorney (at personal cost) to determine the necessary procedure (file for 501(c)(3) status with online form 1013-EZ. Bob suggested a subcommittee compile information. Tiffany, Dale and Bob agreed to form the subcommittee. Marv moved to accept, Tom seconded. Approved. Karl noted that annual reports must be submitted and someone should be appointed to be responsible for that. Chris noted that annual reporting should be minimal.

Old Business: none

New Business:

Doug commented that there were no MAPS Expo signs outside Sharpless. Dale explained it was too windy but he attached the sign to his car.

Karl reported that the motel vendors had asked if Expo could be at the Clarion. Marv replied that we have discussed this before and there are many potential problems: conflation of the motel show and Expo, smaller room size (vendors would have to be distributed through several rooms) and dim lighting. Karl requested that these issues be explored and a quote obtained.

Marv asked if there were any items for the AGM: none.

Marv motioned to adjourn the meeting, Karl seconded. Meeting adjourned 1.53pm.

**Mid-America Paleontology Society Board Meeting
October 14, 2018, Klein Quarry Field Trip**

Board Members present: Marv Houg (scribe), Dale Stout, Jim Preslicka, John Catalani, Tom Williams, and Chris Cozart

Marv called the meeting to order about 12:35 pm.

Minutes from the April 6, 2018 meeting at Sharpless Auction were distributed. Chris moved to accept minutes, John seconded. Minutes were approved.

No treasurer's report was distributed.

John noted that there would be no September/October Digest due to the lack of material to put in a

Digest. The next Digest will be the November/December Digest which will include the registration material. He requested that everyone look over last year's November/December Digest to see if anyone had any suggested changes.

Show related items:

John suggested getting the group "My Fossils" involved with the show, possibly with a booth.

There was some discussion on the whether we need to raise the table fees for this year. It was decided to leave them the same as this year.

For show advertising it was noted that we need to make sure that our Facebook page is up to date. May need to talk to Zach to see what needs to be done. Apparently, he is very busy so may need to find someone else to help with this. Need to look at other Social Media sites to help pass the word about MAPS and the EXPO show.

There was some discussion about moving the show to the Clarion to tie into the motel show. From the discussion it appeared that there was a strong opinion to stay at Sharpless (my editorial take on the discussion). Chris made a motion to end discussion and stay at Sharpless. Jim seconded and the motion was unanimously approved.

We discussed articles for the EXPO Digest which is on trilobites. Possible authors would be Jonathan Adrain, Bill Hickerson, Dan Cooper, Al Scheer, Dennis Kolata (sp?), Markus (sp?). Need to contact these people and find more authors.

The question was raised as to the status of the application for 501(c)(3). Marv reported that he had talked to Bob and that we were planning on meeting on Saturday Nov 10 ahead of our regular MAPS meeting with Bob, Tiffany, Dale, Jim, and Marv in attendance.

Jim made a motion to adjourn and Tom seconded. Meeting adjourned at 1:10 pm.

**Mid-America Paleontology Society Board Meeting
November 10th, 2018. Room 125 Trowbridge Hall, Iowa City**

Board Members present: Marv Houg, Dale Stout, Jim Preslicka, Doug DeRosear, Bob Rondinelli, Gil Norris, Karl Stuekerjuergen, Tiffany Adrain (scribe).

Matt Hill, Iowa State University, presented a program: "An update on Iowa's Ice Age Bestiary: Stag-moose, Muskoxen, and Caribou."

Marv called the meeting to order at 2.35pm, and circulated the agenda.

Minutes from the October 2018 meeting were circulated. Karl moved to approve the minutes, Gil seconded. Minutes were approved.

Treasurer's Report. Jim read the report. The deposit for Sharpless will be the next expense. Doug motioned to approve the report. Bob seconded. Report approved.

Marv noted the Jen is no longer at Allegra and warned Jim to be prepared to deal with new staff. Jim said he may work with the new branch in Coralville in that case.

Expo registration info: John emailed the draft Digest for information. Doug suggested updating Tom's address.

Speakers: Tiffany will get keynote talk title and article from Jonathan Adrain, and suggested asking Tom Hegna to do a day program. Other suggestions for day speakers included Bill Hickerson, Andy Secher (New York, has catalogued his collection of trilobites online). Everyone think of articles and programs.

Advertising: the newspaper ad is expensive, so please use social media, which is probably more effective now anyway.

Tiffany suggested tabling at Coralville Winterfest on January 7 to advertise Expo (but will give out cards there anyway).

Tiffany will provide a display of trilobites and other fossils at Expo.

Marv will have Sharon update the Expo flyer.

Dale will do the news release. Please send any speaker/program info to him.

2019 awards: call Marv to nominate.

Bill and AJ will be doing show security again.

No comments from last year's show that need to be dealt with, specifically.

The Live Auction will be held on Saturday March 30th at the Clarion at 5.30pm. This is a change from the usual venue for it. If this doesn't work, we will try out an earlier spot at the show the year after.

Election of officers:

Nominating Committee: Dale, Tiffany, Jim

Officers:

President: Marv Houg

Past President: Gil Norris

Treasurer: Jim Preslicka

Secretary: Tiffany Adrain

Director: Doug DeRosear (2021)

Dale motioned to accept the officers, Jim seconded. Officers unanimously accepted.

Bob reported on the proposed 501(c)3 status. Marv, Dale, Tiffany and Jim met with Bob previously to complete the required application form. Bob requested to spend approximately \$275 to cover fees for submitting the tax status application. Karl seconded. Motion carried. Bob was designated to sign the form, Karl is the contact.

Karl motioned to adjourn the meeting, Jim seconded. Meeting adjourned 3.20pm.

Mosasaurus

Tom Williams

Mosasaurus are aquatic reptiles related to monitor lizards and snakes. The word mosasaur means Meuse River Lizard which was found in a mine near Maastricht Netherlands in 1764 collected by Lt. Jean Baptiste Drouin 1766. Originally there was a lot of speculation as to what these creatures were ranging from crocodiles to giant fish. In 1794 Napoleon's Army captured the fossil as a prize for the French National Museum. Baron Cuvier 1808 wrote about "le grand animal fossil de Maastricht" with other scientists conferring this animal was related to monitor lizards. W.D. Conybeare fourteen years later coined the name *Mosasaurus*. Remains now began showing up in other parts of the world including Britain, North America and New Zealand. Lewis and Clark's expedition 1804-1806 found remains of 45 foot creature seen in Sioux Country. Fragment remains were sent back to Washington but were lost. But the descriptions recorded in journals from September 1804 most certainly described a Mosasaur.



Original mosasaur specimen collected in a mine near Maastricht Netherlands in 1764.

Thirty years later another was found in the same area along the Missouri River of South Dakota with a complete skull including vertebrae and limb material. This specimen eventually was acquired and sent to Bonn Germany where Dr Goldfuss named it *Mosasaurus maximiliana*. Professional Paper "Der Schadelbau des *Mosasaurus*" published in 1845 described the skull missing the maxilla later turned up and was originally described as part of an ichthyosaur. Soon after the race was on as Marsh, Cope, and Charles Sternberg made extensive finds from 1869 into the 1870's. Remains were soon discovered and identified in the United States from New Jersey to California and Texas to North Dakota. Mosasaurus have been found in nearly every Late Cretaceous marine sediment world-wide. Most numbers and some of the best preserved occurred in Kansas which was part of the Pierre Seaway of the Late Cretaceous. Discoveries showed that they preferred shallow, near costal environments. They could, however, migrate and live in open, deepwater ocean environments. Mosasaurus were quite capable of living hundreds of miles from land as shown by finds in Kansas in the Niobrara chalk. In the Late Cretaceous Mosasaurus were adapting to living in estuarine and fresh water environments.



Pierre Seaway 100-90 million years ago.

The Pierre seaway was a vast inland sea, as large as today's Mediterranean Sea, which lasted for approximately 70 million years. Climate during this time was warm as there were no polar ice caps present with the entire planet 60-70% covered by water. Deposits of chalk hundreds of feet thick were deposited in seas 600 or more feet deep. The sea was relatively flat bottomed. As the Pierre Seaway split North America in half, it created lots of coastline and estuaries perfect for Mosasaur hunting grounds.

Ideas about what are Mosasaurs included early speculations that they were dragons, fish, or crocodile type creatures. Actually they are reptiles, Order Squamata, related to lizards and snakes. Their closest living relative is the Komodo Dragon with some similarities to pythons shown in the tooth structure. *Dallasaurus*, an Aigialosauridae (aigilos meaning seashore, saurus meaning lizard) thought to be the original ancestor, is a varanoid similar to monitor lizards and iguanas today.

Genera of Mosasaurs include: *Halisaurus*, *Clidastes*, *Globidens*, *Mosasaurus*, *Platecarpus*, *Ectenosaurus*, *Plioplatecarpus*, *Prognathodon*, and *Tylosaurus*. Mosasaurs range in size from 6 feet to 50 feet possibly larger. Mosasaurs, especially the Tylosaurs, were top predators of the Late Cretaceous seas. Mosasaurs were originally near shore dwelling lizards 3 to 4 feet in length, which probably began diving into the water to escape becoming lunch from dinosaurs. In a geologic short time, maybe five or so million years, they developed into the Cretaceous top marine predator. Their reign was brief existing for about 25 million years when they became extinct at the end of the Cretaceous. Cause of the extinction of these creatures could be the asteroid impact is a probable cause, with other factors possible.



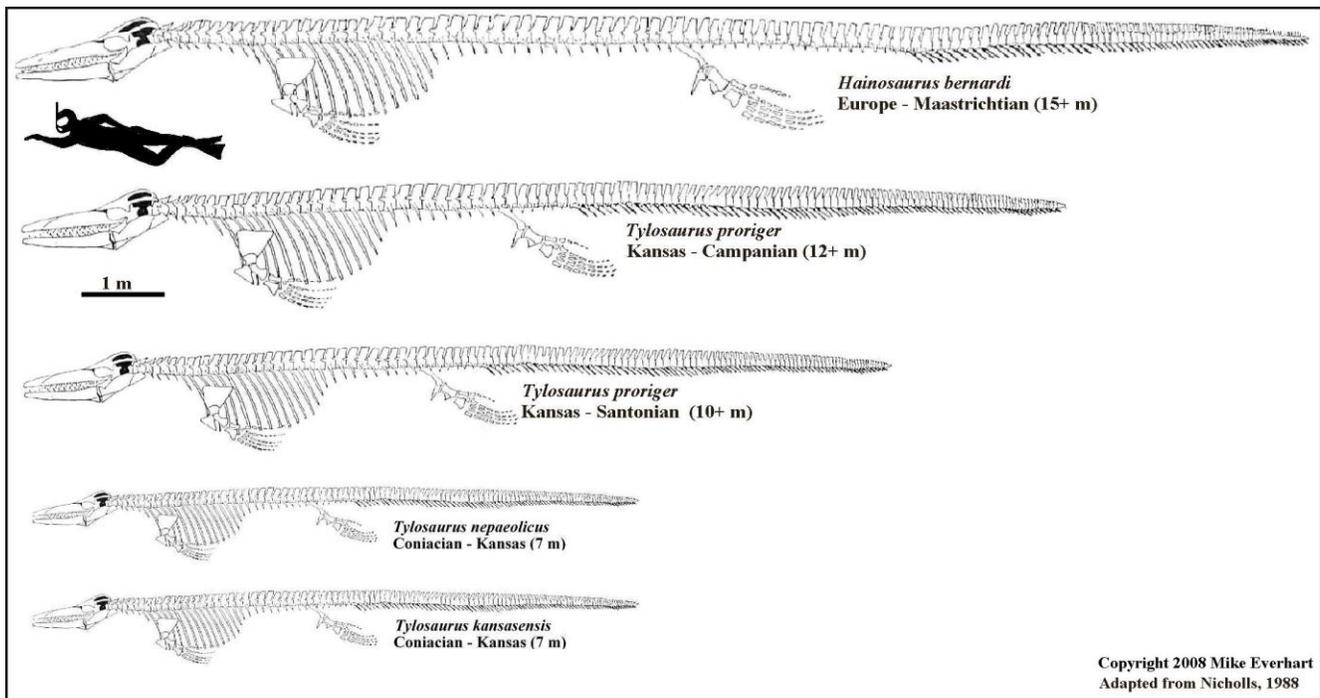
Restoration of *Dallassaurus* a possible Mosasaur ancestor.



Tylosaurus pembinensis on display at the Canadian Fossil Discovery Centre located in Morden, Manitoba Canada.



Mosasaurus conodon on display in the Museum of Geology located at the South Dakota School of Mines and Technology.



Size comparison of several mosasaur species.

Mosasaur Structure

Basic structure involves a large, powerful skull 10-14% of the entire body. The abdomen had four flippers converted from legs over time and a large long powerful tail. Skelton structure definitely speaks to reptilian but adapted over time to ocean living. This transition is clearly one of the most successful transformations from land to sea. However, not all of their reptilian features disappeared. For example, small scales on their skin, as shown in some fossils, were retained. The skull structure is very similar to some snakes (pythons). Large with cone shaped teeth some were slightly recurved, also two sets of pterygoid teeth inside the skull. These teeth in the upper jaw were designed to hold the prey in place while the lower jaws help swallow the prey whole. The lower jaw contained an intermandibular hinge joint between tooth dentary and the surangular that wasn't fused and allowed outward bending. A mobile quadrate providing additional force and aft movement was also present in the lower jaw. The jaw ball and socket type could make an outward angle creating a large diamond shape allowing it swallow things much wider. Mosasaurs would seize their prey, hold it, somewhere in the process killing, and swallow it whole. Cope said they were furnished, like snakes, with four rows of formidable teeth on the roof of the mouth. Though these were not designed for mastication, and, without paws for grasping, could have been little used for cutting, but as weapons for seizing their prey they were very formidable.



Arrangement of teeth in the skull of a *Tylosaurus* displayed at the Mace Brown Museum in Charlestown, SC. Note the two rows of pterygoid teeth in the skull. (From the Mosasaur page by Jayson Kowinsky <http://www.fossilguy.com/>)

The tail is over $\frac{1}{2}$ the body length with 100 or more vertebrae and a bend or curve. *Tylosaurus* has up to 119 caudal vertebrae of the up to possible 140 total vertebrae. The muscular tail was long and flat as shown by the vertebrae with tall neural spines and long chevrons. Structure of the tail, laterally compressed, improved its swimming efficiency but not its speed. Mosasaurs weren't very streamlined swimmers, utilizing an undulating snake-like motion that limited long distance travel at higher speed much different than the swimming abilities of Plesiosaurs and Ichthyosaurs. However, newer research may provide evidence that Mosasaurs were effective swimmers and built for speed as well. The preferred method of food gathering of Mosasaurs was to sit and wait in ambush for the right moment to strike. As a result of their structure and motion, not as fast as Plesiosaurs but capable of short very fast bursts, Mosasaurs were very efficient predators. Simply, Mosasaurs ate anything they could swallow.

Mosasaurs were ambush predators capable of out running prey over a distance because of design. Casual swimming performed mostly by the tail with the paddles retracted aiding in steering. That Mosasaurs gave birth to live young was shown, in 1996, with the discovery of a *Plioplatecarpus* specimen that included an adult with four fetuses inside the abdomen. Mosasaurs may have cared for young for a while such as modern alligators. They also fought for territory in an activity referred to as snout jousting as a test of strength. Sometimes a larger Mosasaur would clamp down on the snout of another twist it around snapping its neck. This is supported by fossil evidence with Mosasaurs fossils revealing broken necks. Aggressiveness of Mosasaurs potentially resulted in driving Plesiosaurs from the Pierre Seaway to more open ocean. Mosasaurs are also believed to have caused the extinction of *Cretoxyrhina* called the ginsu shark which grew up to 25 ft or so.

Conclusions

So, was the Pierre Seaway where Mosasaurs evolved from the varanoid lizard-like *Dallasaurus*? More Mosasaurs are found in the Pierre seaway than anywhere else in the world. Mosasaurs appeared suddenly, evolved quickly to dominate the Late Cretaceous Oceans for about 25 million years, and then became extinct. In 5 to 6 million years they went from 1-2 m lizards to 15 m plus giants and Kings of the Late Cretaceous seas. By the early Turonian Mosasaurs were fully aquatic coinciding with the disappearance of slower, less agile pliosaurs. They evolved quickly filling many ecological niches left open from other disappearing animals. This quick evolution resulted in 38 genera world-wide with as many as 45 species from the Maastrichtian alone.

Three major phases in Mosasaurs fast development, from more primitive *Clidastes* at 4 m to *Tylosaurs* and *Platecarpus* up to 8 m and finally the explosion in the Maastrichtian of the third wave of Mosasaurs including the shell crushers and the gigantic *Hainosaurus* 15 m plus. *Tylosaurus* also attained bigger sizes in excess of 12 m. Towards the end of the Cretaceous; they began to invade fresh water rivers possibility in search of other food sources or to just expand their habitat.

They ate everything in sight including each other and probably didn't turn down too many feeding opportunities. A small, whole *Clidastes* was found inside a *Tylosaur* stomach. Mosasaurs were surviving through some catastrophic events in the Cretaceous including the Mason Crater impact in Iowa. Extinction occurred at the end of the Cretaceous 65 mya coinciding with the asteroid impact. Did this finish them or was it just a part of their demise? What could have happened had they not gone extinct?



Mosasaurs: Kings of the Late Cretaceous Seas

The **M**id-**A**merica **P**aleontology **S**ociety (MAPS) was formed to promote popular interest in the subject of paleontology; to encourage the proper collecting, study, preparation, and display of fossil material; and to assist other individuals, groups, and institutions interested in the various aspects of paleontology. It is a non-profit society incorporated under the laws of the State of Iowa.

Membership in MAPS is open to anyone, anywhere who is sincerely interested in fossils and the aims of the Society.

Membership fee: \$20.00 per household covers one year's issues of DIGESTS. All Canadian and Overseas members receive the DIGEST by air letter post. For new members and those who renew more than 3 issues past their due date, the year begins with the first available issue. Institution or Library fee is \$25.00.

MAPS meetings are held on the 2nd Saturday of October, November, January, and February and at EXPO in March or April. A picnic is held during the summer. October through February meetings are scheduled for 1 p.m. in Trowbridge Hall, University of Iowa, Iowa City, Iowa. One annual International Fossil Exposition is held in late March/early April.

The MAPS official publication, MAPS DIGEST, is published 5 times per year – Jan-Mar, EXPO EDITION, May-August, Sept-Nov, Dec. (EXPO Materials). View MAPS web page at: <http://www.midamericapaleo.org>

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CYATHOCRINITES



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