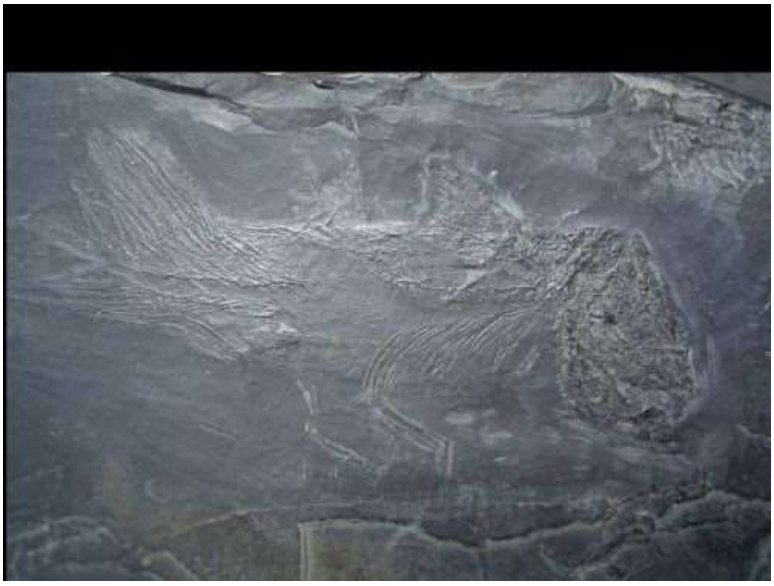
DRAFT: LIFE IN THE MESOZOIC "HACKENSACK RIVER BASIN"

Imagine a world without people, flowering plants, birds, or most familiar mammals. Imagine a landscape of lakes and streams where reptiles and amphibians crawl on land as fish—but not the modern species—swim in the shallow lakes that sometimes dried out completely. Worms burrowed through the soft muds, and insects flew above the surface in a world much warmer than today.

That was how the area that became the Hackensack River basin really was about 200 million years ago. We know this because organisms left evidence of their lives in the muds and sands that eventually became the shales and sandstones we see today. Sediments washed down from adjacent mountains into the streams, lakes, and swamps of the rift valley. Fossils evidence as most people know them—bones—are rare because most dead organisms were scavenged and decayed. But a few fossils survived to be found. Fish skeletons buried in lake muds are most plentiful. A handful of early reptilian relatives of dinosaurs have been discovered and now occupy places of honor in museums. Insect and leaf fossils indicate that the region was covered by low-lying swamps. Soft-bodies organisms, such as worms, rarely form fossils, but did leave trace evidence of their existence in the form of 'burrow holes' preserved in the shales that formed from the mud.

Fish

The Granton Quarry in North Bergen lies on the west slope of the Palisades, forming part of the eastern boundary of the Hackensack River basin. Durable sandstones and shales were removed for building materials over several decades until operations ended in the 1960s. The site became famous for the Triassic fish fossils which could be found there, especially coelacanths (see image below.)



Coelacanth (lobe-finned fish)
(http://www.thefossilforum.com/uploads/1288879103/med_gallery_2081_658_173203.jpg)

Other species of Triassic fish were preserved in the remains of lake beds that dried out during the cyclical climatic changes that marked that period. Images of some of these are:

(Source: http://www.thefossilforum.com/uploads/gallery/album_718/gallery_2806_718_299200.jpg)

(Source:http://earthphysicsteaching.homestead.com/Fossil_Fish__Redfieldius_gracilis__Triassic__Newark_Formation__Faquier_Co.__VA_3A.jpg)

Reptiles

At least four types of Mesozoic reptiles lived in the area. Perhaps the most exciting from the paleontologic viewpoint was "Tany," or, more formally, *Tanytrachelos*. It swam in the rift valley lakes some 215 million years ago. In the early 1980s, three friends looking through the abandoned Granton Quarry rock piles noticed an unusual appearance because the Sun was at just the right angle. They found an almost complete skeleton.

After thorough study by the leading expert on the Mesozoic fossils of this area, Dr. Paul Olsen of the Lamont-Doherty earth Observatory, “Tany” was sent to the New Jersey State Museum. The specimen is especially unusual because it was complete and contained all 128 bones.

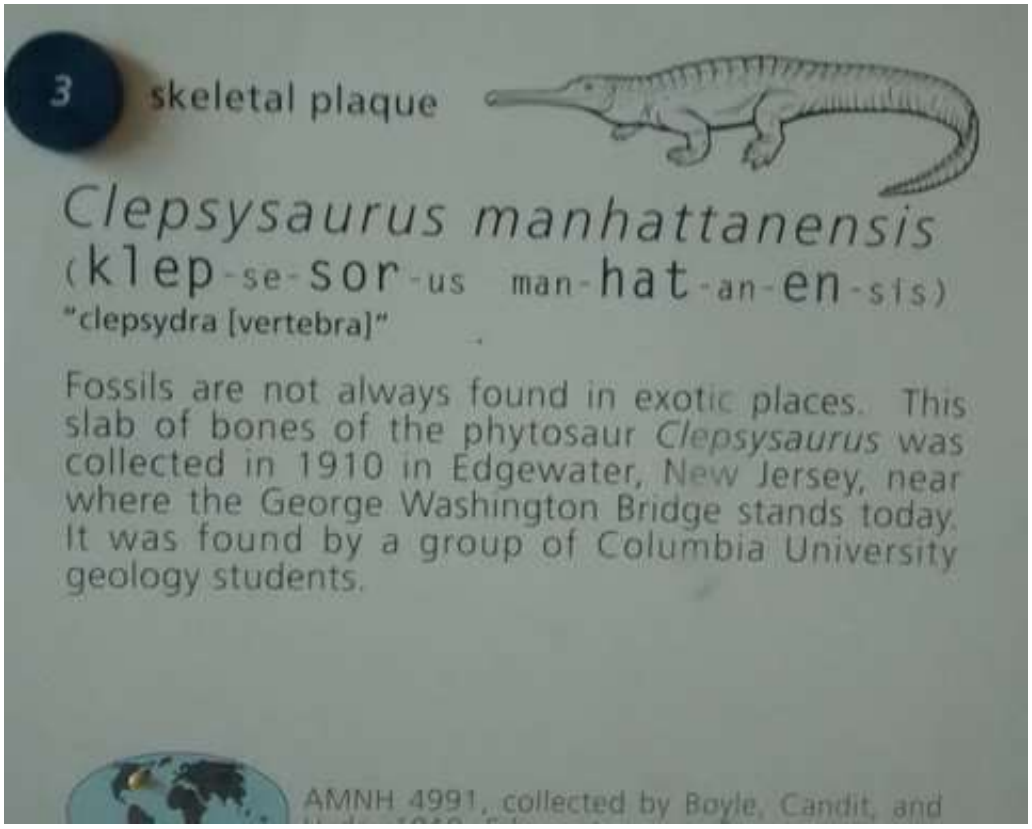
The image to the right shows “Tany.”

(Source: http://hudsonreporter.com/pages/full_story/push?article-NB+fossil+has+NJ+homecoming-Former+resident+remembers+Granton+Quarry-%20&id=7183729)

Another noteworthy fossil was collected in the Granton Quarry in 1963 by Robert Salkin. Salkin discovered and presented a rutiodon skull to the American Museum of Natural History, where it was identified as a crocodile-like reptile that lived in the Triassic lakes. The image below shows another specimen at the AMNH. Salkin later gained fame among New Jersey paleontologists for the many dinosaur footprints he unearthed in Roseland, about ten miles west of the Hackensack River basin.

(Source: https://upload.wikimedia.org/wikipedia/commons/thumb/a/a6/Rutiodon_AMNH.jpg/800px-Rutiodon_AMNH.jpg)

In 1910, a Columbia University geology class walking along the base of the Palisades along the Hudson River in Edgewater, about half a mile south from where the George Washington Bridge was later built, discovered bones of another Rutiodon specimen. These are now on display in the American Museum of Natural History in the “Vertebrate Origins” Hall. See the images below.



Invertebrates

Also common among Granton Quarry fossils is a tiny crustacean known as the "clam shrimp," *Estheria* (see image below).

(Source:http://earthphysicsteaching.homestead.com/Crustacean__Estheria_ovata__Upper_Triassic__Granton_Quarry__North_Bergen__NJ_11.JPG)

There were probably many other invertebrates and plankton that formed the food webs in the Mesozoic lake communities, but which were never preserved as fossils.

"Trace Fossils ("Ichnotaxa")

Also living in the area during that geologic time period were early dinosaurs, such as *Grallator*. These are best known from their three-toed footprints, because no associated skeletons have been found. The term "ichnotaxa" is used to describe fossil organisms known only from such "traces." Many types of organisms probably existed and left no evidence other than footprint, trails and tracks in mud, or other evidence.

The specimen shown to the right was discovered by Paul Olsen and Tony Lessa in 1970 when they were middle schoolers. It is the track of a 9-foot tall biped carnivorous reptile. This was Dr. Olsen's first discovery and stimulated his career as a paleontologist.

(Source: http://endangerednj.blogspot.com/2010/10/riker-hill-park.html)

Another common type of trace fossil was created when a worm burrowed through soft muds in search of food. The cylindrical structure they leave behind show a disturbance not see in the surrounding muds. When these harden into shale, the circular cross-sections or oval structure of the tube may easily been seen, revealing a glimpse into ancient life activities.

Worm burrows (Planolites)
(Source:http://paleoportal.org/index.php?globalnav=fossil_gallery&sectionnav=search&period_id=10&state_id=35)

Plants

Plants formed the base of the food webs in the Mesozoic, as they do today. But they were not flowering plants, which did not evolve until some 50 - 60 million years later. Rather, they includes horsetails (first image below), gingkoes (second image), and ferns (third image). Few, if any, plant fossils from this period have been found in the region, but we can image what it must have been like from similar settings in other locations where the remains were preserved.

Horsetail fossil (Source: http://www.fossilmuseum.net/plantfossils/neocalamites/AAF264C.jpg)

Gingko fossil (Source: http://www2.estrellamountain.edu/faculty/farabee/BIOBK/aginkgoites.jpg)

Fern fossils (Source: http://www.thefossilforum.com/uploads/monthly_03_2010/post-2676-12688564147082.jpg)

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