HGMS "Fieldtrip in a Box" Questions and Answers

The **Stone City** member of the Crockett Formation outcrops under the highway and railroad bridges where Hwy 21 crosses the Brazos River. These rocks are of **Eocene age,** about 35 million years old. I am going to ask you a number of questions that you might be able to answer as you look at the material. I will supply the answers. The included CD has geological studies, photos and directions to the site, and electronic copies of all these documents.

Who first studied these rocks?

_Geologist Ferdinand von Roemer, under a grant from the Berlin Academy of Sciences, surveyed the resources of Texas to find out what areas might be used by German emigrants. He visited and described the outcrop in 1848.

Who studies the Stone City bluff now?

_The outcrop is near the campus of Texas A&M University. Almost every beginning geology student at A&M makes a field trip here and many graduate students do their thesis projects here.

Haven't I heard another odd name for this place?

_Yes, "Whiskey Bridge" ! There has been a bridge here for a long time (before that, there was a ferry and, before that, a ford). After Prohibition, Brazos County was "dry" and Burleson County was "wet" -- and there was a row of cantinas along the bank on the Burleson County side of the river.

How will you break apart the rock without breaking the fossils?

_You are going to break some of the fossils. Alternately wetting and drying the sample usually breaks down the rock.

Was this material deposited in the ocean, in a stream, or a lake?

_An ocean because the shells are very similar to what you find on a beach in Galveston.

Is this sand, clay, or silt?

_The rock is called a greensand because it contains sand-sized particles of green glauconite. Sand is a size term and does not indicate that this is quartz. The matrix material between the glauconite grains and the fossils is a "marl", very fine grained limestone, calcium carbonate.

What is glauconite?

_Glauconite is a blue-green silicate mineral. (The name comes from the Greek "glaukos", which is its color.) Its ions are arranged in sheets that are poorly bonded together, so that it is soft. The formula is amazing: (K,Na)(Fe+++,Al,Mg)2(Si,Al)4O10(OH)2

How does the glauconite get there?

_The rivers carry sand, silt, and clay into the ocean. The glauconite started out as clay and was chemically altered by the seawater.

If the glauconite started out as clay, how did it end up as sand sized grains?

_Everything in the ocean gets eaten by something. The clay is consumed by things like worms, the organics digested, and the residue is excreted as pellets. These pellets are sand sized and are later altered to glauconite.

How deep was the water when the glauconite was deposited?

_In the Gulf of Mexico, glauconite is currently being deposited in 50 to 200 feet of water, 50 miles from the coast line. In general, today, glauconite forms on continental shelves where sediments accumulate slowly and where there is a lot of organic material, such as fecal pellets, in an oxidizing environment.

Is there any economic value to this glauconite?

_Glauconite contains about 2% potassium and a little of it is commercially sold as a "natural" fertilizer.

In general, what kinds of fossils are found here?

_Bivalves (clams) and Gastropods (snails) , otoliths (fish ear bones), and corals are very common. Others are shark teeth, spiral worm shells, crabs, and the beaks of squids.

How can we identify these fossils?

_The HGMS has enclosed an identification guide for the 50 most common fossils.

What characteristics should you look for?

Gastropods have ribs in the opening that are highly characteristic. Bivalves have similar ribs at the hinge that are very specific. When all you have is a fragment, you may not be able to identify it except is the most general sense.

Is there a better identification guide?

_You can buy a complete guide to the 280+ species found at Whiskey Bridge from http://www.itx.com for $20.

Look at the identification guide. Were fish and squids present?

_Yes. Squid beaks and the otoliths, vertebrae, crusher teeth, spines and ray fin bones of fish are found here. Some of these are too rare to be on our "top 50" fossil list.

I can not find everything that is in the identification guide.

_You would probably have to examine 20 gallons of material to find all 50 fossils in the guide. Some of them are quite uncommon.

Is this an accumulation of things that lived together or got washed together after death.

_The number of broken shells indicates that currents moved this material around. The condition of the shells does not indicate what lived together.

After you pick out the big fossils, try washing the material through a piece of window screen. Are there fossils present?

_You will find little corals, foraminifer, and lots of fragments of shells. There are many, many species of microfossils that you will see only if you look at screened material.

What will you see with a magnifier or a microscope?

_Little shells, small corals, foraminifer, bryozoans, lots of stuff.

What is the hard lump that you can not break apart with your fingers?

_These pieces are broken off from a 2 foot thick hard layer and are glauconite and fossils cemented with siderite (iron carbonate). These represent periods of low sedimentation rates. Burrows are frequently preserved in this zone. The siderite "hardground" is resistant to weathering and forms the high bluffs which gave the community of Stone City its name. There ARE rather a lot of stones there: if you wanted to make a chimney, you would very likely have made it of this siderite-cemented material.

How are the gastropods and bivalves preserved?

_The shells are unchanged from when the organisms were alive. The shells have not been replaced or mineralized.

Will we ever run out of fossils to collect along the Brazos River?

_Very unlikely. The formation is quite extensive. People have been collecting there for 100+ years.

Is this sediment deposited in fresh water or salt water? How will you tell?

_Salt water. You can see modern versions of these shells wash up on the beach in Galveston.

Who eats whom?

_Most of the gastropods are carnivores - they eat other gastropods or worms or bivalves.

What about the bivalves?

_Bivalves are always filter feeders.

If you make a collection, how will you store and organize the fossils?

_You might glue each species to a card and make an identification. Maybe put the cards in a shoebox. Include your name and date. HGMS has made a sample collection card for you to copy and use. REMEMBER: the difference between a collection and just a box of rocks is INFORMATION. A fossil without context is just a sit-about.

And then what will you do with them?

_The Public Library has many books, such as the" Golden book of Shells", which will tell you many things about each set of shells.

What do paleontologists try to prove by collecting and examining fossils?

_If you can identify the animals, you can almost always identify the environment they lived in. Groups of fossils are characteristic of particular formations and can be used to match rocks that are now widely separated. Small fossils change rapidly through time and can be used to "tag" particular strata.

Are there as many little fossils as big ones?

_You are going to have to do some work to answer this one. Measure every fossil your class has found (if a fossil is narrow but long, use the longest dimension). Make a graph of number of fossils vs. size. If you have collected everything, not just the largest, showiest fossils, you will find that there are lots more little ones. This is true for two reasons: 1. Occurrence. There are more mice than elephants. A given environment can support more little critters than large ones because they don't take as much room and they don't eat as much. 2. Preservation. Small objects are relatively stronger than large ones. Small objects can also fit in the gaps between larger objects (sand grains or larger shells) and not get crushed by the weight of the sediments burying them.

More biometrics! Can you tell anything about the relative numbers of predators vs. prey in this population?

_Let's do another project. After you have identified all the fossils you have found, sort them into two groups: predators (like most of the gastropods and fishes) and prey (the bivalves, forams, worms,...). Make a pie chart that shows the relative ratio of predator individuals to prey individuals. If you have collected everything, there should be a lot more prey than predators. Of course, every animal was not preserved, even it had a shell in the first place, so this ratio may not be the same as for the living population.

Are some kinds of shells a lot rarer than others?

_Of course, but let's prove it. Identify all of the fossils you have found at least to the Class level. Pick two classes, such as Mollusca Bivalvea and Mollusca Gastropoda and count (1) the number of individuals in each class, and (2, if you can) the number of species in each class. [Hint: you don't have to find the NAME of each species for this exercise, just to be able to count the different types.] Abundance of a species is related to how well that species fits into the environment and the competition. Species diversity tells you the most about how many ecological niches are present (for example, rain forests have many more niches than temperate forests). Caveats: Remember that all counts are subject to preservation bias and collection bias. And you can't really do an abundance or diversity study on just one site -- you would need to go out and collect the same data from more outcrops.

My ID guide got trashed the first class I used it. Where can I get another?

_The Houston Gem & Mineral Society website has digital versions of these documents, which may be duplicated and freely used for educational purposes: They are also on the CD that is included.

Map: http://www.hgms.org/client_trips/WhiskeyBridge/Files/FamousLocalityWhiskeyBridge.doc
Outcrop guide: http://www.hgms.org/client_trips/WhiskeyBridge/Files/OutcropDescription.doc
Fossil guide p1: http://www.hgms.org/client_trips/WhiskeyBridge/Files/CollectingGuide1.doc
Fossil guide p2: http://www.hgms.org/client_trips/WhiskeyBridge/Files/CollectingGuide2.doc
Pictures: http://www.hgms.org/client_trips/WhiskeyBridge/index.htm

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