**Handout 5.2- Specimen Diversity WebQuest**

**The New York Botanical Garden has over 7 million specimens in its collection. Let’s look at some of them in the C.V. Starr Virtual Herbarium!**

1. Type in this url: <http://sweetgum.nybg.org/science/vh/> We will first search for the smallest flowering plants in the world, found in the angiosperm (flowering plant) genus ***Wolffia***. These are aquatic plants that float on ponds and are sometimes called “duckweed.”

**In the search menu, type in “*Wolffia columbiana*” and examine the results.**

What country or countries does this species occur in?

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Are there any specific states or regions in which it occurs? If so, name a few.

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**Click on any of the photos associated with the search results.**

How are the plants displayed on the sheet? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Use the zoom buttons to view the specimen at a higher magnification.**

How many individual plants are there on the sheet you viewed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

How do you think the collectors obtained them and pressed them?

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**Zoom in high enough to view individual plants. Use a ruler and hold it up to the computer screen and measure about 5 individuals. Write down each measurement separately:**

1.

2.

3.

4.

5.

How can you then correlate your measurements of the screen to the actual size of the specimen?

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**Look for a ruler or scale bar near the margin of your photo. Use your ruler to calibrate your measurements with the scale in the photo.**

How did your measurements change? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Next, let’s search for specimens with the largest unbranched inflorescence in the world, the titan arum, ***Amorphophallus titanum***. This species is native to Borneo and other parts of Indonesia but is often grown at botanical gardens because it is so interesting. The single inflorescence produced can reach more than 10 feet tall! When it blooms, the smell is similar to rotting meat, attracting flies to pollinate it.

**Examine the specimens in your search results. View several photos of the specimens and be sure to examine the label information.**

What material is on the sheet? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Is it the entire plant, or just a part of it? If so, what parts are included?

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How is the material secured to the sheet? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If the entire plant isn’t on the sheet, what do you think happened to the rest of the plant?

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How can you tell how big the plant is if you can't see the entire specimen?

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What other information can you use? Be sure to read the label information carefully and check all the specimens available.

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1. Now, we will look at a gymnosperm (cone-bearing plant) that has the world’s most massive cones. ***Pinus coulteri***, known as the “Widowmaker Pine”, can have cones that are up to 5 kilograms, or 11 pounds in weight! The cones of this species are so large they cannot fit on a specimen sheet and are generally stored in boxes and kept separately with a copy of the label in the box. They are found in the coastal mountain ranges of southern California and Mexico.

**Examine the specimens with images carefully, being sure to read the labels. Look at a specimen that has just pine needles.**

What “stamped” note do you see near the label? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Look for specimen #1254 collected by J.B. Walker on 15 March 1995. Open this record and look at the cone.**

How long is this cone? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**This is actually a very small cone by Coulter pine standards!**

How tall was the tree that produced this cone? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**This specimen is called a “voucher,” meaning that it is used as a reference for a scientific study.**

Based on the label data, what was the purpose of this plant collection?

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What do you think the scientists that collected this material planned to do with it?

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1. The coconut tree, ***Cocos nucifera****,* is a palm tree that can grow up to 30 meters tall! It is the only surviving member of the genus *Cocos* and is an important resource for people around the world. Despite its name, the coconut fruit is not actually a nut; it is a drupe. The tough, brown-shelled coconut you might be thinking of is actually the seed from inside the green fleshy fruit, like a peach pit!

**There are multiple specimens of *Cocos nucifera* housed at the herbarium. Examine those collected by M. H. Nee on November 11th 1993.**

What country was this specimen collected from? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How much plant material was collected from the same plant? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Take a look at each of the specimen labels.**

Did the collector indicate that there were multiple specimen sheets? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Why do you think they did this?

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**Find specimen sheet number one and examine its label.**

What plant material is included on this particular sheet? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How long were the leaf blades of the coconut tree the specimen came from? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**There is a note written in the transcribed description that says, “Phenology of specimen.”**

What is the phenology of this specimen? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

One specimen sheet in particular supports this conclusion. Which one is it? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

What plant material is included on **that** specimen sheet? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Each specimen label includes ethnobotanical and ecological information about this plant. What notes does the collector include about how humans, and perhaps other organisms, use this plant?

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**This particular specimen was used as a “voucher” for scientific research, which is noted on three of the specimen sheets.**

What do you think this specimen voucher was used for?

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1. Let’s take a look at another aquatic plant: the water chestnut. ***Trapa natans*** is an herbaceous plant often found floating in ponds.

**Take a look at the specimens collected by T.C. Plowman.**

Do these specimen sheets contain material from the same plant? How do you know?

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Think back to the previous aquatic plant you examined, *Wolffia columbiana.* How does this plant appear similar? How does it appear to be different?

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What ecological notes did the collector include on this specimen? What impact do you think this plant might have on its surrounding ecosystem?

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**Take a look at the specimen containing fruits.**

Do these fruits remind you of anything? There are no wrong answers!

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1. Not all plants can survive on their own. Some are parasitic, like the genus ***Rafflesia.*** *Rafflesia* is the national flower of Indonesia and is distributed across southeast Asia. This genus is known for producing large flowers – in fact, the species *Rafflesia arnoldii* produces the largest single flower in the world.

**There is one specimen of *Rafflesia* in the herbarium. Examine the specimen sheet and label.**

What species is this specimen? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Does the taxon listed in the directory differ from what is on the label? If so, why do you think this is?

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Where was the specimen collected? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The specimen label states that it parasitizes the genus *Cissus.* What type of plant is its host? You can perform an external search and write notes below:

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**We often think of flowers as smelling sweet and pleasant to the nose. However, *Rafflesia* flowers are notorious for their foul, rotten odor.**

What do you think pollinates these flowers? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**It may be difficult to determine the size of the flower based on this specimen alone, but there is a photograph of the flower in its natural habitat.**

What do you estimate its size to be? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Finally, search for a plant on your own and explore the variety of specimens housed in the virtual herbarium’s database. You can use books or the internet for inspiration. Perhaps you could examine how scary carnivorous plants are preserved, or look for the most beautiful flower.

What family is your plant a member of? What species is it?

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When and where was this plant collected? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How is the specimen arranged on the page? Is there anything unique or interesting about how the plant material is preserved?

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Does the label contain any additional information about the plant’s appearance, environment, or usefulness to people or nearby organisms? If so, describe it below:

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