Introduction to Georeferencing

Georeferencing does not simply refer to a point on a map, but it is rather a numerical reference. An acceptable georeference is a numerical description of a place, while an ideal georeference is a numerical description of a place **that can be mapped**. When embarking on a georeferencing project, there are several points about data quality that should be considered:

1. Data have the potential to be used in ways unforeseen when the specimen is collected
2. Value of the data is directly related to the fitness for a variety of uses
3. As data become more accessible, many more uses become apparent
4. GBIF (Global Biodiversity Information Facility) best practices promote data quality and fitness for use

Georeferencing methods:

1. Point method. Pro: easy to produce. Con: no data quality.
2. Bounding-box method. Pro: simple spatial queries. Con: difficult quality assessment.
3. Point-radius method. Pro: easy quality assessment. Con: difficult spatial queries, uncertainty includes many areas that shouldn't be included.
4. Shape method. Pro: accurate representation. Con: complex, requires several coordinates.

Georeferencing and the Macrofungi Collections Consortium

For the purposes of this project, we will most often be using the point and point-radius methods. The Record Capture Team at The New York Botanical Garden has found that both methods are effective ways of georeferencing macrofungi collection sites.

Point method with uncertainty determination

The point method is best used when the georeferenceable locality has a large uncertainty (e.g. collection data only to county level), but it can also be used for more size-restricted and familiar localities. In order to carry out point method georeferencing, two steps are necessary. First, the georeferencer will plot the point on a map. The georeferencer must then determine the uncertainty associated with that plotted point.

Google Maps is one of the most powerful tools used in georeferencing natural history collections. Keep in mind that Google Maps are very accurate for sites in the U.S. and Canada, but this is not necessarily the case for other regions of the world.

To obtain the coordinates for a specific locality, visit the Canadensys LatLong Crosshairs for Google Maps webpage (http://www.canadensys.net/activities/development/latlong-crosshairs). On the main page, locate the "LatLong Crosshairs" hyperlink. Click on the hyperlink, holding down your left mouse button, and drag the "LatLong Crosshairs" widget up to your Bookmarks Toolbar. The "LatLong Crosshairs" application is now ready to use.

In order to obtain the coordinates, bring up the map of the place you want to georeference in Google Maps. Click on the "LatLong Crosshairs" widget. The crosshairs symbol will appear on your screen. The next step is to move your map around (left click and drag anywhere on the map) and place the crosshairs, which remain stationary, over the point you wish to georeference. Once you've moved the map to the desired location behind the crosshairs, simply click on the crosshairs to obtain your coordinates.

In order to determine the uncertainty associated with the plotted points, use Google Map Labs, which is an excellent resource for measuring uncertainty. When the pop-up window appears, you will see a variety of tools in the list. Locate the "Distance Measurement Tool", which should be at the top of the list. Click "Enable" for this tool, and then click "Save Changes". Next to the map scale in the lower left portion of your screen, you will see a ruler symbol. Click on this symbol. In the left panel, a "Units" drop-down list will appear. Ensure that the unit is set to "Metric". The next step is to click on the ruler symbol and then click anywhere on the map. A green pin symbol will appear. Drag this symbol to the spot on the map that was previously georeferenced and release the mouse button. Then click on the area of greatest extent that you are georeferencing, and a red pin will appear. Just like the original point (i.e. green pin), the secondary point (i.e. red pin) can also be dragged to the appropriate spot after the mouse button has been released. The distance between the pins, which is the uncertainty, will be shown in kilometers in the left panel.

Point-radius method using GEOLocate

GEOLocate is a software program that was designed at Tulane University specifically for the purpose of georeferencing natural history collections. This excellent resource is embedded right into the MyCoPortal. One important thing to note about GEOLocate is that it is not capable of georeferencing collection localities that are described only to county level. For these collections, you will need to use the methods described in the previous section.

GEOLocate and the MyCoPortal

In the MyCoPortal, you will see the GEOLocate symbol next to the Google Maps symbol. With your complete locality data already filled in (i.e. the locality information from the collection label), simply click on the GEOLocate symbol. A pop-up window will appear in which the user will see a map, a polygon indicating the area of interest (usually, but not always*), and an adjustable error radius. To edit the uncertainty (i.e. error radius), and to see other data related to the collection location, click on the green dot. Clicking "Edit uncertainty" will make an arrow appear at the upper-right side of the uncertainty radius. To adjust the uncertainty, click on this arrow and drag the uncertainty radius to cover the entire area covered by the polygon. You can also adjust the placement of the green dot at this time to reduce the amount of uncertainty associated with the georeferenced point (e.g. if moving the green dot to the geographic center rather than the populated center reduces uncertainty). Click "Remove Secondary Points", which will remove any red dots on the map (i.e. points that GEOLocate has considered as possible collection localities). Then click "Save To Your Application". The GEOLocate window will close automatically and several "Locality" fields in the MyCoPortal will be populated.

*If you do not see a polygon on the GEOLocate map, it is recommended that you use the point georeferencing method described in the previous section.

Georeferencing Remarks

One very important aspect of georeferencing is adding remarks about how you reached your conclusion with regards to where you plotted your georeferenced point and how you determined the uncertainty. Be as thorough as possible when writing your remarks in the "Georeference Remarks" field of the MyCoPortal, and write remarks for every single record that you georeference. Sometimes it is impossible to georeference a collection. In this case, you would write "Not georeferenceable" in the "Georeference Remarks" field.