Report for Spring 2014 sabbatical
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For this report on my sabbatical activities from the last 5 months, I am starting with the activities that I proposed, then will describe the results of these activities. My activities mostly concentrated on two three week trips, one to the National Museum of Natural History in London, UK, and one to the National Museum of Natural History in Paris, France.

My primary research has to do with the taxonomy and systematics of columbellid gastropods. Columbellids are a highly diverse, cosmopolitan family of marine snails. They are mostly very small, often less than 5mm adult length. There are two projects I focused on:

- **Columbellid systematics.** I am collaborating with Dr. Ellen Strong at the Smithsonian National Museum of Natural History and colleagues at the Paris Museum, to publish a systematic revision of Columbellidae (focusing on recent new expedition material from the Paris Museum) using molecular data. She has been able to get the sequencing done free as part of a global barcoding effort through the Smithsonian lab (and they have the protocols established, whereas the lab here does not). We previously had sequences for the mitochondrial CO1 and 16S genes for about 75 specimens representing 33 species. Additionally, I really needed to spend some time with my collaborators in Paris to network with them. **Results:** to this end, I caught up with Ellen in London and spoke to her about progress and directions on the project. My trip to Paris then focused to a large degree on obtaining more material to work on, as well as networking with other collaborators and potential collaborators. The working group at Paris has independently sequenced a number of columbellid species, but had not identified them to species. So I was able to identify their material for them and get access to the DNA sequences (10 individual 16S mtDNA sequences, 16 28S mtDNA sequences, 71 CO1 mtDNA sequences and 2 sequences from the nuclear H3 gene). I also identified their vouchered material and arranged to borrow over 600 specimens to sequence in addition. Papers to result from this include:
  a. Phylogeny of the Columbellidae (co-authored with E. Strong)
  b. Evolution of small body size in columbellid gastropods (I have been working on this for years, but it needs the molecular phylogeny)
  c. Phylogeny and Systematics of Panamic members of *Anachis* (Columbellidae). I have been working on this for years with anatomical data and I published part of it last year, but most of the results are not well enough resolved to publish. Having the sequence data is likely to fix that, based on results so far. We have been sequencing the Panamic material (which I got as part of a Smithsonian expedition) along with the Paris Museum material.
  d. Patterns of diversification in shallow Indo Pacific molluscan clades. Ellen has an interest in comparing results from the Columbellidae to taxa that she works on, to look for common patterns of diversification in regional clades, which can be compared to recent tectonic and eustatic events in the Pacific.

An additional benefit of this trip was the chance to meet and talk with several graduate students and other colleagues working on projects related to my own work. The Paris lab had a number of visiting researchers from other countries so this aspect was quite valuable.

- **Columbellid taxonomy.** Some of the papers I’ve published in recent years focus on taxonomy; in other words, documenting new species and revising previously named ones based on new findings. Unfortunately this isn’t as easy as it would seem. Identifying a new species requires looking at original specimens (called types) that represent species already named by previous researchers, often more than 100 years ago. Type specimens are typically very old and often very delicate, and are housed in museum collections around the world. Because columbellids are so small, original illustrations of these specimens
(mostly drawings of the shells), if they exist at all, are typically too poor to be useful for identification. Additionally, the original types of certain authorities have been lost in the collections. So part of my plan was to go to the largest museums in London and Paris, to examine and document their type specimens so that the taxonomy of these species can be revised.

**Results:** The Natural History Museum in London actually financially supported my stay there (room and board) for three weeks, based on their need for me to go through their collections and identify historically important (i.e. potential type) material that had been ‘lost’ in the main collections, and a large amount of unidentified material that they needed sorted. So as part of my stay there I databased their type material and a large number of potential type lots that were in the main collection. Doing this allowed me to get information from the specimens that was not possible without seeing them. I also went through and databased the entire Paris type collection, which was considerably smaller and mostly better sorted. As part of this I noted that there were a number of situations where the published species require revision because of some odd unrealized issues with the types (type lots consisting of two species, species misidentified, and similar situations).

Papers that could result from this include:

a. Columbellids of the Hawaiian Islands (I have lots of material, but identification of the smaller species wasn’t previously possible). As it turns out, a number of species in Hawai‘i are probably undescribed.

b. Taxonomic revision of *Graphicomassa* species (one is mis-ID’d).

c. Taxonomic revision of the *Euplica scripta/ bidentata* complex (another issue due to a mis-identified type). I have also contacted the researcher in Australia who mis-ID’d it.

As a side benefit of these trips, both museums have excellent research libraries, so I updated my library resources by copying a number of references that are not available here.

From this point, my intention is to start working on the Paris material, because getting that sequenced and analyzed has been extremely time-consuming. The first batch took 8 months to sequence after I sent them the tissue clips. So my assumption is that this won’t happen quickly, and if I get started on it first then I can work on other more static projects after that gets sent off.

**Addendum, Jun 2015:**

At this point I have achieved a couple of the objectives above; the paper mentioned in (b) above re ‘taxonomic revision of *Graphicomassa* species’ has been written and accepted with revisions for publication in *Zoosystema*, a taxonomic journal housed by the Paris Museum. I am working on revisions requested.

Second, the tissue samples from the Paris material have been sent to the Smithsonian for extraction and sequencing, and an abstract submitted with my collaborator, Dr. Ellen Strong, to present these results at the American Malacological Society meeting in August. We can likely then publish those results following that meeting.

Finally, the National History Museum of the UK in London has partially revised some of their type catalog based on work I did there, and that info has been sent to me for my files. So progress has been made on several fronts.