Understanding Amazonian biodiversity patterns through an economically important palm *Oenocarpus bataua*

The Amazon basin is known to be the world's most biodiverse region and harbors a great variety of both flora and fauna. Recent fires in the Brazil Amazon have brought a lot of attention to the ways in which forest resources are managed and the rapid loss of tropical habitat due to deforestation. While it is true that we must act quickly to protect this ecosystem, the notion of a "pristine" forest that is often presented in popular news can be misleading. In actuality, the Amazon has been managed by humans for at least 10,000 years, for which we have the earliest signs of plant domestication in the region. The main difference between now and then is the *ways* in which humans are using the forest.

- Insert photo 1
  Caption: Sunrise along the Quebrada Tigrillo, a tributary of the Río Tigre

I've spent the last month in the Peruvian Amazon around the city of Iquitos, studying an economically important palm tree, *Oenocarpus bataua*, locally known as *ungurahui*. This tree provides both human and animal communities with a nutritious fruit, rich in protein and oil year-round; additionally, it's trunk and leaves are also used for construction and crafts. The ecology of this plant is also quite interesting, as it is the 7th most abundant tree species in the Amazon basin, being found in Venezuela, French Guiana, Brazil, Colombia, Peru, and Ecuador. It's part of a subset of 227 species of trees which are considered *hyperdominant* because they are much more abundant than the rest of the estimated 16,000 tree species and together make up more than half of the individual trees found in the Amazon. That means that 1.41% of the estimated 16,000 tree species are very common, and the other 98.6% of tree species are rare. Being hyperdominant and economically useful isn't unique to ungurahui. Studies have found that plants which are used by humans tend to be hyperdominant, and archeological sites have a higher proportion of hyperdominant tree species than surrounding forests.

- Insert photo 2,
  Caption Photo 2: Me at the crown of an ungurahui

This begs the question, are these plants abundant as a result of human management or have humans simply learned to use the resources which are most readily available to them? Perhaps this pattern could this pattern be due to some combination of human management and the overall ecology and survival strategy of these plants. These are the questions that initially brought me to Peru to study ungurahui. Furthermore, what are the implications of recent changes in human management of hyperdominant species? There has been a notable increase in demand and consumption of Amazonian products around the world (think açai) from which ungurahui is not exempt. Its pulp is being used to make ice cream and oil for hair and cosmetic products in areas outside of the it's natural range. In order to keep up with the demand some people have turned to cutting down trees to harvest the fruit instead of climbing them, as has been done traditionally.

- Insert photos 3, 4, 5, 6

Caption photo 3: A raceme of fruit that we harvested for preliminary experiments

Caption photo 4: A single raceme can bear thousands of fruits
Caption photo 6 & 5 : Measuring a single leaf of *Oenocarpus batuaua*. It was 8.81m long.

In order to begin answering these questions, I started working with a local pulp processing organization – Recursos Amazonicos Frutales (RAF SAC), based in Iquitos. They have designed specialized ungurahui climbing gear, called a maquisapa, which makes harvesting fruits both safer and easier. RAF SAC personnel go around to communites where ungurahui is found and provide training workshops on how to use the maquisapa. They then work with these communities and purchase sustainably harvested fruits from them, which are then processed and frozen in Iquitos. These pulps are sold to restaurants around town, but they are working to start sending pulps internationally.

- Insert photo 7
  Caption: Learning how to use a maquisapa!

I've been visiting some of the communities that RAF SAC works with collecting *O. bataua* fruits and leaves, in addition to soil samples and taking census data to understand the ungurahui varies in different locations and habitat types. I started my research in San Juan de Raya (Raya), a community of about twenty houses found the on the bank of the Río Pintuyacu. Here found a population of *Oenocarpus bataua* about 30 minutes upstream, where we used the maquisapa to climb the trees, and specialized saw to collect fruits and leaf tissues, which will be used for genetic analysis and to make herbarium specimens. Working with locals from Raya, I learned about how local changes in weather affects the time for fruit to mature – more rain speeds up the ripening process. I was taught how to prepare *chapo*, a traditional beverage, is made by macerating the pulp in a small volume of water and drank with sugar and dried manioc. The chapo was shared with the community, but I kept the seeds for subsequent analysis and experiments to come after the collection trips.

- Insert photo 8
  Caption: A pot full of ungurahui seeds used to make chapo

After a few days back in Iquitos where we sterilized and froze the collected fruits, our team arrived in Nueva York, a larger community found on the Río Tigre. We had heard that the fruits from this were different in texture and produced more oil than fruits from other regions. Locals confirmed this, but we were not able to find any trees with mature fruits on them to see for ourselves. We also learned that felling trees is more common than climbing here, which we were able to confirm during our search for fruiting trees. The only trees which had any signs of recently producing fruits had been cut.

- Insert photos 9 & 10
  Caption photo 9: The community of Nueva York
  Caption photo 10: A recently felled ungurahui tree

We still have 2 more trips to along the Ríos Blanco and Ucayali, where we hope to be able to collect more fruits of ungurahui and find other species of *Oenocarpus*, which although are not hyperdominant, are economically important and still merit studying. I'm excited to see what we find in these new locations and for more collaboration and integration of traditional knowledge into the academic world. Upon my return to Berkeley I will be sequencing DNA from leaf samples and running nutritional analysis of the fruits in order to get a better understanding of human-plant interactions and the ways that humans influence the environment and vice versa.