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RE: Update #8 on Insect Project.

What a week! Remembering to remain flexible was critical to us this week. The planned work at Ravine Chabot and Millet was rained out, and Eli and Crystal had our first flat tyre. Of course, this could not happen on a paved road with a nice flat shoulder, but they never happen there, do they? A problem with the battery charger and a failed ultraviolet light were issues that required a work-around, and several other small issues cased some grief. Still, all-in-all, we managed to keep the traps running full-tilt, with only a day's adjustment here and there. With the moon in the 3rd quarter and the rainy season species starting to emerge, it is a critical time for our trapping efforts. Such small set backs just make us appreciate how well the overall project has been going.

Our site on the top of Gros Piton was retired this week, having reached its allotted number of weeks, and the traps moved to a new one established north of Barre de L'Isle. We continued to increase our targeted collecting aimed at increasing the series of a few very special finds, including a new genus of flea beetle from mosses on Troumassee and Piton de St. Esprit. This tiny, almost spherical animal has lost its flight wings, and has spring-like hind legs longer than the body. Troumassee yields very few species and specimens, but they all seem to be special, many new. Another find from there this week is a new species of darkling beetle that is the first of its genus known from the Lesser Antilles, and a nearly blind weevil that looks very unfamiliar.

A night spent with lights on the beach filled in some of our more obvious holes from previously recorded species (apparently previous visitors liked to spend more time on the beach than we do).

We added another family to our list this week, with our current 68 families bringing us to within striking distance of our predicted goal of 70. Interestingly, we did not add this family by adding a single species that belongs to it, but by adding 2 species, one each of both genera known to occur in the West Indies.

Ending the week, it was a sad day Saturday when we said goodbye to Ross Winton, who has been with us since the first day we arrived. Ross has been the backbone of our efforts so far, and we will miss him greatly, but he had to get back in time to do the sampling required for his own Master's Thesis. He carried 16 boxes of specimens back to the lab, and will start working on them with Ian Foley in anticipation of our return. We are grateful to Ross' wife, Danielle, for doing without him for the last 2 months so that the St. Lucia project could benefit from his work here.

This leaves only 4 of us here for most of the coming week, our nadir, but our numbers will increase again with the arrival of 3 more on Friday.

How many beetles are there on St. Lucia?

Last week I mentioned that there are various ways to estimate how many species are in a place, and that I would discuss one of them this week. There are about 180 species recorded in the scientific literature from St. Lucia, but based on the size of the island, and comparison to other better-known islands like Montserrat and Guadeloupe, I expect the real total to be somewhere in the 1,400 to 1,600 species range. I do not know how many we have collected so far, but our goal is to pass 700, or 50%, in the time we have here.

Why so few? Some species may not be out at this time of year; some live in tiny, specialized niches that we will miss; some are so rare that we will not cross their paths; and some of what is and isn't found is just luck. It has been 2 months of collecting every day, and we have not yet seen the island's largest beetle! So, how to estimate the total from what we have so far, i.e. "How do we know what we do not know?"

Let's say we want to know how many first names there are in Dennery. Let's say we do not have the resources to find everyone and ask them their name, and there is no list, so we have to find a way to estimate it. We can assume that some names are very common, such as David and Michael, while others will be less so, and a few so rare that we will never run into the one person who has it. So, we keep track of the names we find, and how many times they repeat. At first, we will add new names very often, but soon we will find repeats more often than new names, and before long, a new name will be a rare event. By graphing this relationship between number of people encountered and number of new names discovered, we will have a curve that starts very steep, and then curves off to a lower and lower angle. Before we get to the end of the curve, we will have an idea of where the curve is headed, and can use this to estimate the point at which all names will have been found, and how many names there are at that point.

Another way of looking at it is suppose there is a jar of jelly beans, and each color is represented by a different number of beans. If there are 100 colors, and the most abundant one is the color of 1000 beans, and the 5 rarest colors are only represented by a single one, with the other 97 colors scaled between them, how many beans must you sample to find all 100? The answer is "up to 1000." However, if you draw out 20, replace them, mix the jar and draw again 20 times, and keep track of the number of each color seen in each sample, you can get a pretty good estimate of the total using the same ideas as we discussed about for names. The answer will be something like "96 plus or minus 8" meaning there is a 90% likelihood that the actual total is somewhere between 88 and 104.

We have not even recollected all of the first 180 beetle records, which is the equivalent of not re-sampling a color of jelly bean in the first handful. Clearly, if we collect 700 species of beetles, but do not recollect some of those collected by others on less extensive efforts, the total species pool is very large, with a significant number remaining to be discovered.

This technique is mathematically far more sophisticated than I have made it sound, but was developed by a statistician who used the pattern of spotting the unique numbers on taxis in Edinburgh, Scotland, to find a technique to estimate the total number of taxis in the city (which was known because of records on licenses given). So, using simple repeated measures, we can get a pretty good estimate of what is out there.

We will use this type of estimator on the data we are collecting to get a better idea of how many species of beetles really inhabit this island with us. Each specimen will be considered a collecting event, and the distribution of number of specimens per species will give us the data we need for an estimate.