Protocol Draft

Questions

What are the effects on herbivorous arthropod populations, specifically butterflies, in the absence of birds?

a. Is there an increased abundance of butterflies on Guam, which has no insectivorous forest birds, compared to Saipan and Rota, which do have insectivorous forest birds?

b. Are rates of herbivorous arthropod predation higher on Saipan and Rota than on Guam?

Hypothesis

Birds exert top-down control of herbivorous arthropods.

Prediction

If birds exert top-down control of herbivorous arthropods, then a higher abundance of butterflies will occur on Guam than on Saipan and Rota. In addition, predation rates on Lepidoptera will be lower on Guam than on Saipan and Rota.

Butterfly Survey

Materials

1. Field notebook
2. Pencil
3. Flagging tape
4. GPS
5. At least 2 people

Protocol

1. Find possible limestone forest sites
   1. There should be 3 native forest limestone sites. (insert description)
   2. There should be 3 disturbed limestone sites. (insert description)
2. Using a GPS device, measure a 300 m distance.
   1. The 300m distance should be on a trail that is fairly straight. Slight curves are acceptable; however, avoid trails that are in loops or circles, as this can cause butterfly counts to be redundant.
3. Mark off the 300m mark with flagging tape
   1. With a partner walk the length of the trail in one direction. One partner will watch and search for butterflies in a 3-5 meter radius. Note\*: Pace should be fairly slow (insert exact speed here)
   2. The other partner will keep a tally in a field notebook of all butterflies spotted, and species of the butterflies spotted.

Notes Regarding Survey Conditions

* 1. Weather should be uniform throughout all surveys. Temperature should be between 55 and 102 degrees. In the event of sudden rain during a butterfly survey, the surveyors should wait until rain has ceased and then restart the survey.
  2. Surveys should be taken between 10am and 3pm.
  3. Wind speeds should not be excessive. On the Beaufort scale, wind should not exceed 5. In the event that winds are too strong, the survey should be rescheduled for a more suitable time.

Clay Caterpillar Experiment

Materials

1. Non-hardening, non-toxic - green clay
2. Super Glue or Rubber Cement
3. Flagging Tape
4. GPS
5. Field notebook
6. Plastic Container
7. Cloth
8. Wax paper

Protocol

1. Make clay caterpillars
   1. Roll 300 clay caterpillars. They should be smooth and 3cm in length: modeled after the *Eurema Blanda* caterpillar found in the Micronesian Butterfly Guide.
   2. Place the clay caterpillars in a plastic container. Line the container with wax paper so the caterpillars do not merge together or move.
2. There should be two randomly chosen 300m trails for the clay caterpillar experiment. One native limestone forest and one disturbed limestone forest.
3. On each trail distribute 150 clay caterpillars.
   1. Starting at the 0 meter mark, place a caterpillar on the nearest tree found at every 2 meters. Place the caterpillar on a stem, not a leaf. The stem should be at a height above 1 meter but no higher than 2 meters.
   2. Continue this process for the duration of the 300m trail.
4. Adding caterpillars
   1. Using the cloth, wipe off any stems that may be wet due to rain.
   2. Apply rubber cement to stem. Wait 15 seconds to allow it to partially dry.
      1. Apply caterpillar to stem. Note\* The stem should be unobstructed from other foliage.
      2. Note\* Ensure that no markings have been added to the clay caterpillar during handling.
5. Record in field notebook the site name of the trail, the time the caterpillars were placed out, and the date the caterpillars were placed out.
6. Leave the clay caterpillars out for 48 hours.
7. Collect caterpillars
   1. Go back to trail 24 hours later
   2. Look for caterpillars. At each caterpillar, record in the field notebook the tally of caterpillars that have suspected predation (markings or pinches), no predation at all (smooth), as well as the number of caterpillars that are missing.
   3. Take a picture of any caterpillars that have suspected predation for further analysis and record image # in field notebook.
8. Analysis
   1. General linear mixed effects model

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| Island | Site | Visited? | Type of Forest | Important Notes | Concerns |
| Guam | Anao | Yes | Native |  |  |
| Guam | S. Blas | Yes | Native |  |  |
| Guam | Guam Community College Trail | Yes | Native | Trail is much curvier than others |  |
| Guam | Two Lovers Point | Yes | Disturbed | Large presence of African Tulips |  |
| Guam | Pagat | No | Disturbed |  |  |
| Guam | Andy South | Yes | Disturbed |  |  |
| Guam | Anao Disturbed, on road to S.Blas | Yes | Disturbed |  |  |
| Saipan | Forbidden Island | Yes | Native |  |  |
| Saipan | Marpi | Yes | Native |  |  |
| Saipan | LADT – trail | Yes | Native |  |  |
| Saipan | Mt. Tapachau | No | Native (?) |  |  |
| Saipan | LADTS – road | Yes | Disturbed |  |  |
| Saipan | Naftan | No | Disturbed |  |  |
| Saipan | Grotto bike trail | Yes | Disturbed |  |  |
| Saipan | Bird Island Conservation Area Trail (Toyota Key Trail) | Yes | Disturbed |  |  |
| Saipan | Bird Island Trail | No | Native |  |  |