United States Department of Agriculture

Progress Report

Title:	Guam Forest Biodiversity Inventory

Sponsoring Agency	NIFA	**Project Status**	ACTIVE
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Experiment Station

Non-Technical Summary

The main goal of this project is to build and maintain a Guam Forest Biodiversity Inventory. In its simplest form, a biodiversity inventory is a checklist of animals and plants inhabiting a geographic area or habitat of interest. In this case, the habitat of interest is Guam's forests. This project will be a major component of a larger project aimed at building a Guam Terrestrial Biodiversity Inventory to include all life forms found on the island.

Guam's forest ecosystems are rapidly being degraded by invasive insect species and habitat destruction. Impacts of bird extinctions caused by the brown tree snake predation on Guam's forests are well known. But these impacts are rivaled by contemporary ecological disasters:

- In 2002, Guam's endemic cycad, Cycas micronesica, was the most abundant tree (DBH > 5 inches) in Guam's forests (Donnegon et al., 2002). In 2003 the Asian cycad scale (Aulacaspis yasumatsui) was detected on Guam infesting ornamental cycads. The scale quickly spread to wild cycads and started killing them. Within only three years, Cycas micronesica was placed on the IUCN Red List of Threatened Species and in 2016, this plant was placed on the US national endangered species list. It is estimated that 90% of Guam's cycads have been killed and there is no sign of recovery.
- Coconut (Cocos nucifera), is Guam's second most abundant tree species. Guam's palms are rapidly being killed by coconut rhinoceros beetle (Oryctes rhinoceros) which was first detected on the island in 2007. It is likely that 50% or more of the island's coconut palms will be lost.

Despite rapid destruction of Guam's forests, there is not even a basic checklist which can be used to document changes in biodiversity. A biodiversity inventory is needed:

- to document changes in Guam's ecosystems
- to document detection of and impacts caused by invasive species which are arriving at a rapid rate
- to provide free, open access to information on Guam's flora and fauna (including images and occurrence maps) to the global scientific community, policy makers, and the public
- to act as a digital repository for data from biological surveys and biological collections
- to provide links to scientific literature about taxa which occur on Guam
- to document ecological relationships among taxa such as hosts, predators, parasites and diseases

Accomplishments

Major goals of the project

1 Goal: Liberate data from biological collections

1.1 Objective: Complete digitization of the UOG insect collection

The UOG insect collection catalog has already been made available online using Symbiota. Note that Symbiota automatically uploads data to GBIF. The next phase of this digitization project will be imaging of all taxa in the collection. Existing images will be uploaded and linked to specimen data. Images will be made for taxa which have not been previously imaged and these

will also be uploaded.

1.2 Objective: Complete digitization of the UOG herbarium

Digital images are available for all herbarium sheets. The existing herbarium catalog will be converted from a local database to an online database using Symbiota or Specify. Both of these online collection database managers automatically upload to GBIF.

1.3 Objective: Liberate data from the scientific literature

The PI will organize extraction of Guam biodiversity information from primary scientific publications, starting with Insects of Guam I and II.

2 Goal: Provide public access to Guam forest biodiversity data

2.1 Objective: Build the Guam Forest Biodiversity Web Site

The PI will launch a web site to serve as a portal to Guam forest biodiversity data stored in GBIF. Pages will be developed to dynamically generate lists such as those suggested above.

3 Goal: Foster public interest in Guam's forest biodiversity

3.1 Objective: Outreach and Citizen Science Activities

- The PI will offer annual workshops on the use of iNaturalist, a social networking app used by citizen scientists and naturalists which enables them to record biodiversity observations with images and georeferencing using smart phones. iNaturalist data which is validated as research grade by the community is automatically uploaded to GBIF.
- The PI will continue to maintain an iNaturalist project entitled Insects of Micronesia.
- The PI will work with the UOG Center for Island Sustainability to organize annual bioblitzes. A bioblitz is is an intense period of biological surveying in an attempt to record all the living species within a designated area. Participants in the bioblitzes will be trained to useiNaturalist which will be used to document results.

4 Goal: Foster collaboration to help overcome the taxonomic impediment

4.1 Objective: Collaboration with taxonomists, collectors and the biodiversity informatics community

- Collaboration with taxonomists will be cultivated to help identify a large backlog of unidentified specimens in the UOG insect collection.
- Existing collaboration will be maintained with existing partners list in the Collaboration/Cooperation section of this proposal.
- The PI will participate in at least one scientific meeting per year covering biological collections and/or biodiversity informatics.
- The PI will encourage donation of voucher specimens to the UOG insect collection from biological surveys such as those being conducted by the Ecology of Bird Loss and the baseline surveys being done by military contractors in support of the military buildup.

What was accomplished under these goals?

Little progress on this project was made during FY2020 because work and travel were impeded by the COVID-19 pandemic:
* Plans to continue digitization of the University of Guam insect collection using student interns was cancelled because the University was closed.
* Plans to participate in the 4th iDigBio Annual Digital Data Conference which was to be held at Indiana University were abandoned.
* Public outreached in the form of local workshops was curtailed.

Insect occurrence records for Guam continue to accumulate in the Global Biodiversity Information Facility (GBIF) [1]. Most records are from data sources maintained by this McIntire-Stennis project.
* GBIF currently reports 18,604 Guam insect ocurrence records which include 16 orders, 228 families, 620 genera, and 1035 species.
* 15,136 records were sourced from the University of Guam Insect Collection online catalog.
* 457 records were sourced from iNaturalist Research-grade observations. Most of these are from the iNaturalist Insects of Micronesia Project.

[1] GBIF.org (28 December 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.yfwjwt

What opportunities for training and professional development has the project provided?

{Nothing to report}

How have the results been disseminated to communities of interest?

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{Nothing to report}

What do you plan to do during the next reporting period to accomplish the goals?

Priority for the new year will be:
* Completion of a datamining project to extract bidiversity data (occurrence records, ecological associations, etc.) from Insects of Guam I and Insects of Guam II.
* Completion of digitization of the University of Guam Insect collection. Next step is adding images for all pinned specimens tot the online database.

Participants

{Nothing to report}

Target Audience

{Nothing to report}

Products

{Nothing to report}

Other Products

{Nothing to report}

Changes/Problems

Little progress on this project was made during FY2020 because work and travel were impeded by the COVID-19 pandemic. Datamining of biodiversity data from Insects of Guam I and II was delayed following accidental data loss.