CFES Report 2019

Aubrey Moore, Ph.D.
Associate Professor / Extension Entomologist

January 14, 2020

I was hired by the University of Guam on October 1, 2003 under a limited-term, split appointment (50% extension and 50% research). On June 26, 2008, I started a tenure-track appointment as extension entomologist (100% extension) with the academic rank of Assistant Professor. At the end of the 2012 fall term I applied for tenure and promotion and received both in 2013. I intend to submit my application for promotion to full professor during Fall semester 2018.

I work within the Agriculture and Natural Resources Unit of the University of Guam Cooperative Extension Service. I am a faculty member of the Environmental Science Graduate Program and a member of the Western Pacific Tropical Research Center.

This report documents my activities from June 2017 through the present. My current faculty role allocation is as follows:.

- 51% Extension and Community Activities
- 34% Creative/Scholarly Activity or Research
- 15% University and Community Service

Note to Reader:

This report is available as an electronic document in PDF format at https://tinyurl.com/am-cfes-rept-2018.

If you are reading the PDF version of the report on a device connected to the internet, you will be able to follow hypertext links to documents I have referenced.

University of Guam
College of Natural & Applied Sciences
Cooperative Extension & Outreach

Reflective Form

Comprehensive Faculty Evaluation System (CFES) – Part I
***or* Plan of Work (POW)**

Your name: Aubrey Moore

Your current Rank and Step: Professor

This CFES/POW evaluation period: June 15, 2018 – June 14, 2019

Role Assignments	**Percent of Time**
Extension & Outreach	51% (primary focus must be a minimum of 50%)
Creative/Research/Scholarly	34%
Instruction	0%
University Service	15%
TOTAL	100%

Please list any outside consulting or paid board activities for this performance period:
None.

The components of: (1) Planned Activities, (2) Evidence of Accomplishment, and (3) Evaluated By for each of the Roles identified above are found in Part II.

I have met with my appropriate administrative supervisor and discussed my evaluation plan for the period above cited. I understand that amendments to my plan are possible and that said amendments, if any, are to be discussed with and agreed upon by my administrator prior to initiating.

_____
Signature of Faculty Date:

_____
Signature of Associate Dean Date:

_____
Signature of Dean/Director Date:

Contents

1. Extension and Community Activities

1.1. Insect Diagnostic Services

As an extension entomologist, a major part of my job is providing insect identification and pest control recommendations to a diverse clientele including commercial growers, gardeners, householders, GovGuam agencies, federal agencies, and UOG colleagues. Most client contacts are initiated by a phone call or a visit by the client to the ANR office. In many cases identification and pest control recommendations require a site visit by me and/or extension associates to collect samples and define the problem.

Activity

- The number of extension calls requiring my assistance averages approximately three per day during the reporting period. Many of these are documented as postings to iNaturalist [1].

References

[1] Aubrey Moore. *iNaturalist Observations of Arthropods from June 15, 2017 to June 14, 2018*. 2018. URL: https://www.inaturalist.org/observations/aubreymoore?d1=2017-06-15&d2=2018-06-14&filter_spam=true&page=1&taxon_name=Arthropoda&user_id=7547 (visited on 07/29/2018).

1.2. Detection and Documentation of Invasive Species

Invasive insects are arriving on Guam at a very high rate (estimates range as high as one new species per day). Very few of these are detected and even fewer are identified because Guam suffers from the taxonomic impediment. Even when reliable species determinations are made, new island records are only rarely documented in the scientific press. Thus, impacts of invasive insects on Guam and elsewhere in Micronesia are grossly underestimated. One of my professional goals is to work towards solving this problem by increasing the detection rate, getting specimens identified by qualified taxonomists, and publishing new island records in the scientific literature.

Activity

- 3 new invasive insects documented in iNaturalist posts, 1 new invasive species fact sheet, 1 peer-reviewed journal article.
  - Lobate lac scale, *Paratachardina pseudolobata* [3]
  - Mango fruit borer, *Citripestis eutraphera* (identification not yet confirmed) [1, 2]

- The International Union for Conservation of Nature (IUCN-ISSG) is building a Global Register of Introduced and Invasive Species. I have volunteered to coordinate building a check list for species on Guam.
- The Guam Invasive Species Council is required to maintain a list on invasive species on Guam. I have volunteered to be "registrar" for this list.

References

[1] Aubrey Moore. Citripestis Eutraphera. 2018. URL: https://www.inaturalist.org/observations/13466275 (visited on 08/25/2018).

[2] Aubrey Moore. Citripestis Eutraphera. 2018. URL: https://www.inaturalist.org/observations/15067449 (visited on 08/25/2018).

[3] Aubrey Moore. *Lobate Lac Scale (*Paratachardina Pseudolobata*)*. 2018. URL: https://www.inaturalist.org/observations/12779405 (visited on 07/29/2018).

1.3. University of Guam Insect Collection

The UOG insect collection is a valuable reference collection for extension entomology, teaching and research. I am a member of the board of directors for the collection and I work with Dr. Ross Miller to curate and catalog this collection.

Activity

- I ported the digital catalog for the UOG Insect Collection from a CSIRO BioLink database to a more modern web-based Symbiota database which is now online [**moore2018scanuniversity**].
- I established an internship to train entomology students how to curate an institutional insect collection [**moore2018internship**].
- The Benita Laird-Hopkins collection includes more than 5,000 insect specimens reared from seeds of forest plants from Saipan and Guam as part of the Ecology of Bird Loss Project. This collection has been cataloged and accessioned into the UOG insect collection and a publication is being prepared [**laird-hopkins2018inpreparation**, **moore2018onlinecatalog**].
- In June, I attended the Second Annual Digital Data in Biodiversity Research Conference sponsored by iDigBio (Integrated Digital Biocollections) to attend a workshop entitled Sharing and Mobilization of Massive Specimen Image Databases from Collections of Tropical Island Biodiversity as an invited participant. I made a presentation on building a biodiversity inventory for Guam

[**moore2018building2**] and discussed ongoing collaboration with Dr. Alex Vandam on writing an NSF proposal to support digitization of biological collections on American-affiliated islands [**moore2018tripreport**].

1.4. Guam Coconut Rhinoceros Beetle Project

This is my largest and most important project. Please see CRB activities in the Creative/Research/Scholarly section

1.5. National Plant Diagnostic Network (NPDN)

1.6. Public Outreach (Guest lectures, presentations, interviews)

1.7. Public Outreach(Internet)

2. Creative/Scholarly Activities or Research

2.1. Coconut Rhinoceros Beetle (CRB) Biocontrol

This is my largest and most important project. Funding for outreach and applied research is currently provided by three grants: USDA-APHIS FY17 Farm Bill, USDA-Farm FY18 Bill, and a grant from the Department of the Interior-Office of Island Affairs for FY18-19.

I have submitted a proposal for FY19 Farm Bill Fundings. The abstract from this proposal serves as a description of this ongoing project:

A newly discovered biotype of coconut rhinoceros beetle (CRB-G) is rapidly killing coconuts and other palms on Guam and on other Pacific islands. Following a failed eradication attempt on Guam, CRB-G proved hard to control because it is resistant to *Oryctes rhinoceros* nudivirus (OrNV), which was previously used as the preferred biological control agent for control of CRB outbreaks on Pacific Islands and elsewhere. Previous to the discovery of CRB-G, all OrNV releases on Pacific Islands resulted in immediate and sustained suppression of CRB damage to low levels and prevented tree mortality.

Guam is currently experiencing an uncontrolled and unmonitored island-wide CRB-G outbreak which was triggered by abundant CRB-G breeding sites in the form of dead and dying vegetation left in the wake of Typhoon Dolphin which occured in May 2015. of a recent typhoon. Most of these breeding sites are inaccessable to sanitation efforts, being either in the jungle or on military land (which covers one third of Guam). A positive feedback cycle has begun whereby large numbers of adult beetles are killing large numbers of palms which become breeding sites which generate even higher numbers of adults. Severe damage to Guam's palms prompted the Governor of Guam to declared a state of emergency in July 2017.

The main objective of this project is to stop the uncontrolled outbreak on Guam. Entomologists working on the CRB-G problem on several Pacific islands agree that the

most feasible tactic to halt tree mortality and suppress damage to tolerable levels is establishment of biological control using an isolate of OrNV which is highly effective as a biological control agent for CRB-G. We are working with collaborators to identify populations of CRB-G throughout the Asia-Pacific region. We will sample these populations for biological control agent candidates which will be evaluated in laboratory bioassays performed at UOG. Promising candidates will be field released using autodissemmination as per a USDA-APHIS import and release permit.

Concurrent with establishment of CRB-G biocontrol, success of the project will be monitored in a quarterly, island-wide tree health survey and incidence of OrNV infection will be monitored in a subsample of all field collected CRB-G.

If the Guam CRB-G infestation cannot be controlled, it is expected that most palms on the island will be killed and CRB-G will continue to spread to other islands and beyond. If CRB-G invades smaller islands and atolls where coconut is the tree of life, a human tragedy will ensue. On larger islands, coconut and oil palm industries will be severely impacted. Attempts to organize a regional project in response to CRB-G are underway.

2.2. Cycad Aulacaspis Scale (CAS) Biocontrol

A US Forest Service survey published in 2002 reported that the most abundant tree in Guam's forests (DBH $>$ 5 inches) was Guam's endemic cycad, *Cycas micronesica*. In 2003, an invasive scale insect, *Aulacaspis yasumatsui,* was detected on ornamental cycads but it soon infested wild cycads and started killing them. Within a decade, 90% of Guam's endemic cycads have been killed by the scale and other invasive species. *Cycas micronesica* was placed on the US National Endangered Species List in 2015.

Mature plants are protected by a lady beetle I introduced, but no natural reproduction is occurring because seeds and seedlings are still being killed by the scale insect. A likely solution to this problem is establishment of a small biocontrol agent, such as a miniature parasitic wasp which will control scale insects infesting seeds and seedlings.

2.3. Guam Forest Insect Survey

The objective of this project is to compile a comprehensive check list of insects impacting Guam's forests. While it is notable that Guam's two most numerous forest trees, namely fadang, *Cycas micronesica*, and coconut palm, *Cocos nucifera*, are under simultaneous attack by invasive insects, there are many other forest plants under attack from invasive insects. This project is funded by McIntire-Stennis.

3. Eight Spot Butterfly (ESB) Conservation

The Guam Department of Agriculture Division of Aquatic and Wildlife Resources (GDOA-DAWR) requested assistance with conservation of the rare Mariana eight-spot butterfly, *Hypolimnas octocula marianensis.* I grant proposal for this work was funded by US Fish

and Wildlife and funds were made available to the Guam Department of Agriculture for this work. The project was halted shortly after it began because USFWS listed ESB on the National Endangered Species List. This required a permit to work with this species. I worked with GDOA-DAWR on a permit application. I am ready to restart this project, but GDOA-DAWR is unable to access grant funding from GovGuam.

3.1. Guam Biodiversity Inventory

I consider this to be my second most important project.

A biodiversity inventory is essentially a database containing a comprehensive check list of all taxa known occur within a defined area.

A terrestrial biodiversity inventory for Guam is needed to document rapid changes to Guam's ecosystems, to provide free and open access to information on Guam's flora and fauna, and to share Guam biodiversity information with the global scientific community, policy makers and the public.

The Guam Biodiversity Inventory will facilitate automatic generation and updates to lists such as: a list of all invasive species on Guam with year first recorded, a list of new species described from specimens collected on Guam, a list of observations for Guam's endangered species, a list of Guam's native plants with associated herbivores and pathogens, and a list of crops grown on Guam and pests and pathogens which attack them.

4. University and Community Service

4.1. Instruction

4.2. Faculty Committees

4.2.1. Faculty Building Facilities Committee for the ALS

This committee was formed by the Agriculture and Life Sciences Division to provide advice to the Dean on facilities problems within the Agriculture and Life Sciences Building. During the reporting period, I was re-elected as chair of this committee and I am joined by Dr. Jim McConnell and Dr. LaJoy Spears as the other members.

Activity

- Plans for improvements to the ALS124 teaching lab have been only partially achieved. For the past three years, faculty have asked for a dedicated computer and modern audiovisual equipment to facilitate science teaching. During the reporting period, lab tables were equipped with power sockets to replace those removed during a previous renovation.
- We continue to struggle with finding solutions to chronic air conditioning problems.

4.2.2. Search Committee: Extension Animal Scientist

I chair this committee. I am joined by Mari Marutani, LaJoy Spears, Bob Schlub, and Tom Poole, Guam's Territorial Veterinarian.

4.2.3. Search Committee: Extension Agricultural Economist

I am a member of this committee and I am joined by Bob Barber (chair), LaJoy Speers, and John Brown.

4.2.4. Search Committee: Research Associate II (CRB Project)

I chaired this committee and was joined by Jim Grasela, Roland Quitugua, and Jesse Bamba.

4.2.5. Continuing Employment Committee: Austin Shelton

I chair this committee and I am joined by Ross Miller and Hui Gong.

4.2.6. Continuing Employment Committee: Andrea Blas

I served on this committee with Ross Miller and Frank Camacho.

4.2.7. Extension Publications Committee

I served as a member of this committee.

A. Grants

B. Selected Examples of My Work

MooreAfter2017.bib

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[2] Aubrey Moore. "Guam Biodiversity Inventory". Presented at the Regional Invasive Species Council Meeting at the Plant Inspection Facility, Tiyan, Guam. Sept. 21, 2018.

[3] Aubrey Moore. "The Coconut Rhinoceros Beetle Outbreak on Guam: What Can Be Done About It?" Presented to students participating in the Guam Humanities Project: Taking Root: Growing Youth Empowerment for Island Sustainability at University of Guam, Mangilao, Guam. Sept. 22, 2018. URL: https://ndownloader.figshare.com/files/13141172.

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[6] James Grasela and Aubrey Moore. *Protocol for Injection of the Guam Coconut Rhinoceros Beetle Genotype (Oryctes Rhinoceros) with Nudivirus (OrNV)*. 2018.

[7] Koro Vaka'uta. *Radio New Zealand Interview: Viral Control Wanted for Coconut Rhinoceros Beetle*. In collab. with Aubrey Moore. Aug. 8, 2018. URL: https://www.radionz.co.nz/international/programmes/datelinepacific/audio/2018657196/viral-control-wanted-for-coconut-rhinoceros-beetle (visited on 08/22/2018).

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[11] Moore, Aubrey. *McIntire Stennis Project Report 2014-18: Guam Forest Insect Survey*. Sept. 12, 2018. URL: https://cris.nifa.usda.gov/cgi-bin/starfinder/11799/crisassist.txt.

[12] Aubrey Moore. "2019 Forest Service Review of University of Guam Projects". Mar. 2019. URL: https://github.com/aubreymoore/2019-Forest-Service-Review/raw/master/2019%20Forest%20Service%20Review.pdf.

[13] Aubrey Moore. *Animal Scientist Announcement - American Society of Animal Science*. 2018. URL: https://github.com/aubreymoore/Miscellaneous-Docs-for-CFES2018/raw/master/Animal%20Scientist%20Announcement%20-%20American%20Society%20of%20Animal%20Science.pdf.

[14] Aubrey Moore. *Aubrey Moore's iNaturalist Observations of Arthropods from January 1, 2013 to December 15, 2018*. 2018. URL: https://www.inaturalist.org/observations/aubreymoore?d1=2013-01-01&d2=2018-12-15&filter_spam=true&page=1&taxon_name=Arthropoda&user_id=7547 (visited on 07/29/2018).

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[16] Aubrey Moore. "Biological Invasion of Guam". July 11, 2018. URL: https://github.com/aubreymoore/Guam-Bioinvasion-July-2018/raw/master/compress_biological_invasion_of_guam_July_2018.pdf (visited on 07/20/2018).

[17] Aubrey Moore. "Biological Invasion of Guam". July 30, 2018.

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[21] Aubrey Moore. Citripestis Eutraphera. 2018. URL: https://www.inaturalist.org/observations/13466275 (visited on 08/25/2018).

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[30] Aubrey Moore. *FY19 Farm Bill Suggestion: Biocontrol of Coconut Rhinoceros Beetle Biotype G*. 2018. URL: https://github.com/aubreymoore/Miscellaneous-Docs-for-CFES2018/raw/master/MooreFB19.pdf.

[31] Aubrey Moore. *FY19 Farm Bill Suggestion: Budget*. 2018. URL: https://github.com/aubreymoore/Miscellaneous-Docs-for-CFES2018/raw/master/MooreFB19.pdf.

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