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Coconut Rhinoceros Beetle Biological Control

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Repository: <https://github.com/aubreymoore/FB18-Report-2>
Document: <https://github.com/aubreymoore/FB18-Report-2/raw/master/report.pdf>

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1. Summary

Coming soon!

2. Background

The major goal of this project is to find an effective biological control agent for coconut rhinoceros beetle biotype G (CRB-G).

Prior to arrival of CRB-G on Guam during 2007, coconut rhinoceros beetle infestations of Pacific islands were readily controlled by classical biological control using *Oryctes* nudiviruses (OrNV). Following a lack of response to release of OrNV on Guam, research showed that the Guam CRB population is a genetically distinct virus-resistant biotype which has become known as CRB-G[2]. This biotype is highly invasive and is causing massive damage to coconut and oil palms in Papua New Guinea and the Solomon Islands. CRB-G has also invaded Oahu and Rota. Eradication attempts have been launched on these two islands.

Additional goals for this project are to establish a CRB damage survey to evaluate efficacy of biocontrol and other tactics, and to maintain and facilitate collaboration with other Pacific island entomologists working to find solutions for CRB-G management.

3. Staffing

Staff for this project currently comprises of only 2 people: the PI, Dr. Aubrey Moore, and a post-doc, Dr. James Grasela.

- Dr. James Grasela, an insect pathologist, has been hired for a term of 2 years with a grant from Department of Interior, Office of Island Affairs.
- Ian Iriarte, a graduate student working on this project, resigned to accept a permanent job. Search for a replacement is under way.

4. Bioassays to Detect Candidate Biocontrol Agents for CRB-G

4.1. Bioassay Results

Recent bioassay results are attached in Appendix [A](#).

4.2. CRB Rearing Facility

4.3. Laboratory Information System

[\[3\]](#)

4.4. Acquisition of an OrNV isolate from Taiwan

4.5. Acquisition of a Virus-Susceptible CRB Biotype for Comparative Bioassays

4.6. Laboratory Improvements

5. CRB Damage Survey

The objective of this component of the project is to develop an automated system to evaluate CRB damage by image analysis of roadside video surveys. We have completed a *proof of concept* trial in which we used deep learning to train an object detector which locates and counts dead and CRB-damaged coconut palms in video streams. Visual results are presented in a YouTube post [\[7\]](#) and technical details are available in an Open Science Framework Project [\[5\]](#).

6. Regional Collaboration

6.1. Wiki Site

[\[4\]](#)

6.2. Facebook Site

[\[9\]](#)

6.3. CRB Bibliography

A copy of the bibliography is provided in Appendix [B](#).

6.4. Online CRB Invasion History Map

[\[6\]](#)

7. References

- [1] James Grasela. *Progress in Bioassays of OrNV Isolates to Detect Biocontrol Candidates for CRB-G*. University of Guam, Sept. 29, 2019, p. 2. URL: <https://github.com/aubreymoore/FB18-Report-2/raw/master/Grasela-September%202019%20Progress%20Report.pdf>.
- [2] Sean D. G. Marshall, Aubrey Moore, Maclean Vaqalo, Alasdair Noble, and Trevor A. Jackson. “A New Haplotype of the Coconut Rhinoceros Beetle, *Oryctes Rhinoceros*, Has Escaped Biological Control by *Oryctes Rhinoceros* Nudivirus and Is Invading Pacific Islands”. In: *Journal of Invertebrate Pathology* 149 (Oct. 1, 2017), pp. 127–134. ISSN: 0022-2011. DOI: [10.1016/j.jip.2017.07.006](https://doi.org/10.1016/j.jip.2017.07.006). URL: <http://www.sciencedirect.com/science/article/pii/S0022201117300289> (visited on 08/26/2017).
- [3] Aubrey Moore. *Coconut Rhinoceros Beetle Rearing Database*. Oct. 13, 2019. URL: <http://aubreymoore.pythonanywhere.com/rearing>.
- [4] Aubrey Moore. *CRB-G Wiki*. Oct. 13, 2019. URL: http://guaminsects.net/CRBG/index.php?title=CRB-G_Wiki.
- [5] Aubrey Moore. *Open Science Framework: Digital Image Analysis for Detection of CRB Damage in Videos*. Oct. 12, 2019. URL: https://osf.io/czr8t/?view_only=cdec7cc47b514b31b33115113193a2d4.
- [6] Aubrey Moore. *Web Page: Online Interactive Map of Coconut Rhinoceros Beetle Invasion History*. 2019. URL: <http://aubreymoore.github.io/crbdist/mymap.html> (visited on 05/28/2019).
- [7] Aubrey Moore. *YouTube: Training an Object Detector to Locate Coconut Palms Damaged or Killed by Coconut Rhinoceros Beetle*. Oct. 9, 2019. URL: <https://www.youtube.com/watch?v=zzSorqcmt9U>.
- [8] Aubrey Moore and James Grasela. *Coconut Rhinoceros Beetle Bibliography*. 2019. URL: <https://www.overleaf.com/project/5d92e50a61cab30001783d1a>.
- [9] Aubrey Moore and Ian R. Iriarte. *FaceBook Site: CRB-G*. Oct. 13, 2019. URL: <https://www.facebook.com/groups/crbg07/>.

A. Recent Bioassay Results

James Grasela. *Progress in Bioassays of OrNV Isolates to Detect Biocontrol Candidates for CRB-G*. University of Guam, Sept. 29, 2019, p. 2. URL: <https://github.com/aubreymoore/FB18-Report-2/raw/master/Grasela-September%202019%20Progress%20Report.pdf>

B. Coconut Rhinoceros Beetle Bibliography

Aubrey Moore and James Grasela. *Coconut Rhinoceros Beetle Bibliography*. 2019. URL: <https://www.overleaf.com/project/5d92e50a61cab30001783d1a>