

Update on the Guam Coconut Rhinoceros Beetle Situation for the Guam Invasive Species Council

Aubrey Moore

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Basic Biology

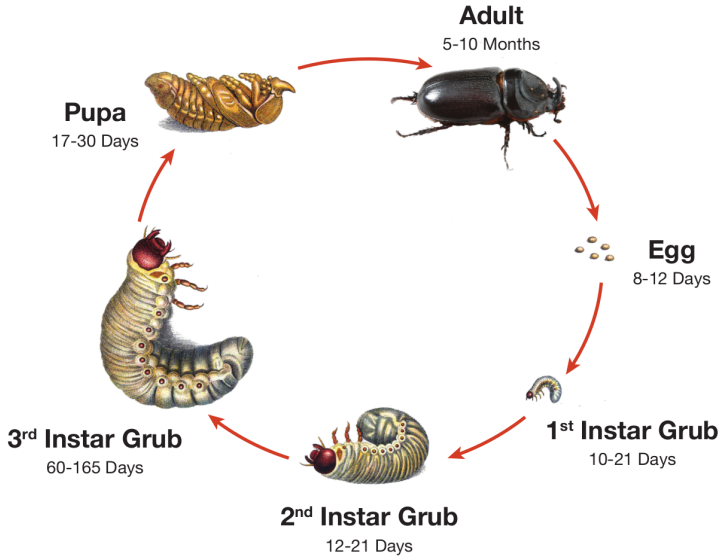


Figure 1:

Positive Feedback Cycle



Figure : Coconut palms killed by *Oryctes rhinoceros* in Fiji (photo by Bedford)

CRB on Guam

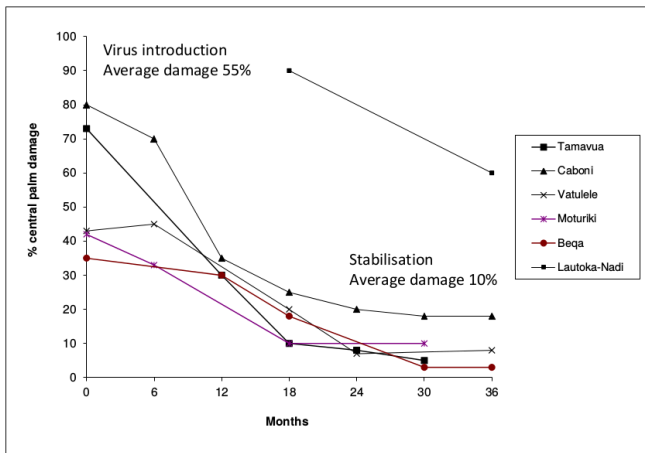
- ▶ First detected in Tumon, September, 2007
- ▶ Eradication attempt based on mass trapping and sanitation failed
- ▶ CRB spread island-wide by 2010
- ▶ Attempts at biological control using *Oryctes nudivirus* (OrNV) failed

Oryctes Nudivirus

- ▶ a naturally occurring virus which attacks only rhino beetles
- ▶ discovered in Malaysia during the 1960's
- ▶ quickly became the preferred biological control agent for managing CRB on Pacific islands
- ▶ prevents population explosions
- ▶ is persistent once introduced into a CRB population

Oryctes Nudivirus

Damage reduction after virus introduction – Fiji 1970s



(Adapted from Bedford 1981)

Figure 3:

CRB Attacking Guam is a Novel Biotype (CRB-Guam)

- ▶ genetically different
- ▶ resistant to all available isolates of OrNV
- ▶ more invasive

CRB-Guam is Genetically Different

Variation among CRB populations

Light to moderate palm damage
OrNV commonly detected

Severe palm damage
No OrNV detected*

agresearch

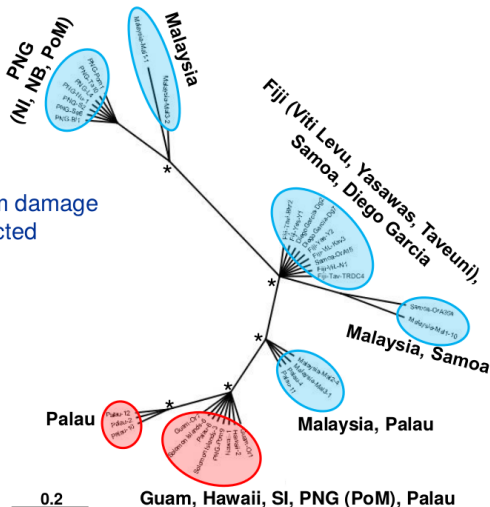


Figure 4:

CRB-Guam is More Invasive

- ▶ Following 30 years without range expansion, CRB has recently invaded Guam, Oahu (Hawaii), Guadalcanal (Solomon Islands), and Port Morseby (PNG). All new invasions involve CRB-Guam.

Discovery of the CRB-Guam Biotype

- ▶ Marshall, Sean, Maclean Vaqalo, Aubrey Moore, Roland Quitugua, and Trevor Jackson (2015). **A new invasive biotype of the coconut rhinoceros beetle (*Oryctes rhinoceros*) has escaped from biological control by *Oryctes rhinoceros nudivirus*.** Presented at the International Congress on Invertebrate Pathology and Microbial Control and the 48th Annual Meeting of the Society for Invertebrate Pathology, Vancouver, BC, August 2015. Available on-line at <http://www.sipmeeting.org/van1/SIP2015-Full%20Program.pdf>

Discovery of the CRB-Guam Biotype

- ▶ Jackson, Trevor (2015). **Need for emergency response for a new variant of rhinoceros beetle (Guam biotype).** International Association for the Plant Protection Sciences Newsletter (XI). November, 2015. Available on-line at <https://www.plantprotection.org/portals/0/documents/newsletters/2015/iapps%2011-2015.pdf>

Discovery of the CRB-Guam Biotype

- ▶ Vaqalo, Maclean, Sean Marshall, Trevor Jackson, Aubrey Moore (2015). **An Emerging Biotype of the Coconut Rhinoceros Beetle Discovered in the Pacific.** Secretariat of the Pacific Community, Land Resources Division. Available on-line at http://www.spc.int/lrd/plant-health-publications/doc_download/2374-ph-agalertno51

Recommended Action

8th Pacific Plant Protection Organisation Board Meeting & 16th Regional Technical Meeting on Plant Protection

Recommendations

- PICTs require a regional concerted effort to
 - **Create awareness** to the general public about the emergence of CRB-Guam biotype to try contain it from spreading to other sites
 - **Complete survey** of CRB DNA analysis in PICTs (Tonga, Tokelau, A/Samoa, Wallis & Futuna)
 - Determine the **specific origin** of CRB-Guam biotype
 - **Exploration of effective biological control candidates**, especially virus from native range of CRB Guam biotype
 - A need to **proper research on Improved management** initiatives/practices
 - **RTMPPO to endorse the intention to write a project proposal** to fund good research project on CRB-Guam type

21st – 25th September, 2015. Tanoa International Hotel, Nadi, Fiji

Figure 5:

Recent Changes on Guam



- ▶ CRB adults emerging from abundant typhoon generated breeding sites could trigger a positive feedback where CRB adults kill palms which become breeding sites which generate even more adults.
- ▶ Current tactics of trapping, sanitation, and application of *Metarhizium* may reduce local damage, but will do little to prevent an island-wide population explosion because most breeding sites are inaccessible (in jungle and/or on military bases).

Figure 6:

Recent Changes on Guam

- ▶ A CRB population explosion triggered by Typhoon Dolphin was predicted in the following press release.
- ▶ Anonymous. **Pacific Island Entomologists are Worried About a New Type of Coconut Rhinoceros Beetle Discovered on Guam.** University of Guam, College of Natural and Applied Sciences Press Release, September 2, 2015. <http://guaminsects.net/anr/sites/default/files/CRBpressRelease.pdf>

Recent Changes on Guam

- ▶ Recent trapping data indicate that a CRB population explosion was initiated by Typhoon Dolphin which visited Guam in May 2015, leaving many new breeding sites in its wake.