

Biosecurity Vanuatu Pest Reporting to IPPC

Date Thursday 26th September 2019



Figure 1: Map of Vanuatu. Blue Arrow indicates area where CRB was discovered on Efate Island.

1. Identity of the Pest

common name: Coconut rhinoceros beetle

scientific name: *Oryctes rhinoceros* (L.)

(Insecta: Coleoptera: Scarabaeidae: Dynastinae)

Oryctes rhinoceros (L.), the coconut rhinoceros beetle, is a pest species occurring throughout many tropical regions of the world. Adults can cause extensive damage to economically important wild and plantation palms.



Figure 2. Palm damaged by *Oryctes rhinoceros*. Photograph by [Mark Benavente](#).

Oryctes rhinoceros is one of the most damaging insects to palms in Asia and the Pacific Islands. Adults eat the leaves and burrow into the crown, stunting plant development (Giblin-Davis 2001).

Pest Description

Although *Oryctes rhinoceros* is found in several regions of the world, its shape, size and color are generally consistent (Manjeri et al. 2013). Adult beetles range from 1.2 to 2.5 inches in length (3.0 to 6.3 cm) and are dark brown or black. The ventral surface (underside) of males and females has reddish-brown hairs, but the female has a fuzzy grouping of these hairs at the tip of the abdomen. Both males and females possess a similarly sized horn used for leverage when moving within tightly-packed leaves or within the cavities they create in the crown of palms, the horn length is longer on average for males (Doane 1913).



Figure 3. Female (left) and male (right) *Oryctes rhinoceros*. In this picture, the head of the female is up while the head of the male is down, displaying an exaggerated difference in horn length. Photograph by [Mike Dornberg](#), Florida Department of Agriculture and Consumer Services, Division of Plant Industry.



Figure 4. *Oryctes rhinoceros* larvae (grubs) are milky white with red heads. The body is C-shaped, has three pairs of segmented legs, and is grayish posteriorly. Over the course of three instars, or phases between molts, they grow to 4.0 inches long (10.0 cm).

Note that pictures in Figure 2, 3 and 4 are taken from the internet, website: entnemdept.ifas.ufl.edu/creatures/orn/palms/oryctes_rhinoceros.htm

Geographical Distribution of CRB in Vanuatu.

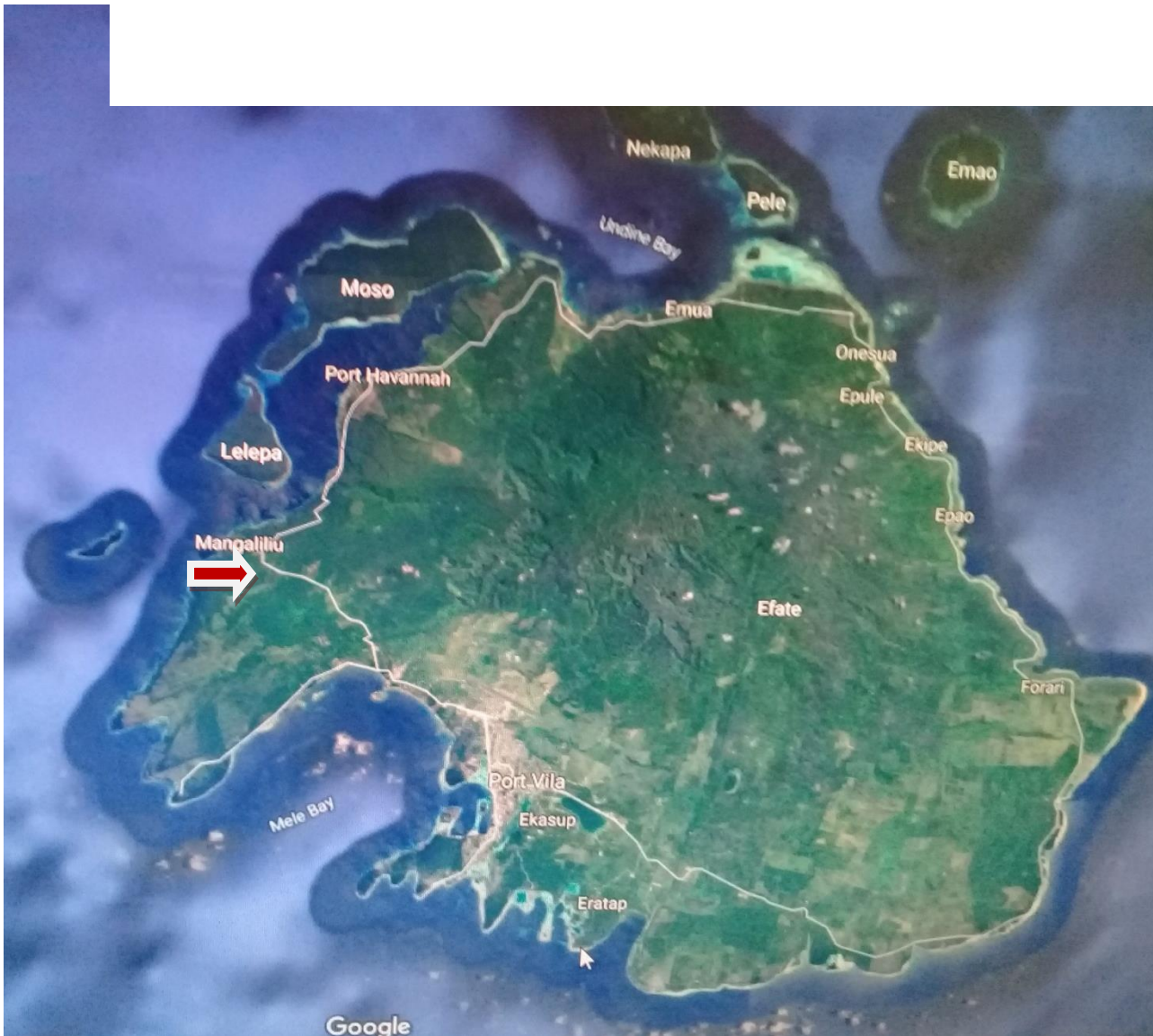


Figure 5: Efate Island, Vanuatu. Red Arrow indicates village of Mangaliliu, where the CRB incursion was discovered on the 20th of May 2019. Note that Efate Island is where Vanuatu's main Capital, Port Vila Town is situated.

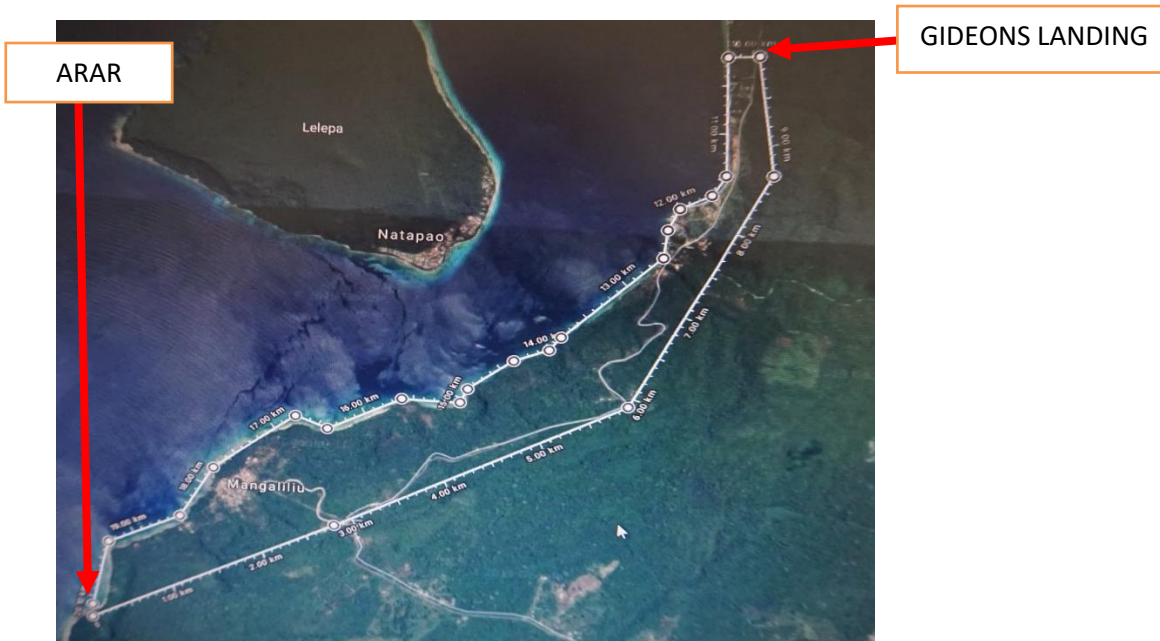


Figure 6: Infested Area on Efate, From Mangaliliu Village to Gideon’s Landing. Arar is part of Mangaliliu Village.

Coconut Rhinoceros Beetle (CRB), *Oryctes rhinoceros*, was discovered in Vanuatu on the 20th of May 2019. It was discovered by two Biosecurity officers while on official duty at the village of Mangaliliu on the Island of Efate, Vanuatu.

The discovery has been confirmed on Mangaliliu village on the Island of Efate. Samples were sent to Ag research in New Zealand and the results came back confirming for the first time occurrence of Coconut Rhinoceros beetle in Vanuatu.

Below is the result received from Landcare Research in New Zealand regarding the CRB sample sent to them.



SPECIES AND HAPLOTYPE IDENTIFICATION RESULTS REPORT

Samples

Two beetle specimens were sent to the Ecological Genetics Laboratory at Manaaki Whenua – Landcare Research in Auckland, New Zealand for species and haplotype identification. The samples were received at the laboratory on Thursday 23rd May 2019. The following details were included with each specimen:

Island: Efate, Vanuatu. Collection Date: 20/05/19. Collector: L. Howard.

Project Summary

DNA was extracted from leg tissue of each specimen using readymade reagents from Qiagen® following the manufacturer's instructions. Species and haplotype identification was undertaken by amplification of a highly conserved region of the cytochrome c oxidase subunit I (COI) gene using primers LCO1490 and HCO2198 (Folmer et al. 1994). Edited DNA sequences were then compared against sequences from GenBank, administered by The National Center for Biotechnology Information (NCBI). The BLAST (Basic Local Alignment Search Tool) algorithm was used to search for the most closely matching sequences within the NCBI database.

Results

The resulting DNA sequences both most closely matched the PNG (Papua New Guinea) haplotype (as defined by Marshall et al. 2017) of the *Oryctes rhinoceros* (coconut rhinoceros beetle) with a maximum identity of 100%, when compared against nucleotide sequences from GenBank.

References

- Folmer, O., Black, M., Hoeh, W., Lutz, R. & Vrijenhoek, R. (1994). DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology*, 3(5), 294-299.
- Marshall, S. D., Moore, A., Vaqalo, M., Noble, A. & Jackson, T. A. (2017). A new haplotype of the coconut rhinoceros beetle, *Oryctes rhinoceros*, has escaped biological control by *Oryctes rhinoceros nudivirus* and is invading Pacific Islands. *Journal of Invertebrate Pathology*, 149, 127-134

2. Host Concerned

Oryctes rhinoceros affects all palm related plants. The coconut rhinoceros beetle is most closely associated with its preferred host plant, *Cocos nucifera* L., the coconut palm (Hinckley 1973). Figure 2.

As with many beetles, adults and larvae have different feeding preferences. In the case of *Oryctes rhinoceros*, damage to plants is caused by adults (especially young adults) and not larvae, which feed on already rotting material (Giblin-Davis 2001).

Larvae live in decaying material including: *Cocos nucifera*, *Artocarpus* sp. (breadfruit), *Calophyllum inophyllum* (Alexandrian laurel), *Mangifera* sp. (mango), and *Pandanus* sp. (Gressitt 1953).

Adults are a major pest of *Cocos nucifera* (coconut palm) and *Elaeis guineensis* (African oil palm) (Giblin-Davis 2001) but are a minor pest of many other palms and plant species. By feeding on healthy leaves, *Oryctes rhinoceros* causes physical damage, which can stunt growth and lead to secondary infections from bacteria or fungi (Hinckley 1973).

Minor host plant species include:

<i>Acanthophoenix rubra</i> (barbel palm)	<i>Corypha umbraculifera</i> (talipot palm)	<i>Pandanus tectorius</i> (Tahitian screwpine)
<i>Agave sisalana</i> (sisal agave)	<i>Corypha utan</i> (buri palm)	<i>Phoenix dactylifera</i> (date palm)
<i>Agave americana</i> (American agave)	<i>Cyathea</i> sp. (tree fern)	<i>Phoenix sylvestris</i> (wild date palm)
<i>Aiphanes horrida</i> (ruffle palm)	<i>Dictyosperma album</i> (red palm)	<i>Pinanga</i> sp.
<i>Ananas comosus</i> (pineapple)	<i>Dypsis pinnatifrons</i>	<i>Pinanga insignis</i>
<i>Areca</i> sp. (areca palm)	<i>Heterospatha elata</i> var. <i>palauensis</i>	<i>Pritchardia pacifica</i> (Fiji fan palm)
<i>Areca catechu</i> (betel-nut palm)	<i>Hydriastele palauensis</i>	<i>Raphia farinifera</i> (raffia palm)
<i>Arenga</i> sp. (arenga palm)	<i>Hyophorbe lagenicaulis</i> (bottle palm)	<i>Raphia vinifera</i> (bamboo palm)
<i>Arenga pinnata</i> (sugar palm)	<i>Latania</i> sp.	<i>Roystonea regia</i> (royal palm)
<i>Borassus</i> sp. (borassus palm)	<i>Livistona chinensis</i> (Chinese fan palm)	<i>Saccharum</i> sp. (sugarcane)
<i>Borassus flabellifer</i> (palmyra palm)	<i>Metroxylon amicarum</i> (Caroline ivory-nut palm)	<i>Syagrus romanzoffiana</i> (queen palm)
<i>Caryota urens</i> (fish-tail palm)	<i>Metroxylon sagu</i> (sago palm)	<i>Thrinax</i> sp. (thatch palm)
<i>Casuarina equisetifolia</i> (Australian pine)	<i>Musa</i> sp. (banana)	<i>Verschaffeltia splendida</i> (Seychelles stilt palm)
<i>Clinostigma samoense</i>	<i>Normanbya</i> sp.	<i>Wodyetia bifurcata</i> (foxtail palm)
<i>Colocasia</i> sp. (taro)	<i>Nypa fruticans</i> (nipa palm)	
<i>Corypha</i> sp. (gebang palm)	<i>Oncosperma</i> sp.	

(Gressitt 1953; Lever 1969; Elfers 1988; Giblin-Davis 2001; Quitugua 2010)

3. Status of the Pest

As soon as the pest was discovered on May 20th, Biosecurity Vanuatu officers mobilised themselves so activities started on the 21st of May 2019. Officers were grouped according to following activities:

- Group 1-Surveillance (Delimiting survey)
- Group 2- Construction and placement of PVC and Bucket Traps
- Group 3-Preparation and presentation of Awareness material around communities on Efate Island.
- Group 4-Sanitation- Destruction of breeding sites and covering burned breeding sites with Gill nets.

So far sanitation work has been completed for the infected area, and the burned breeding sites are being revisited, re-burned and covered with gill nets.

Two other incursions were reported on two other islands, namely Emae Island and Santo Island, but this has been confirmed to be *Oryctes centaurus* which is native to Vanuatu. Once

molecular analysis is ready, the NPPO Vanuatu will inform IPPC of this update. So far the beetle is only confined to Efate Island, from Mangaliliu village (Arar Point) to Gideon's Landing.

The infected area has been divided into 3 zones, Zone 1, Approximately 2KM radius - 203,800 square meters, Zone 2, Approx. 17 KM radius – 5.03 Square Kilometres and Zone 3, Approx. 7 KM radius – 907,800 Square Meters. So far surveillance, placement of traps and sanitation work has covered all this area and at the moment casuals are revisiting burned sites for re-burn and covering of all burned breeding sites with gill nets.

The Biosecurity Department is using metharizium fungus and Oryctes Nudi virus as biological control for the Beetle.

More updates on these Biological control agents will be made available when Data is collected during the Evaluation and Monitoring period.

4. Conclusion

To control movement of the pest from spreading out of infected area, check points have been placed so officers inspect all goods coming out from nearby surrounding areas before reaching the main market in Port Vila town. Communities have been advised to de-husk both green and dry coconuts before leaving the infected area. More awareness will be provided to communities in the infected area as well as nearby villages about importance of movement control of host materials for CRB.

Reference

1. http://entnemdept.ifas.ufl.edu/creatures/orn/palms/oryctes_rhinoceros.htm
2. ISPM 8
3. ISPM 17
4. CRB Daily Situation reports June 2019, Bill Garae