



## Submissions for Diagnostic Protocols

### I. General information

<b>Submission number</b>	2023-003
<b>Title of Proposal</b>	Developing Diagnostic Protocols for the Coconut Rhinoceros beetle (CRB). <i>Oryctes rhinoceros</i>
<b>Submitted by</b> (Country or Organization)	Regional Plant Protection Organization (RPPO)
<b>IPPC Official Contact Point or RPPO</b>	Pacific Plant Protection Organisation (PPPO)
<b>Supported by</b>	Pacific Plant Protection Organisation (PPPO)

### 2. Contact information

<b>Name</b>	Dr Mark Ero
<b>Position and organization</b>	Project Leader of Pacific Awareness and Response to Coconut Rhinoceros (PARC) project, SPC
<b>Mailing address</b>	The Pacific Community SPC, Private Mailbag, Nabua, Suva, Fiji.
<b>Phone</b>	+679 7339083
<b>Email</b>	visonit@spc.int

### 3. Summary of proposal

<b>Summary of justification for the proposal</b>	Coconut Rhinoceros beetle CRB is the major pest on coconuts in the region. For decades there has only been 1 strain of CRB established in the region and damage levels have been moderately low due to introduction of the nudi virus. However in the last decade several new strains of CRB have been identified and do not respond to the current control methods thus causing extremely high levels of damage to coconuts. The coconut tree is termed in the region as the tree of life. If the new strains are not managed soon this will allow them to disperse in the region causing extreme damage leading to food security issues.
<b>Proposed priority</b>	I (high)
<b>Comments</b>	CRB is native to South East Asia but is also found in Reunion, Yemen and many Pacific Island countries.

### 4. Literature review

Literature review	<p>Introduction: The coconut rhinoceros beetle (<i>Oryctes rhinoceros</i>) is a destructive pest that poses a significant threat to coconut palms (<i>Cocos nucifera</i>) and other palm species worldwide. This literature review aims to provide an overview of the current knowledge on the beetle's biology, ecology, distribution, damage potential, and management strategies.</p> <p>1. Biology and Life Cycle: The coconut rhinoceros beetle is a large, dark-colored insect belonging to the family Scarabaeidae. Adult beetles measure around 2-5 cm in length, with males exhibiting a characteristic horn-like projection on their head. Females lay eggs in decaying organic matter, such as fallen palm fronds or compost piles. Larvae feed on decomposing plant material, including the roots and stems of palm trees. Pupation occurs within a cocoon made of soil and plant debris, with adults emerging after a few weeks.</p> <p>2. Ecology and Distribution: Originally native to Southeast Asia, the coconut rhinoceros beetle has spread to various tropical regions, including the Pacific Islands, Africa, and parts of the Americas. The beetle's distribution is influenced by factors such as climate, host availability, and trade routes. Its ability to adapt to different environments and host plants contributes to its successful establishment in new areas.</p> <p>3. Damage Potential: Coconut rhinoceros beetles cause significant damage to coconut palms, which are an essential economic and cultural resource in many tropical regions. Adult beetles feed on the leaves, creating characteristic V-shaped cuts that can lead to defoliation and reduced palm productivity. Larval feeding damages the palm's root system, weakening the tree and making it more susceptible to wind damage and disease.</p> <p>4. Management Strategies: Effective management of coconut rhinoceros beetles requires an integrated approach that combines cultural, biological, and chemical control methods. Cultural practices, such as proper sanitation and removal of breeding sites, can help reduce beetle populations. Biological control agents, including parasitic wasps and nematodes, have shown promise in suppressing beetle populations. Chemical control, mainly through the use of insecticides, can be effective but should be used judiciously to minimize environmental impact.</p> <p>5. Research Gaps and Future Directions: Despite significant research efforts, there are still several knowledge gaps regarding the biology and management of coconut rhinoceros beetles. Further studies are needed to understand the beetle's behavior, host preferences, and factors influencing its population dynamics. Additionally, the development of sustainable and environmentally friendly control strategies, such as the use of pheromone traps or genetic control methods, holds promise for future management efforts.</p> <p>References:</p> <p>1. Beddard FE. (1897). A monograph of the genus <i>Oryctes</i>. London: Taylor &amp; Francis.</p> <p>2. Hallett RH, O'Connor S. (2007). The coconut rhinoceros</p>
-------------------	--

	<p>beetle: its biology and management. In: Vreysen MJB, Robinson AS, Hendrichs J, editors. Area-Wide Control of Insect Pests. Dordrecht: Springer. p. 257-264.</p> <p>3. Marshall SDG, Moore A, Vaqalo M, et al. (2017). Biology and management of the coconut rhinoceros beetle, <i>Oryctes rhinoceros</i> (Coleoptera: Scarabaeidae), in the Pacific. <i>Journal of Insect Science</i>, 17(1): 1-19.</p> <p>4. Sisay B, Emanu G, Feyisa T, et al. (2020). Integrated pest management of coconut rhinoceros beetle, <i>Oryctes rhinoceros</i> (L.) (Coleoptera: Scarabaeidae): a review. <i>Journal of Entomology and Zoology Studies</i>, 8(4): 144-150.</p> <p>5. Vargas RI, Stark JD, Mackey B, et al. (2010). Evaluation of the <i>Oryctes rhinoceros</i> (Coleoptera: Scarabaeidae) nudivirus as a biocontrol agent for rhinoceros beetles. <i>Journal of Economic Entomology</i>, 103(2): 183-189.</p>
--	---

### 5. Criteria for prioritization of Diagnostic Protocols

Criteria	Information provided by Submitter
<b>1. Need for international harmonization of the diagnostic techniques for the pest (e.g. due to difficulties in diagnosis or disputes on methodology)</b>	The emergence of new strains has led to some uncertainty on the appropriate diagnostic tools especially at the molecular level. There is need to look at the current molecular techniques being used currently and other possible techniques in order to determine the best way forward.
<b>2. The relevance of the diagnosis to the protection of plants including measures to limit the impact of the pest.</b>	Diagnosis is important to determine exactly what these new strains are and provide the best diagnostic method available. This will also help determine which management measures are best for each of the strains as we still do not know which nudi strain is most appropriate for each CRB strain etc.
<b>3. Importance of the plants protected on the global level (e.g. relevant to many countries or of major importance to a few countries).</b>	The coconut tree is distributed globally in tropical sub tropical regions and the CRB has spread to many countries and regions already. The potential for the biotypes to also spread to these regions.
<b>4. Volume / importance of trade of the commodity that is subjected to the diagnostic procedures (e.g. relevant to many countries or of major importance to a few countries).</b>	Diagnostic protocols will allow proper and accurate identification of biotypes which will help predetermine the impact that new introduced biotypes could potentially cause to coconut production and trade.
<b>5. Other criteria for topics as determined by CPM that are relevant to determining priorities</b>	Huge impact on agriculture trade as huge array of commodities from coconuts. Have impact on food security at national and regional level. Implementation will have global impact
<b>6. The balance between pests of importance in</b>	The pest will affect developing countries since most lie within the tropical regions. Coconut products lie in the Class III

<b>different climatic zones (temperate, tropics etc) and commodity classes.</b>	
<b>7. Number of labs undertaking the diagnosis.</b>	There are currently 3 labs undertaking the diagnosis work in Landcare Nz, University of Queensland, and CSIRO Australia.
<b>8. Feasibility of production of a protocol, including availability of knowledge and expertise.</b>	I believe that we have enough people in the regions of the pacific islands and Asia to conduct the work