

Date: 23 February 2022

To: Shaun Walsh – Noosa Council

Cc: Larry Sengstock, Kim Rawlings, Leo Jensen – Noosa Council

From: Dr Eddie Game - The Nature Conservancy

Subject: Response to questions to Noosa Council regarding QX and winter mortality disease risk to Sydney Rock Oyster ecosystem restoration in the Noosa River estuary.

Thank you for the opportunity to respond to this inquiry. TNC is a science-based organization which takes environmental disease, biosecurity and other risks to project success very seriously. We therefore carefully evaluate and manage for these risks in restoration projects like the Noosa Oyster Ecosystem Restoration Project.

Below is a summary of the key points in our response, followed by a more detailed explanation.

- QX and winter mortality disease are endemic to South-east Queensland and occur where rock oysters are found.
- These diseases can cause high, but rarely total, mortality in rock oyster populations. Mortality rates are highly variable.
- Wild populations of oysters have some natural resilience to endemic disease.
- The larger and more genetically diverse an oyster population is, the greater its chances of developing natural resilience to disease.
- TNC has taken a careful and precautionary approach to ameliorate the impact of environmental risks such as QX and winter mortality disease to Noosa's oyster restoration efforts. Supplementing natural recruitment with hatchery-reared Noosa oysters placed on the reefs will help combat oyster mortality due to disease and also other environmental factors.
- TNC will monitor the reefs closely and continue to rely on its extensive local and international network of shellfish experts to inform management responses and address threats to oyster restoration.
- Restoration is an action to boost the number, genetic diversity and thus resilience of rock oysters and associated species and is a key reason why human assisted oyster ecosystem restoration is required.

About QX disease and winter mortality in Sydney rock oysters

'QX' stands for 'Queensland Unknown', the title given to this disease before scientists discovered the parasitic organism that we now know causes it. In 1976, *Marteilia sydneyi* was formally described as the cause of QX disease in oysters. *Marteilia sydneyi* is a protozoan (single-celled) parasite that belongs to a small group of parasites that mostly affect bivalves (animals with two 'shells', such as

oysters, mussels, and pipis). QX disease infects the Sydney rock oyster (*Saccostrea glomerata*), which is the commercial rock oyster grown along the east coast of Australia from the NSW/Victorian border north to the Great Sandy Strait in southern Queensland¹.

QX infection in Sydney Rock Oysters is seasonally occurring, usually between January - April, with affected oysters losing condition and dying through autumn and winter. While seasonal, infection dynamics are complex, and it is not always observed each year in those estuaries where it is known to occur. *M. sydneyi* has a lifecycle which involves at least two hosts, which means QX cannot be passed directly from one oyster to another (is not directly transmissible). Periods of extremely warm water, accompanied by high rainfall tend to result in QX outbreaks, but not always. It is important to note that the presence alone of *Marteilia sydneyi* does not necessarily result in outbreaks of QX¹.

About Winter Mortality disease in Sydney rock oysters

Winter mortality (WM) is a poorly studied disease affecting Sydney rock oysters in estuaries in New South Wales and Queensland where it can cause significant losses. WM is more severe in oysters cultured deeper in the water column and appears linked to higher salinities. It is often suggested that WM is caused by the microcell parasite *Bonamia roughleyi*, but evidence linking clinical signs and histopathology to molecular data identifying bonamiasis is lacking².

TNC actions

The Noosa Oyster Ecosystem Restoration Project - Project Management Plan, which was endorsed by the project's Technical Advisory Group (TAG) and endorsed by Noosa Council in its September 2020 general meeting, assessed environmental risks to the success of the Noosa Oyster Ecosystem Restoration Project.

Pre-project implementation, those risks were rated as medium, but with management action during implementation, all parties agreed that those risks would be reduced to a low and acceptable level. TNC has implemented a raft of measures to address environmental risks. These actions, listed below, result in a low-risk rating for environmental threats:

1. Use of science and habitat suitability models to inform the site selection process (e.g., water quality, topography, hydrodynamic, sediment analysis, benthic habitat type, historic shellfish ecosystem locations).
2. Establishment and engagement of a technical advisory group (TAG) to help guide and review management interventions.
3. Established Shuck Don't Chuck oyster shell recycling and will augment natural oyster reseeded of the oyster reef patches with oyster shells seeded with Noosa oyster spat. Reseeding is a

¹ Reference: www.dpi.nsw.gov.au/fishing/aquatic-biosecurity/pests-diseases/animal-health/aquaculture/qx-oyster-disease

² Dis Aquat Organ. 2014 Jul 24;110(1-2):151-64. doi: 10.3354/dao02629.

widely used and highly successful method of ensuring against low natural oyster recruitment and can be used to help recover reefs impacted by events such as disease outbreaks.

4. Regular consultations with relevant experts in shellfish, shellfish diseases, oyster aquaculture and/or shellfish restoration about environmental risks such as disease:

- Dr Ben Diggles, Digfish Services – independent marine pathologist, advisor to DAF and Queensland expert in marine invertebrate diseases and pests such as QX and winter mortality
- Dr Stephen Welsche, shellfish aquaculture and QX expert, DAF biosecurity division + member of the Noosa TAG
- Rebecca Schofield, DAF aquaculture specialist and member of the Noosa TAG
- Wayne O’Conner, Sydney Rock Oyster aquaculture expert, Department of Primary Industries, NSW
- Dr Vicki Cole, specialist shellfish restoration ecologist, Department of Primary Industries, NSW
- Dr Max Wingfield – Shellfish specialist and lead officer for the planned Noosa oyster seeding project, Bribie Island Research Centre (DAF)

As well as TNC’s internal expert team:

- Dr Boze Handcock, TNC global shellfish restoration lead scientist
- Dr Eddie Game, TNC Lead Scientist & Director of Conservation, Asia Pacific
- Dr Chris Gillies, marine invertebrate ecologist and past Director of Australia Oceans Program

5. Drawn on experience gained from other projects and processes where QX and winter mortality disease are also endemic. These projects include:

- Dr Ben Diggles, Ozfish and Healthy Land and Water led - Pumicestone Passage, Moreton Bay pilot Sydney Rock Oyster restoration project
- Department of Primary Industry led - Port Stephens, Sydney Rock Oyster restoration project
- TNC in partnership with DPI - Sydney Rock Oyster Restoration Project – Botany Bay, NSW
- TNC in partnership with DPI - Sydney Rock Oyster Restoration Project – Wagonga Inlet, NSW

5. Developed a comprehensive Project Restoration Plan for Noosa oyster restoration which includes detailed restoration monitoring and adaptive management procedures which will be used if environmental hazards hinder oyster reef restoration. One key response to high oyster mortality is oyster reseeded in future years, if the project requires this additional measure.

6. Developed a comprehensive site-by-site restoration monitoring, evaluation and reporting system, which will be used by TNC and its contract ecologists to track and report on the ecological performance of Noosa’s oyster reefs and which will guide any future adaptive management required to ensure their restoration success.