National Science Challenges | SUSTAINABLE SEAS | Ko ngā moana whakauka

Image: Mike Martin / NIWA

Summary

# What to consider when starting rehabilitation and restoration activities for shellfish and their habitats

**Shellfish are central to thriving coastal marine communities in Aotearoa New Zealand – as kaimoana and as essential components of a healthy ecosystem. As the health, structure, and function of many of our coastal ecosystems have declined or changed, so too have some of the once plentiful shellfish beds.**

## About this document

This document gives an Aotearoa New Zealand perspective and overview of the importance of shellfish to healthy marine ecosystems, and the pressures that threaten them. It describes a process and wider considerations for initiating restoration or rehabilitation activities. These considerations include:

- cultural perspectives
- setting and agreeing on goals
- risk and benefits
- evaluating success
- legal considerations.

Image: Dave Allen / NIWA

## Shellfish provide important ecosystem functions and services

Shellfish are an essential group of organisms in our marine environment. The organisms themselves, and the habitats they create, provide important ecosystem functions, including:

- filtering water
- recycling nutrients and chemicals
- stabilising sediment
- enhancing biodiversity
- increasing the complexity of habitats
- providing food.

These functions provide direct benefits to humans – known as ecosystem services – including improved water quality, carbon sequestration and denitrification, coastal protection, and fisheries enhancement. Shellfish are also culturally and economically significant.

## Stressors and their cumulative effects harm shellfish and their habitats

Despite the benefits of shellfish to the marine environment and the ecosystem services they provide, many stressors can harm them, for example seafloor disturbance, climate change, pollution, nutrients, sediments, invasive species, and disease. The level of impact varies, ranging from reducing resilience of shellfish to future stressors, to complete degradation of their habitat. The impacts of multiple stressors, at once or over time, can accumulate to cause greater impacts.

## Rehabilitation initiatives need a clear vision and purpose

Interest is increasing in improving shellfish populations and habitats and the ecosystem services they provide – through restoration and rehabilitation.

- Restoration aims to help an ecosystem recover to a pre-degraded state.
- Rehabilitation aims to recover and re-establish the functionality of an ecosystem.

For longer-term success and persistence of any restoration or rehabilitation activities, initiatives should have a clear purpose and vision, and include and consider cultural perspectives and ecosystem-based management.

Good initiatives will have clear and collective goals, strong leadership, and a collaborative and engaged working team. This team will have evaluated and agreed on the strategies that are likely to be effective, and carefully considered potential risks, scientific information, and legislative requirements (including customary requirements). The team will also have ensured that their goals and actions or activities align with other actions and initiatives beyond their own. A longer-term plan should be in place for monitoring and measuring success (or failure) of the activities, and for adapting plans accordingly.


**For a full report with more detailed discussion, including practical examples, please see Considerations for rehabilitation of shellfish and shellfish habitat in Marlborough Sounds**

Image: Dave Allen / NIWA

## Follow a process to rehabilitate shellfish and their habitats

The reasons for rehabilitating shellfish and their habitats will depend on the overall vision. It's important that goals are identified, discussed, and agreed at the outset, and viewed as part of wider management considerations of the area in question. Here is a suggested process.

### Define the problem and goals to be addressed 1

Work together to define and agree on the issue (problem) and the goals of the activities.

### Decide who should be involved 2

Ensure there is broad engagement, including with community, tangata whenua and stakeholders, to incorporate the needs and concerns of multiple people. Consultation should be wide in the first instance. Partners with different perspectives, and a range of knowledge and skillsets, will ensure the relevance and usefulness of the activities.

### Understand the legislative requirements for any proposed projects 3

Legislation and policy settings are crucial enablers or inhibitors for rehabilitation in the marine environment. Settings should provide the necessary structure, support, and regulation to ensure that shellfish rehabilitation efforts are successful, sustainable, and beneficial for the marine environment and communities.

Aotearoa New Zealand has a complex regulatory environment (particularly in the coastal area), where several different pieces of legislation protect the marine environment and manage use of its resources. Our current policies are protection-centric, and rehabilitation policies need to be developed to better support active marine rehabilitation of degraded marine environments. Creating fit-for-purpose marine rehabilitation policy for Aotearoa New Zealand would offer several benefits, addressing existing challenges and facilitate more effective (and efficient) rehabilitation efforts.

### Learn from and build on existing knowledge and other rehabilitation initiatives 4

Immense value comes from learning from previous projects and aligning with other initiatives, to avoid duplication and to build on existing knowledge or activities. We can learn much from the experience and mahi of others, who may have investigated reasons for population declines, and trialled or implemented various activities. Considering existing knowledge and information can help avoid repeating mistakes or ineffective techniques, ensure projects complement each other, and give a project a head start.

### Consider the feasibility, effectiveness, risks, and benefits of proposed activities 5

Before beginning, carefully consider each option for rehabilitation, and the planned actions that are required to achieve it. This work should include evaluating the feasibility of implementing the action(s), for example how difficult is it to do, what will it cost, and do you have the capability? Evaluate if the action was implemented, how effective it would be towards achieving the goal. Weigh up the risks and benefits of options and think beyond the initial implementation. Examples of risks include, the ecological and biosecurity ramifications of transplanting potentially parasite-infested or contaminated shellfish, the spread of invasive species into new areas (for example, fan worms, tunicates, or algae), or the mixing of shellfish populations from different areas, which can reduce diversity of a species over larger spatial scales.

Evaluating risk is important when initiating a project and it should also be re-evaluated routinely throughout the project's lifetime.

### Consider species' whole ecological requirements 6

When the intent is to restore biodiversity and a natural functioning community through the enhancement of a key species, it's crucial to understand the ecological needs and requirements of the species throughout its life history. As an organism develops and grows over time, its habitat requirements change. What does the species need to grow and survive at each life stage, for example food, shelter, and oceanographic conditions? What are the threats to each life stage, for example predators, sediments, and ocean acidification?

This information is essential to determining the suitability of the habitat, the timing of any activities, and the likely longer term persistence of the species. As a major goal is for the population to be self-sustaining, all these considerations will provide information to increase the chances of a project being successful.

### Evaluate success 7

Success depends on the goals, and the outcomes that you are wanting. To learn from rehabilitation projects, it is important to design suitable monitoring. The measures used for evaluating and determining success can be largely based on the goals of the rehabilitation or restoration project.

Different environmental factors and conditions make locations more or less suitable for the species of interest. Other summaries are already available that provide useful guidance on what factors are important to monitor, and the methods for doing so.

A baseline evaluation or an initial survey, carried out before activities begin, provides a benchmark or starting point that can be used to evaluate the effects of any restoration or rehabilitation efforts.