National SCIENCE Challenges

RESEARCH ROUND-UP

Aquaculture: Tools, resources and research

This is a catalogue of our tools, resources and research that are relevant to aquaculture.

These were developed with stakeholders and Māori partners.
Some are already in use, others may require further development by users.

Summary

Available now

Real-time forecasting tool

Digital Tool

This provides a daily forecast (like a weather map) of river plumes entering the sea and contaminant measurements that accurately estimate *E. coli* bacterial contamination risk in Tasman and Golden Bay waters.

Aquaculture farmers can use the tool to help manage shellfish harvest and minimise the number of days unnecessarily closed to harvest.

How much development is required?
Currently only applicable to Tasman Bay and Golden Bay. Costs to maintain this is estimated between $5,000 to $7,000 per month (depending on the extra features). Sampling costs are not included. With some further validation and testing this model could replace existing harvest rules.

Contact: Ben Knight, Cawthron
Find it at: sustainableseaschallenge.co.nz/real-time-forecasting-tool or scan the QR code

Ocean Plastic Simulator

Digital Tool

This online public engagement tool tracks how floating plastic waste moves around Aotearoa New Zealand's coastline. With the right source data, it can be modified to show where plastic pollution has come from or to predict the movement of floating things.

It has been adapted for use in environmental impact assessments and is being used to predict the ecological footprint of proposed salmon farm sites.

The underlying model is being used in a number of ways, including research into biosecurity tools, tracking natural mussel spat, and the connectivity between farms to assess the risk of disease. The aquaculture industry could use it to track or predict larvae, spat, or lost equipment, and track the spread of disease or invasive species between farms.

Contact: Ross Vennell, Cawthron
Find it at: sustainableseaschallenge.co.nz/ocean-plastic-simulator or scan the QR code

Social licence language

Summary

The term 'social licence to operate' suggests that communities have power to grant or withhold approval of commercial operations in the marine environment. However, the language that the aquaculture industry uses when talking about social licence can empower or disempower communities.

This poster summarises the types of verbs that should be considered when discussing social licence to empower communities and build the genuine relationships required for social licence.

How much development is required?
None, it is ready for use now.

Find it at: sustainableseaschallenge.co.nz/social-licence-poster or scan the QR code

Ingredients Tool

Guidance

A practical one-page resource for marine managers, and others, to support broad participation in marine decision-making.

If an aquaculture company is planning to expand operations, set up a new farm, or to improve community relationships, this can be used to structure discussions and encourage deep conversations.

How much development is required?
None, this tool can be used now.

Find it at: sustainableseaschallenge.co.nz/ingredients-tool or scan the QR code

Ecosystem models

We have developed a suite of ecosystem models to explore the implications of a range of environmental or management scenarios in Tasman and Golden Bays:

- *Atlantis Model* – An 'end-to-end' modelling tool that allows researchers and decision makers to test the effects of different scenarios on the whole ecosystem, encompassing everything from sunlight and nutrients through to predators and fisheries.
- *Food web model* and *size-based ecosystem model* – These are simpler to use with shorter run times than Atlantis and can be used to prioritise scenarios for Atlantis runs.

How to use this? For all these models, stakeholders and Māori partners can identify possible scenarios, but a modelling expert is required to run the models and support interpreting their outputs.

Contact: sustainableseasNC@niwa.co.nz
Find it at: sustainableseaschallenge.co.nz/ecosystem-models or scan the QR code

Detecting harmful algal blooms

Our aim was to develop simple, cost-effective sensitive tests that could be used by public health agencies and the aquaculture industry to detect and monitor harmful algal blooms. These can reduce the risk of unnecessary closures. We trialled:

- *qPCR* – Detects and quantifies algal DNA in the water. The method was sensitive, simple and practical. We were able to estimate the amount of the algae present within 90 minutes of collecting samples. Cawthron is continuing to optimise this testing method.
- *Imaging FlowCytoBot* – This device can automatically identify and count algal cells underwater. Cawthron is now training image recognition software to identify local species, and working with an aquaculture industry consortium to investigate purchasing an IFCB.

Contact: Lincoln Mackenzie, Cawthron
Find it at: sustainableseaschallenge.co.nz/early-detection-of-harmful-algal-blooms or scan the QR code

Aotearoa Cumulative Effects framework

A tool to help planners and agencies collaboratively manage cumulative effects across a range of scales (spatial and temporal), developed in partnership with Aquaculture New Zealand, government agencies and community representatives.

It can be used to facilitate discussions with community, stakeholders, local authorities, and other users. It can also help identify potential issues to do with cumulative effects when developing resource consents applications.

How much development is required?
None, this guidance can be used now.

Find it at: sustainableseaschallenge.co.nz/ace-framework or scan the QR code

Mitigating ocean acidification around mussel farms

Two strategies – waste shell and aeration – were tested in field experiments to see how effective they are at mitigating acidification around mussel farms.

What was found? Although we found that waste shell or aeration have limited potential to mitigate ocean acidification around mussel farms (within the scope of this study), it has provided recommendations for future research:

- Investigate applying both strategies at the dropper line scale.
- Consider more direct uses of waste shell such as calcination.
- Aeration may be more beneficial upstream of the farm, as opposed to within it, but this requires further testing.
- Assess natural 'bio-buffering' options such as macroalgae beds upstream of mussel farms.

Contact: Cliff Law, NIWA
Find it at: sustainableseaschallenge.co.nz/mitigating-mussel-acidification or scan the QR code

Ecosystem services maps

Knowing where biogenic refuge habitat is located can be useful when considering locations for aquaculture farm resource consents or marine spatial planning purposes.

Biogenic habitat refuge maps are available for the Hauraki Gulf, Queen Charlotte Sound and Te Tau Ihu/Top of the South.

How much development is required?
None, these maps can be used now.

Find it at: sustainableseaschallenge.co.nz/ecosystem-services or scan the QR code

Upcoming research

Innovation Fund 2020

The Innovation Fund supports research projects that will help build a blue economy in Aotearoa New Zealand. Some of the projects announced this year are relevant to aquaculture. These projects will be up and running in early 2021.

Learn more at: sustainableseaschallenge.co.nz/innovation-fund or scan the QR code

Testing natural fibres for mussel restoration lines

The *Awhi Mai Awhi Atu* project is investigating the feasibility of mussel lines made from natural fibres. Informed by mātauranga Māori, this project has the potential to help restore mussel beds without plastic pollution from mussel farming equipment (rope).

Contact: sustainableseasNC@niwa.co.nz
Find it at: sustainableseaschallenge.co.nz/awhi-mai-awhi-atu or scan the QR code


©Dave Allen, NIWA

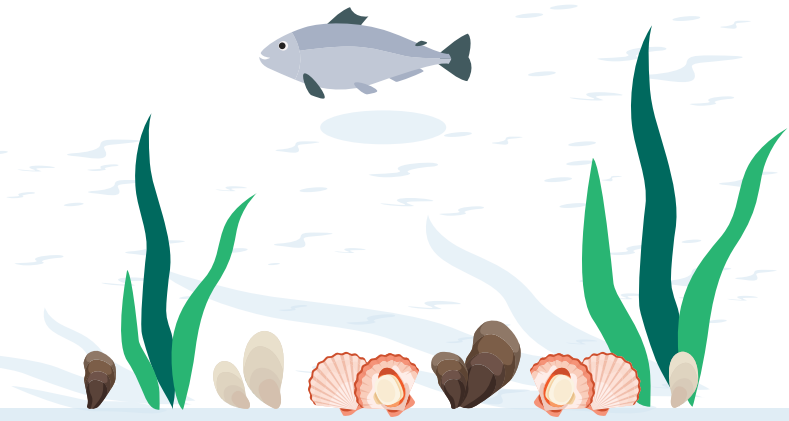
Ecosystem connectivity: shellfish survival and salmon farm waste

We traced water and sediments from land through coastal food webs to identify the effects of key coastal developments (including aquaculture) on food web connectivity.

- *Shellfish survival* – We studied how changes in land-use have influenced uptake of organic matter and contaminants by bivalve populations including cockles, mussels, scallops and horse mussels.
- *Commercial fish farms* – We studied how waste materials from salmon farming operations are taken up and processed by natural food webs.

These two studies were part of Masters and PhD research, which are expected to be published in the primary literature in 2021.

Contact: Steve Wing, University of Otago
Find it at: sustainableseaschallenge.co.nz/ecosystem-connectivity or scan the QR code



Watch now

The following videos, webinar or public talk recordings are useful resources.

Find them at:
bit.ly/SusSeasYouTube

- Webinar: **Tracking ocean plastic**
- Video: **Mitigating ocean acidification**
- Webinar: **Measuring and mapping ecosystem services**
- Webinar: **Which ecosystem model works best for what you need?**
- Webinar: **Detecting and forecasting coastal contamination**