Ministry for Primary Industries
Manatū Ahu Matua

APF Project Web Summary

Project Title:	Marlborough Sounds Hydrodynamic and Ecological Modelling
Grantee:	Marlborough District Council
Grant Number:	13-01
Contact Person:	Dr Steve Urlich
Address:	PO Box 443, Blenheim
Telephone:	
Email:	steve.urlich@marlborough.govt.nz
Related website links:	http://www.marlborough.govt.nz/

Summary

This coastal project is designed to contribute towards gaining a better understanding of the marine physical and biological characteristics of the Pelorus and Outer Marlborough Sounds. The development of a 3D hydrodynamic model coupled with a water quality model validated by the collection of water quality parameters will help determine base line information for water quality. The models will also enable simulation of any influence of existing aquaculture activities on nutrient concentrations, phytoplankton, zooplankton and deposition. The models will then be able to simulate any influence on the environment from future aquaculture scenarios.

The Opportunity

Marlborough coastal resources are increasingly utilised by the community, tourism, recreational users and industry. In regard to aquaculture there are currently 576 marine farm sites authorised in the coastal waters of Marlborough.

The Council have a statutory planning role and are required to balance the sustainable growth of aquaculture in the sounds against a range of values including; environmental, social and cultural values.

A number of environmental pressures exist from marine based activities and land use intensification. The understanding of the environmental consequences of any future development is undermined by a lack of environment information. Furthermore, the cumulative environmental effect on the coastal environment from land based activities is not that well understood. The planning process is difficult when resource knowledge of Marlborough's marine environment is limited. There is currently no baseline water quality information or any real appreciation of water quality limits or holding capacity for aquaculture in the coastal marine area.

This project provides an opportunity to gain a better understanding of coastal water quality, cumulative effects on the environment, and the likely scenarios for any potential growth in Aquaculture.

Intended Outcomes

The key outcomes from the project will mean an improved understanding of the Pelorus and Outer Sounds marine physical characterises, water quality, and will help determine environmental bottom lines. The information will help our collective understanding of the environmental effects from marine farming and will assist future consent holders and other agencies with more effective and efficient monitoring. The information and modelling will also assist Council, Government, Industry and Iwi to make sustainable decisions on the cumulative effects relating to the use and development of the marine area.

Methods

The first stage of the project (2013/14) is focused within the Pelorus Sound. The second phase of the project is expected to extend to the Outer Sounds (Port Gore) during 2014/15. The selection of monitoring sites are to be determined for state of the environmental monitoring outcomes, however integration where possible with the monitoring data requirements of other marine consent holders consent conditions will be taken into consideration.

The 3D models to be developed are based on the 'Regional Ocean Modelling System' (ROMS) and 'Fennel' for the water quality (ecological) model.
The project methods, in summary, include:

- Conducting 3D hydrodynamic simulations to accurately simulate tidal, wind and residual currents, and model the changes in stratification over seasonal and annual periods, at a spatial resolution sufficiently fine to resolve bay-scale flow features
- Conducting coupled hydrodynamic-water quality modelling to simulate the influence of present day aquaculture activities on nutrient concentrations, phytoplankton, zooplankton and deposition
- Conducting coupled hydrodynamic-water quality modelling to simulate the influence of future aquaculture scenarios (e.g. increased finfish farming) on nutrient concentrations, phytoplankton, zooplankton and deposition.
- Monthly collection of samples at two depths of; Nutrients, chlorophyll, suspended solids, phytoplankton, carbon & nitrogen, zooplankton
- Monthly profiles of salinity, temperature, PAR, chlorophyll & dissolved Oxygen at 11 stations in the PS.

The information will be presented to a least three stakeholder forums at the completion of the Pelorus and Port Gore models. A state of the environment report card summarising the project outcomes will be available on the MDC web site.

Update at Project Completion

Outcomes Achieved

The key outcome from the project of an improved understanding of the Pelorus Sound marine physical and water quality characteristics has been achieved.

This was presented to Council by NIWA on 23 July 2015, and also submitted to MPI.

The model is now up on Council's coastal webpages[1]
https://www.marlborough.govt.nz/environment/coastal/coastal-ecosystems/hydrodynamic-models

The information has achieved the intended outcome of improving our collective understanding of the environmental effects from marine farming.

The model has been through a number of forums: Council's Environment Committee on 23 July 2015[2] and a community/industry workshop held on 1 April 2015 in Blenheim, and the Sounds Advisory Group on 10 August 2015[3]. A presentation of the model to Council is also on Council's YouTube channel[4].

It has been used in planning and consent processes for marine farms. For example, MPI and NZ King Salmon have commissioned subsequent work (and refinements) using the model to inform the 2016-2017 salmon farm relocation process.

This is contributing towards the intended outcome of assisting Council, Government, Industry and Iwi to make sustainable decisions on the cumulative effects relating to the use and development of the marine area.

The option to undertake modelling in Port Gore has not been taken up for several reasons. First, in 2014 the Supreme Court declined the Port Gore salmon farm that had been granted consent to NZ King Salmon by the Environmental Protection Agency's 2012 Board of Inquiry. That removed the driver in the APF contract to undertake a biophysical model. Second, the possibility of varying the contract to use the remaining funds to undertake refinements of the Pelorus model was explored for several years, including at community forums. However, the initiation of the separate NZ King Salmon farm relocation process halted that. This is because MPI and NZ King Salmon took up the NIWA modelling capacity in examining various options for farm relocations, and undertook some improvements to the model (and also to Council's own Queen Charlotte model). This work is still ongoing. Hence, Council has decided not to take up the option of using the remaining available APF funds. If further modelling is required in future, a new APF contract can always be formulated.

---

1 https://www.marlborough.govt.nz/repository/libraries/id:1w1mps0ir17q9sgxanf9/hierarchy/Documents/Environment/Coastal/Hydrodynmic%20Models%20List/Pelorus_Hydrodynamic_Model_10_June_2015.pdf

2 https://www.marlborough.govt.nz/repository/libraries/id:1w1mps0ir17q9sgxanf9/hierarchy/Documents/Your%20Council/Meetings/2015/Environment%202015%20List/Environment_23_July_2015_Agenda.pdf

3 https://www.marlborough.govt.nz/repository/libraries/id:1w1mps0ir17q9sgxanf9/hierarchy/Documents/Environment/Coastal/Sounds%20Advisory%20Group%20Meeting%20Notes%20List/SAG10August2015.pdf

4 https://www.marlborough.govt.nz/environment/coastal/coastal-ecosystems/hydrodynamic-models

Next Steps

The Pelorus biophysical model (which has subsequently been upgraded by MPI and NZ King Salmon) will help to inform the Marlborough Aquaculture Spatial Planning Exercise, which is currently underway in 2017.

Further modelling developments will be considered as necessary, particularly if water quality data collection improves through the installation of continuous monitoring instruments on moored buoys. This is currently being explored with a range of stakeholders.

Further information

Dr Steve Urlich, Coastal Scientist, Marlborough District Council. Email steve.urlich@marlborough.govt.nz