THE UNIVERSITY OF SYDNEY

# Pacific Oyster Mortality Syndrome – OsHV-1
# University of Sydney Technical Visit to New Zealand
# 27-29 March 2012

**Background**
The recent emergence of ostreid herpesvirus (OsHV1 µ-var) in both Australia and New Zealand requires a coordinated international discussion in order to understand possible sources and means of control. The Fisheries Research and Development Corporation (Australia) hosted a meeting in Cairns from 9-10 July 2011 to explore the known aspects of the disease. This meeting was attended by scientists, government agencies and oyster growers from both countries. A second opportunity for discussion was provided by the 4th International Oyster Symposium in Hobart from 15-18 September 2011, and this meeting also enabled oyster growers from New Zealand to visit farms in Australia. Finally, a delegation of oyster industry representatives funded by FRDC toured POMS-affected areas in France in 2011 and prepared a detailed report for the Australian industry.

Research on management strategies to continue to farm oysters in the presence of POMS commenced in Australia in September 2011 under FRDC project 2011-053. The results from this project are novel and offer some insights into future approaches. Some work is believed also to have been undertaken on-farm in New Zealand. There is now a good opportunity for an exchange of results and ideas so that larger-scale research can commence in the summer of 2012-2013, building on the best ideas from current trials.

**Technical visit**
A technical visit to New Zealand was proposed by Professor Whittington in January 2012 and will be funded by the University of Sydney and private funds. Mr Jim Dollimore kindly offered to coordinate the visit.

*Purpose of visit:*
To visit oyster farmers, scientists and other industry people to see how OsHV-1 is being managed in New Zealand, to discuss the Australian approach, and also results from current research in Australia, and to explore future research and management approaches.

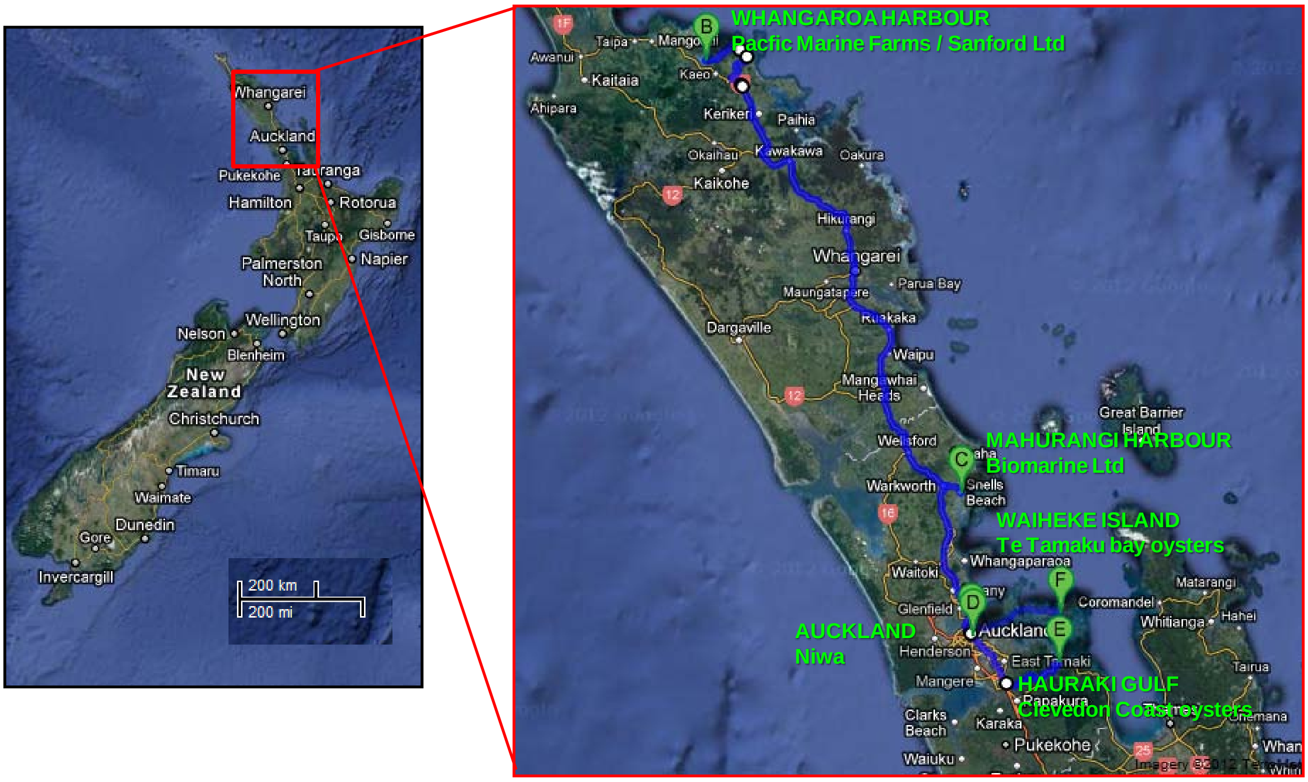
*Host and local arrangements:*
Mr Jim Dollimore, Biomarine New Zealand

*Attendees from Australia:*
- Professor Richard Whittington (Chair of Farm Animal Health, University of Sydney)
- Dr Ika Paul-Pont (Research Fellow Environmental Immunology, University of Sydney)
- Mr John Stubbs- oyster grower representing Broken Bay Oysters (Hawkesbury River, Sydney)
- Mr Steve Jones – oyster grower (Hawkesbury River, Sydney)

*Intended outcome from visit*
A brief report prepared by Professor Whittington, Dr Paul-Pont, Mr Stubbs and Mr Jones under the auspices of the University of Sydney, for distribution to industry in both Australia and New Zealand.

THE UNIVERSITY OF SYDNEY

*Location and itinerary*




| | |
|---|---|
| Tues 27 Mar | Whangaroa Harbour, Mahurangi Harbour |
| Wed 28 Mar | Mahurangi processing plant; NIWA Auckland |
| Thur 29 Mar | Clevedon coast and Waiheke Island |

THE UNIVERSITY OF SYDNEY

## Summary of findings

**Oyster production**

The NZ culture system mostly involves the use of intertidal rack and sticks to catch wild spat, while rack and stick, rack and tray and adjustable long lines and to a lesser degree floating systems are used for growout. Oysters are usually transferred from sticks to trays/baskets when they reach marketable size to toughen up. Both diploid and triploid spat are grown. Spawning and spat settlement mainly occurs in December and February but can last until June in some harbours. Tidal ranges in NZ and Australia are similar. The market for NZ PO is open shell frozen for export. Depuration is not done in NZ.

**POMS experience**

*Disease pattern:*

POMS virus was detected in archived oysters from 2007, however the first POMS associated mortalities were detected in Coromandel in March 2010. The period at risk extends from September until March but no consistent observations have been recorded about any typical pattern (one or two big hits *vs.* virus continuously active through the summer). Interestingly, infection/mortality coinciding with neap tides seemed to be a common view. There is also some concern about the negative impact of land-based and farming activities on water quality in some POMS infected areas.

Harbours and bays of the North Island were differentially affected during summers 2010 and 2011. There was spatial and temporal variation of POMS expression and intensity probably due to topography, distance, hydrodynamics and oyster movements. Kawhia Harbour is the only one not to be affected by POMS. Oyster farmers feel that the reasons might be no transfer of oysters and shallow area/topography leading to higher flush/water renewal than in other bays. The South Island is infected (virus present) but not affected (no mortality recorded, except in hatcheries).

*Age and size:*

All ages are affected and the mortality rate reduces with age: young stages more affected than older stages: spat/juvenile: 75-100% mortality; intermediate mature stages: 30-50% mortality; very mature stages:10% mortality.

*Growing height:*

Some farmers have tried to modify the height of their racks/lines, however there is no consistency of observations/results among different harbours. They also highlighted that the modification of rack height is not realistic in some areas as the cost for the farmers would be too high, especially for modification of rack and rail systems.

*Growing system:*

No significant survival has been identified in any particular cultivation system (e.g. intertidal *vs.* subtidal, trays *vs.* baskets). Some farmers suggested that handling the oysters during an outbreak caused much greater mortality.

*Survivorship:*

Survivors from a first outbreak survived later outbreaks regardless of age or location (harbours). Survivors have a low growth rate. These are consistent observations among NZ farmers even if the percentage of survival remains unclear.

*Wild spat:*

Some farmers indicated better survival of natural wild spat suggesting (1) a natural selection of resistant oysters among wild populations or (2) a greater sensitivity of hatchery single seeds selected for high growth rate or other non disease related criteria which might make them vulnerable to POMS.

Some farmers indicated higher settlement of spat in these last few years; as most spat in the water die the ones that happen to have settled higher may be just more noticeable these days.
Catching sticks are being deployed a lot later in the season than normal to try and avoid the first infection period (December). This strategy seems to work in some harbours.

*Production:*
National production in NZ has dropped down to 20% of pre-infection levels, consequently oyster prices have increased by 40% to allow the industry to remain financially viable. Also, farm and processing plant staff reductions have had to substantial to lower costs.

*Support from government:*
This has been limited to diagnosis and no recovery plan has yet emerged. Biosecurity NZ provides testing at ~$2000 per 30 oysters and also free testing when an unknown mortality event occurs. However, outbreaks in POMS endemic areas are diagnosed clinically (high mortality in young oysters in summer)

**Current strategy for production**

There is a strong focus on a breeding program and selection of resistant family lines. This work is done by the Cawthron Institute in the South Island in collaboration with oyster farmers. Field trials are currently running in three infected harbours of the North Island with 60 families (including some wild families). There is also a need to test the selected lines through a standardised experimental transmission model. New Zealand researchers and industry have indicated willingness to work with Australia in this area so that efforts are not duplicated.
Besides this genetic work, practical solutions are also attempted by oyster farmers to reduce the losses. They delay the placement of spat in infected sites: they keep them in non affected area (South Island or Kawhia harbour in the North Island) and they transfer them when viral activity ceases in autumn. They also deploy sticks later in the season (February instead of December) to avoid the first infection period. The reliance on the naturally resistant wild spat population through natural selection is also a common hope.

**Hatchery and South Island status**

The South Island is infected as the virus has been detected at low levels in archival material and also in the environment. The virus has been examined (partial sequencing and endpoint PCR fragment sizes compared) and appears identical to that causing disease in the North Island. However, no mortality event has been detected in the South Island and hatchery single seed are grown successfully in the South island nursery area.

In late 2010 the main South island hatchery suffered a number of crashes of larval batches from North island broodstock. Internal testing confirmed OsHV-1 as the likely cause. The hatchery has since changed the conditioning and spawning techniques for broodstock, and has significantly invested in upgrading the biosecurity systems at the hatchery.

From February 2011 onwards the hatchery has been able to produce batches of larvae that test negative from broodstock coming from known affected bays in North Island. It was felt that there was clear evidence that high quality hatchery biosecurity and changes to conditioning and spawning can result in OsHV-1 negative offspring being produced consistently. There have been some larval losses in this period, but they have been investigated and all have been negative for OsHV-1.

Water temperatures in the hatchery ponds and spat nursery vary between <10°C in winter and <27°C in summer, with daily variation, which is within the range of temperatures associated with disease, yet spat in the nursery consistently test OsHV-1 negative. Testing involves at least 200 spat (nursery system as part of a health management programme of regular testing and daily monitoring) or equivalent mass of larvae (each batch is tested before release from the breeding area) and is done independently by MAF. Spat were not subjected to temperature stress OsHV-1 qPCR diagnosis, but are now being subject to heat stress and mortality monitoring.

**Research in NZ**

Until very recently there has been a non-coordinated approach with individual companies attempting ad hoc trials (to assess various aspects of the disease (effects of height/growing system, location, window of infection, presence of other molluscs (mussels) and family line resistance). Therefore there may be some repetition/redundancy of trials. The reduction in farm labour force due to economic pressure has also made it difficult to conduct trials while managing production.

Some research on viral sequence (molecular epidemiology) is being developed with French institutes (IFREMER La Tremblade).

Selective breeding appears to be the main thrust and is currently underway. Field trials are currently running and there is a strong desire to develop an infectivity model to challenge the resistant lines.

A research application under the Sustainable Farming Fund was submitted and has been funded. It has a focus on hatchery breeding and remote settling. This will be a large 3 year research program involving the Cawthron Institute (Nelson) and industry.

**Collaboration between Australia and New Zealand**

Collaboration between both countries is supported by all parties (researchers, farmers, hatchery). There may be some trade-sensitive matters (for example a resistant line) but collaboration is needed to avoid duplication of effort especially in development of methodologies. Overall most of the research is needed to benefit both countries and there is merit in joint funding of research between countries. The main benefit concerns an infectivity model with a standardised approach and the rapid fire testing of many lines. Differences in need may relate to “stick” farming (a significant part of NZ production) *vs.* hatchery farming (most Australian PO farming). The experimental challenge model is an immediate priority for both countries.