AQUACULTURE READINESS DATA PROJECT – BIOSECURITY AND AQUACULTURE
INFORMATION SHEET 2

DEFINING DISPERSION AREAS FOR AQUATIC PESTS AND DISEASES

This is the second in a series of three information sheets explaining what has been learned from the MPI's Aquaculture Readiness Data (ARD) project. Key findings from the project showed that there is a need for improving farm data (farm locations, stocking densities, and animal movements), better record-keeping and reporting in general, and modelling to support management decisions. These findings are explained in this and two other information sheets:

- **INFORMATION SHEET 1 –** Aquaculture – Biosecurity preparedness
- **INFORMATION SHEET 3 –** The need for quality data

As New Zealand's aquaculture industry grows there is a recognised need to develop good baseline data and data recording systems that can support effective biosecurity and animal health decisions across the industry.

To determine the aquaculture industry's readiness for collecting and using this data, the Ministry carried out the ARD project in 2010/2011. The project was required to develop a preliminary New Zealand-specific spatial model of the likely spread of pests and diseases within and among aquaculture sites (including farms, processing facilities, and hatcheries).

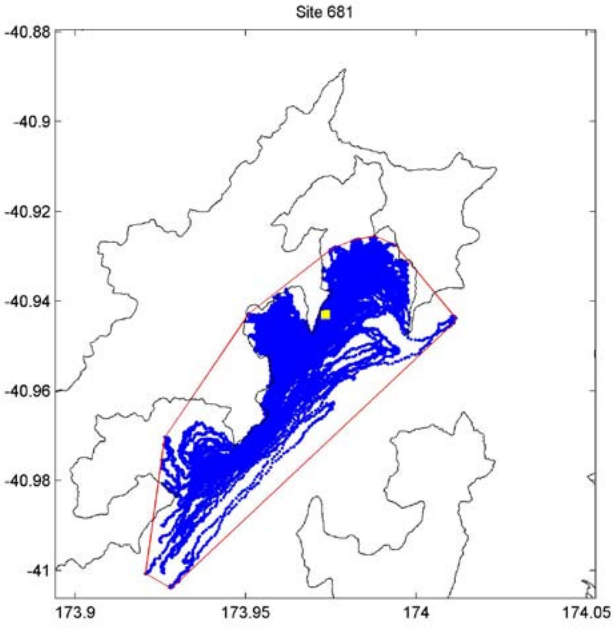

Figure 1: Example of how pests and diseases can disperse (blue colour) from a marine farm (yellow square) due to natural water currents. Red line shows the dispersion area.

DEFINED DISPERSION AREAS

Pests and diseases can be spread in a number of ways in the aquatic environment. Some introductions may be through natural dispersal and others may be caused by human activities. Once introduced in our waterways, pests and diseases are difficult to contain or eradicate.

Creating defined dispersion areas can provide information on the potential transfer of pests and diseases in the aquatic environment. The defined dispersion areas approach looks "beyond the farm gate" and, based on the concept of the epidemiological unit which the World Organisation for Animal Health (OIE 2011), has described as "a group of animals that share approximately the same risk of exposure to a pathogenic agent".

MODELLING DEFINED DISPERSION AREAS

Defined dispersion area modelling for the ARD project looked at how pests or diseases could move from a specific location within a 24-hour period. Researchers used this information to determine dispersion areas (see Figure 1).

MODELLING METHODS FOR MARINE-BASED AQUACULTURE

For marine farms a hydrodynamic model was used to calculate tidal currents over a given period at spring tide. The particles were released over one tidal cycle (12.42 hours), and assumed to have a life span of 24 hours (which is similar to what has been done in overseas modelling studies).

MODELLING METHODS FOR FRESHWATER AQUACULTURE

For freshwater aquaculture the dispersal of particles by downstream drift in rivers was simulated using flow rates (mean annual, mean annual maximum, and mean annual low flow) to imitate downstream dispersion distances. In addition to farms directly located on waterways (for example, canals), the model also included land-based aquaculture activities that discharge into waterways.

For planning purposes hydrodynamic models can be used to simulate the dispersal of pests or diseases to illustrate biosecurity risk. A considerable amount of information already exists about the hydrodynamics of New Zealand's coastal waters.

Hydrodynamic models allow government and industry planners to use a defined dispersion areas approach.

DEFINED DISPERSION AREAS AS A MANAGEMENT TOOL

The dispersion areas for aquaculture sites are often adjacent or overlap. For the purposes of modelling, a group of overlapping areas represented a single defined area. This is because there is a risk of spreading pests or diseases to adjacent or overlapping dispersion areas (see Figure 2). Dispersion areas that are not adjacent or do not overlap are unlikely to exchange pests or diseases and are considered separate areas.

In general, aquaculture sites that have the same level of infection risk based on hydrodynamic modelling should be managed under common biosecurity measures. It is important to note, however, that there are other types of movement between aquaculture sites (for example, equipment, personnel, and animals between facilities) that are not accounted for in the defined dispersion areas approach. For this reason, the same management procedures (for example, cleaning of equipment) for both animal health and biosecurity should apply for both defined dispersion areas and sites that are linked in other ways.

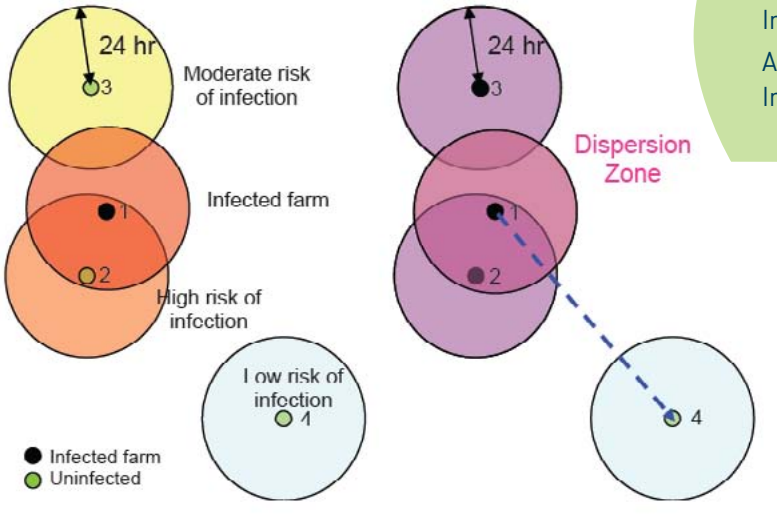

Figure 2: Representation of how dispersion areas are defined. Left: Farm 1 is infected. Farm 2 lies within the tidal excursion (the distance that a pest or disease can travel during one tidal cycle) of Farm 1, and has high chance of infection.

BUILDING ON CURRENT KNOWLEDGE

The ARD project has illustrated how modelling defined dispersion areas can be used to develop pest and disease management plans based on the OIE concept of epidemiological units. The ARD project has also raised awareness about the limitations of current data sets (see Information sheet 3).

NEXT STEPS

The Government's *Aquaculture Strategy and Five-year Action Plan* sets out the Government's intended actions and activities to support the growth of New Zealand's aquaculture sector over the next five years. As part of this work, MPI will be working with the aquaculture sector to improve biosecurity preparedness. This will include looking at ways to improve the information required to be recorded and reported to better manage biosecurity preparedness and response. An aspect of this work will be centralising required data for marine and land-based aquaculture.

Additionally, MPI will be working with the aquaculture industry to establish biosecurity plans for key growing areas. This will involve effectively engaging with the aquaculture sector to improve and maintain New Zealand's world-class biosecurity system.

FURTHER READING

Aquatic Animal Pest and Disease Readiness Planning and Intelligence – Phase I

Aquatic Animal Pest and Disease Readiness Planning and Intelligence – Phase II