Stopping fish from eating mussels

Fish predation is a major issue for Greenshell™ mussel farmers throughout the Coromandel, where species such as snapper and parore are particularly abundant. As part of MPI funded project with support from Coromandel mussel farmers, the University of Auckland has been tasked with assessing the extent of fish predation on mussel farms in the Coromandel, identifying the responsible species, and developing practical strategies to mitigate the problem.

Our research to date has shown that snapper are primarily responsible for crop losses on mussel farms, with parore contributing to a lesser extent. The project has also confirmed industry reports that the extent of crop losses due to fish predation varies widely, ranging from minimal impact to complete removal of the crop. Now that we know the fish species responsible, we are focusing on developing practical strategies to address the problem.

One approach that has often been highly effective when trialled overseas is physical exclusion, effectively fencing off farming areas to prevent fish from entering. Due to this success we decided to trial a similar approach here. To achieve this, our PhD student Cary Mason designed an experiment to test the effectiveness of two levels of physical exclusion at deterring fish predation on mussel farms.

The first level of physical exclusion he assessed was the humble cotton stocking. He imported newly developed "anti-predation" cottons from Australia and tested them alongside cotton routinely used by the industry. He then randomly assigned sections of line seeded with each of these cottons to one of three additional levels of protection: a control with no additional protection, a treatment with partial protection which was comprised of mesh cages with holes cut out, and a full protection treatment that consisted of mesh cages that completely excluded fishes (Fig. 1).

Fig. 1. *Photograph of predator exclusion cages being attached to seeded dropper line in the Coromandel*

The results were surprising. Firstly, the different cottons made no difference, even the "anti-predation" cotton. Crop losses due to fish were consistent irrespective of the cotton used to seed the lines. However, the major differences came from the different levels of protection provided to protect the mussels from the fish. Those lines in the control treatment that had no protection from fish lost 86% of their initial seeding densities after only 45 days, compared to lines in the partial and full protection treatments that did not lose any. Clearly physical exclusion works. These results are shocking for the industry. While this is primarily a Coromandel problem for now, as waters warm and snapper head south, fish predation is likely to become more of an issue for those in the Marlborough Sounds too (Fig. 2). Evidently a strategy for limiting fish predation is desperately needed.

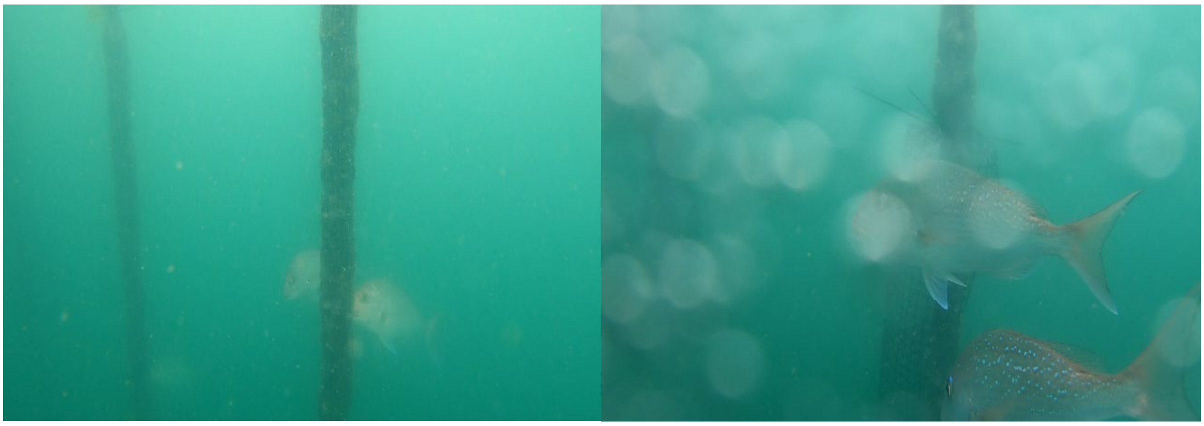

Fig. 2. *– Underwater photographs showing snapper feeding on the unprotected dropper lines within minutes of seeding and the barge driving away.*

While this study was only experimental, and mesh cages clearly won't be a practical solution for the industry, this research shows that predator exclusion works. Shellfish farms throughout the world routinely have nets installed around them to prevent predation, and here in New Zealand, we routinely protect crops on the land, so why not at sea too? Even if there are costs associated with resource consenting, installation and maintenance, surely that will be better than losing 86% of interseed mussels.

Cary's next experiment will focus on testing whether underwater sound of varying wavelengths and frequencies can be used to deter fish from entering mussel farms. It might *sound* far-fetched, but colleagues overseas have found that such an approach has managed to deter fish predation on mussel farms for up to five years before fish became accustomed to it. Therefore, Cary's work will focus on developing random sounds that change continuously to try and prevent fish habituation.

Stay tuned.

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