

'Biocontrol' of aquaculture biofouling



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AQUACULTURE BIOFOULING



The use of biocontrol to reduce fouling has been much studied, but little employed within the aquaculture sector. However, several studies have shown the benefits of biocontrol in reducing fouling on infrastructure and stock animals, resulting in increased growth, quality and survivorship of the stock species. Such benefits may help to shorten the culture period for the stock species, thereby reducing costs to the industry.

The periwinkle (*Littorina littorea*) has been shown to increase oyster growth rates by 30% by controlling algal fouling on infrastructure, thereby maintaining water exchange and food supply. However, non-algal foulers require predatory control such as crabs, the benefits of which were happened upon by accident in 1978. Crabs were shown to reduce fouling by 76-79% in oyster culture, resulting in stock growth increases of 10-60% and shell quality improvements. The dogwhelk (*Nucella lapillus*) has also been utilised within bivalve culture, reducing the presence of mussels and increasing stock survivorship. Even fish have been employed to control ascidians in bivalve culture trays and for sea-lice and net fouling in salmon farming. The use of predatory species requires care as they may have the potential to predate on the stock.

“results from several studies have shown the benefits of biocontrol”

Urchins have been successfully used to control fouling on both infrastructure and shells within suspended bivalve culture. Some studies have shown a 74% reduction of fouling on infrastructure and a 71% fouling reduction on the shells of the stock themselves (including the reduction of barnacles and tube worms).



Work within the CRAB project initially set out to identify the most suitable grazer for shellfish culture. Studies initially looked at the gastropod snail (*Monodonta lineata*) and the urchin (*Paracentrotus lividus*), which were incorporated within scallop tray culture at three different grazer densities (2, 5 and 10) at a site in SW Ireland. The initial pilot study during the 2005 fouling season showed promising results; highlighting urchins, at the lowest study density (2 animals per tray), as being more efficient at keeping fouling in check than gastropod grazers of any of the three study densities. These results were presented at AQUA2006 in May.



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From this initial study a density of two urchins per tray was selected for a full trial incorporating scallop stock during the 2006 fouling season. The early results for this portion of the study have been less positive and it appears that the filtering effect of the stock species is in itself a major control of fouling organisms to the interior of the culture trays. However, this does not appear to affect the fouling on the exterior of the trays - meaning that the tray stacks still require regular cleaning.

“the use of grazers should not negatively impact on the health and well-being of the stock species”

The incorporation of grazers into scallop culture in the CRAB field trials has been conducted in conjunction with a laboratory behavioural study in order that the relationship between grazers and shellfish can be assessed. This is very important as it would be beneficial for grazers to prevent fouling on the stock species as well as on the aquaculture infrastructure itself. However, any damage by the grazers on the stock is obviously unwanted and requires to be studied in order that successful deployment of grazers within the sector can be guaranteed not to affect the stock.

Thus far the behavioural relationship between all grazers and stock species (scallop and oyster) has been shown to be benign in nature. Scallops were apparently able to define the differences between the tube-feet of grazing urchins and the tube-feet of predatory sea-stars. Therefore, it was shown that the use of grazers should not negatively impact on the health and well-being of the stock species in culture.

At present the aquaculture sector is moving away from the use of certain coating products, such as those based on copper. Therefore, it is likely that future trends within the industry will be 'environmentally friendly' in nature - a category into which biocontrol fits. This trend will benefit and accelerate research into the potential use of biocontrol techniques of fouling control. Previous studies have highlighted the benefits of such techniques - despite the recent CRAB project not showing the same level of benefits as other studies. There are unquestionably benefits to the use of grazers as anti-fouling agents; however these are likely to be dependant on the culture species, the biocontrol species, the culture method and the density of grazers utilised. Therefore, site-specific studies need to be carried out in order that the appropriate balance is achieved.

For further information concerning this newsletter information, please contact Dr. Douglas Watson at D.Watson@ucc.ie

CRAB partner James Newman (Ireland). All photos courtesy of Dr. Douglas Watson

The objective of CRAB is to develop and implement effective biofouling prevention and management strategies for the aquaculture industry.

The CRAB consortium is composed of 4 RTD organisations, 4 industry associations and 14 small-medium enterprises, including 5 shellfish farms and 5 finfish farms.

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