Aquaculture & biotechnology

Developing high performance broodstock

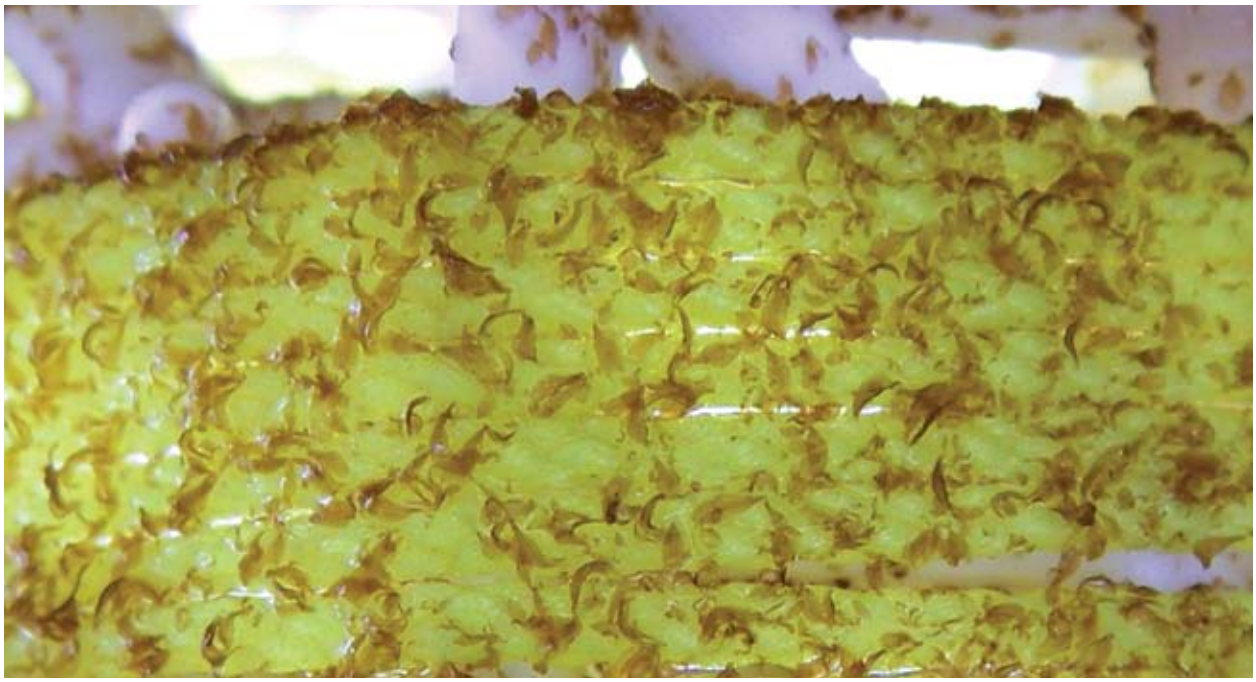
The New Zealand aquaculture industry's aim to become a billion dollar industry by 2025 requires the use of new high-value species. NIWA continues to have significant success in developing rearing methodologies for new aquaculture species such as kingfish, hapuka (groper), and paua. Having established that these species are feasible options for aquaculture, our world-class research team is now undertaking to turn these into high return export industries.

To provide the foundation for future development, we have expanded and successfully bred from our wild kingfish and hapuka broodstock. Hapuka bred and reared in captivity – a world first – form part of this broodstock.

We are now developing elite broodstock through selective breeding to produce superior seed for the developing industries. Our first endeavour has established a series of paua families at Mahanga Bay; their performance will be evaluated over the next three to four years. We'll also develop similar programmes for other key species. The research is supported by the industry and the Foundation for Research, Science & Technology.

NIWA

The product of a world first: 4 month old juvenile hapuka in the breeding facility at Bream Bay.



Kate Neil, NIWA

Seaweed cultivation.

Seaweed: a versatile product

Seaweeds provide an ideal diversification activity for mussel farmers, as they are low maintenance and use similar culture technologies to mussel farming. Seaweed is in great demand, with uses ranging from foodstuffs to cosmetics. But regulations surrounding wild seaweed harvesting mean that aquaculture is currently the only way to boost supply of this versatile product.

NIWA has successfully developed techniques to culture a number of seaweed species on ropes as part of a Foundation for Research, Science & Technology-funded project Industrial Research Ltd is undertaking. Seaweed spores settled onto strings at our Mahanga Bay facility are ongrown at mussel farms. We are now achieving excellent growth rates and repeated harvests of a red seaweed that is valued for its unique chemical extracts.

NIWA's biotechnology team has identified extracts with anti-viral and anti-bacterial properties from a range of New Zealand seaweeds. These offer potential to develop new high value, natural products unique to New Zealand.

We are also exploring the use of seaweeds in both onshore and offshore co-culture systems as a means of contributing to sustainable aquaculture.

Co-culture for sustainability and profit

Growing ecologically complementary species together can yield more value from existing aquaculture space while reducing environmental impacts. Complementary species can be grown using the waste from mainstream aquaculture species. This reduces environmental impact and provides additional revenue to farmers – a win:win situation.

For instance, mussels and seaweeds grown on lines around salmon farms remove suspended waste and nutrients, while sea cucumbers ranched below either salmon or mussel farms remove solid waste that falls on the seafloor.

With industry collaborators Marlborough Mussels Ltd and The New Zealand King Salmon Company Ltd, we are trialling various combinations of salmon, mussels, seaweeds, and sea cucumbers in Pelorus Sound. At each site, water currents and temperature, levels of nutrient and suspended waste, sediment deposition, and growth rates of the co-culture species are monitored. Matching the species to the environment is crucial to success.

NIWA also successfully trialled a land-based recirculation system that uses the red seaweed karengo to remove nitrogenous waste from paua tanks. Funded by the Foundation for Research, Science & Technology, this is being piloted near Wellington by collaborators Hongoeka Development Ltd.

Alan Blackbck, NIWA

Graeme Moss (NIWA) and Wally Turvey (Hongoeka Development Ltd) monitoring the polyculture system at Hongoeka Bay, Plimmerton.

Improving treatments for fish diseases

NIWA is working on more efficient and environmentally-friendly ways of tackling aquatic diseases in order to enhance aquaculture productivity and sustainability.

We've adopted some principals from human pharmacology (the study of how drugs interact with the body over time) to better predict the outcome of a dosing regimen. Compared with traditional trial-and-error methods of selecting dosing regimens, this approach can improve the effectiveness of the drug, reduce costs, minimise waste and environmental impact, and identify where disease therapies are likely to fail.

Using an established drug for the treatment of parasitic worms in kingfish, we have modelled the link between drug performance and the biological processes of drug absorption, distribution, metabolism, and excretion in fish, all of which affect treatment outcome.

This provides a mechanism to predict and develop treatments for emerging diseases of new aquaculture species, such as hapuka. It's also a cost-effective and powerful tool to assess the performance and viability of alternative disease therapies. In the future, we hope to examine the effectiveness of natural marine extracts, identified by our biotechnology team, in treating aquaculture diseases.

This research was funded by the Foundation for Research, Science & Technology.

Larry Hammell, Atlantic Veterinary College, Canada

Lincoln Tubbs conducting a post-mortem on hapuka at Bream Bay.

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