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SKRETTING

Nexus

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R&D FOCUS

THE KEY TO INNOVATION

SKRETTING
a Nutreco company

CONTENTS

Cover image: The EAF in Taroona, Tasmania

About this issue

DR NICOLE RUFF PRODUCT MANAGER

Welcome to the Spring edition of Nexus.

With innovation at the core of our business, it seems appropriate to update you on our ever-evolving and expanding R&D portfolio. We are proud to have the Skretting Aquaculture Research Centre (ARC) as our innovation backbone, delivering global sustainable feed solutions, such as our recently launched zero fishmeal diet for Atlantic salmon, MicroBalance FLX. MicroBalance FLX is a great example of a product which takes into consideration so much more than nutrition. Focusing on some of these additional aspects, we have highlighted the main environmental benefits of our key products and services in this edition.

Whilst a lot of our innovative products and services are borne out of the R&D conducted at Skretting ARC, we recognise the immense need for local R&D to address the particular challenges in our own marketplace. In this edition of Nexus we wanted to highlight some of our current activities in this space.

With the Experimental Aquaculture Facility (EAF) at Taroona completed and commissioned, our first trial investigating nutritional support for large Atlantic salmon at elevated water temperatures is well underway. We are also delighted to announce that we were granted resource consent to build a research facility at Okiwi Bay, New Zealand. Being able to run controlled trials on king salmon nutrition will greatly support our New Zealand customers.

Further in this edition, you will find an overview of our local R&D engagement across the wide range of aquaculture species we produce feed for. This includes an update on the projects of two PhD students we currently support, both of whom are undertaking fundamental research investigating significant farming challenges, the outcomes from which should lead to improved productivity and profitability for farming operations.

With R&D at centre stage, there is no better time to welcome Leo Nankervis to our team at Skretting Australia. At present, Leo is the Team Leader for Salmonid Nutrition at Skretting ARC, but in October this year he will join us in the role of Marketing Manager. Leo will bring a wealth of knowledge into Skretting Australia's R&D program and we look forward to introducing him to our customers.

We hope you enjoy this edition of Nexus.

Whilst a lot of our innovative products and services are borne out of the R&D conducted at Skretting ARC, we recognise the immense need for local R&D to address the particular challenges in our own marketplace

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Background image: aerial photograph of the EAF

Tasmania - a centre for research excellence

DR RHYS HAULER COMMERCIAL MANAGER

THIS APRIL MARKS THE START OF THE FIRST ATLANTIC SALMON RESEARCH TRIAL IN THE NEWLY COMMISSIONED $6.5 MILLION EXPERIMENTAL AQUACULTURE FACILITY (EAF), IN TASMANIA.

Located at the University of Tasmania's Institute for Marine and Antarctic Studies (IMAS) Taroona fisheries and aquaculture research centre, the EAF is the first of its kind in the Southern Hemisphere. The EAF is jointly sponsored by the University of Tasmania (UTas), industry partners Huon Aquaculture and Skretting Australia, and the Federal and State Governments. The facility is managed by Tasmanian local, Dr Polly Hilder.

The EAF operates within a time-share framework between the three funding participants: the University of Tasmania, Huon Aquaculture and Skretting Australia, and focuses on commercially relevant research, which aims to improve the health, nutrition and growth of Atlantic salmon. Each research trial is designed to have a six month experimental period.

As we announced in the previous edition of Nexus, Leo Nankervis will be joining Skretting Australia in October this year and taking on the role of Marketing Manager. He will bring significant R&D expertise to our technical team.

DEDICATED RESEARCH - ADDRESSING LOCAL CHALLENGES

Skretting Australia has long been looking for opportunities to work with large salmonids in a temperature controlled environment to focus on developing feed solutions that support fish during high-temperature conditions. While the ideal temperature for Atlantic salmon is 15°C, warmer temperatures of ≥18°C for prolonged periods of time are normally experienced during a Tasmanian summer. As such, controlled feed trials at the EAF will further build upon our knowledge of large salmonids exposed to high temperature conditions to optimise our feed solutions.

Continued over page

Background image: aerial photograph of the EAF

A PROMISING START

In April this year, Skretting started its first EAF trial. The trial was designed with significant input from Leo and is focused on investigating the effects of different feeds on the performance and health of large salmon held at high water temperatures. The fish for the experiment were received from SALTAS the previous October and had been on-grown successfully in the stock tanks from smolt size to approximately 1.4kg. The fish were stocked into the 7,000L tanks and extreme care was taken to ensure random stocking with consistent fish sizes between tanks and low size variation within tanks. Gentle transfer and an adequate acclimation period are essential to avoid depressed feed intake that could affect the research outcome.

Following stocking and acclimation, the groups of salmon were fed one of four different diets initially at 15°C for one month, followed by a temperature increase to 19°C, which will be maintained for a further three months. At the conclusion of the trial, salmon performance will be assessed with the information used to further develop our feed solutions and our customer's summer feeding strategies.

DEDICATED STAFF – THE KEY TO SUCCESS

No matter how good the design of a research facility is, it would not work without dedicated staff. Polly was appointed as EAF manager last year and has been fundamental to the early success of the facility. Polly brings decades of expertise in fish husbandry and research. Technical officers Stephen Ley and Harley Clements have a strong background in recirculation technology and years of experience in salmon recirculation hatcheries. Their skill sets combined means that all trials will be well executed and the fish looked after.

We believe that the prospect of undertaking robust science, leading to positive commercial outcomes for the salmonid industry is an extremely worthwhile investment for Skretting Australia and our research partners. We look forward to the benefits it contributes directly to the Tasmanian Atlantic salmon industry, but also the extension benefits beyond Tasmania.

Polly, Harley and Stephen – the EAF's dedicated team

Georgina Eastburn, Laboratory Technician at Skretting Australia, helping in the setup of the first Skretting experiment

Smolt in a stock tank at the EAF. A high standard of water quality can be maintained in the facility's systems

DEDICATED FACILITY - THE EAF IN A NUTSHELL

The facility consists of five different operational entities:

An incoming water treatment plant where seawater is pumped from the River Derwent and filtered to one micron and UV treated before being stored for use.

A stock tank system comprised of 2 x 13,000L tanks operated with one common recirculation system. Environmental parameters including light, water quality and temperature can all be controlled. This system will receive smolt each spring and autumn to be on-grown for six months from approximately 100g to >1kg.

A 12 x 2,500L "small" indoor tank system, where each tank has its own recirculation system. The same environmental parameters as above can be controlled. This system is specifically designed for amoebic gill disease (AGD) challenge trials. Fish stocked into these tanks for trials will be <500g and sourced as either smolt or post-smolt from a commercial hatchery or from fish held in the on-site stock tanks.

A 12 x 7,000L "big" outdoor tank system operated through one common recirculation system, but capable of running a different temperature in each row of six tanks at any one time. The same environmental parameters as above can be controlled. This system is specifically designed for trials on large fish, >1kg sourced from the on-site stock tanks, to investigate effects of temperature and nutrition.

Wastewater treatment system that cleans the effluent water before discharge.

Trial designs have been modelled on those used at Skretting's Aquaculture Research Centre (ARC) experimental station at Lerang, Norway. This will allow the two facilities to be benchmarked against each other. Dr Leo Nankervis, Team Leader Salmon Nutrition at the Skretting ARC, played an integral part in the design of the EAF. His extensive experience in working within similar facilities has helped with the design of this world class facility.

More information about the EAF can be found here: http://www.imas.utas.edu.au/research/fisheries-and-aquaculture/experimental-aquaculture-facility ■

Investing in the future of New Zealand aquaculture - Okiwi Bay R&D facility

BEN WYBOURNE TECHNICAL ACCOUNT MANAGER NEW ZEALAND

The farmed salmon industry in NZ is based exclusively on Chinook (king) salmon (*Oncorhychus tshawytscha*). The production of king salmon is largely confined to New Zealand, so there has been little ongoing R&D globally on the specific nutritional requirements of this species.

MEETING RESEARCH NEEDS

To address this unmet need for nutrition research in king salmon, Skretting plans to build a research tank system at Okiwi Bay in the north of the South Island. The system will be built on commercial land that is owned by Skretting's valued customer Sanford. Sanford are enthusiastic for Skretting to build the research system at the site, which they believe will make a valuable contribution to the success of their own king salmon farming operation, which is the second largest in New Zealand.

The system will operate as a temperature-controlled recirculating aquaculture system, much like the EAF in Tasmania. This will allow both winter and summer temperature conditions to be explored precisely, at any time of year. There will be 12 covered trial tanks of 7,000L capacity, which will support trials with fish up to harvest size. The tank design will mirror that of the 7,000L trial tanks at the ARC in Lerang and at the EAF, and will allow fish to grow undisturbed and with accurate measurement of feed intake.

A key outcome will be the transfer of technologies developed by Skretting for Atlantic salmon, to king salmon. Early R&D targets will include validating the use of zero fish meal diets, improving our knowledge of the protein requirement of king salmon and validating the use of high energy (Premium) diets in king salmon. All of these questions have strong cost and environmental implications for the NZ salmon farming industry.

INVESTING IN THE FUTURE

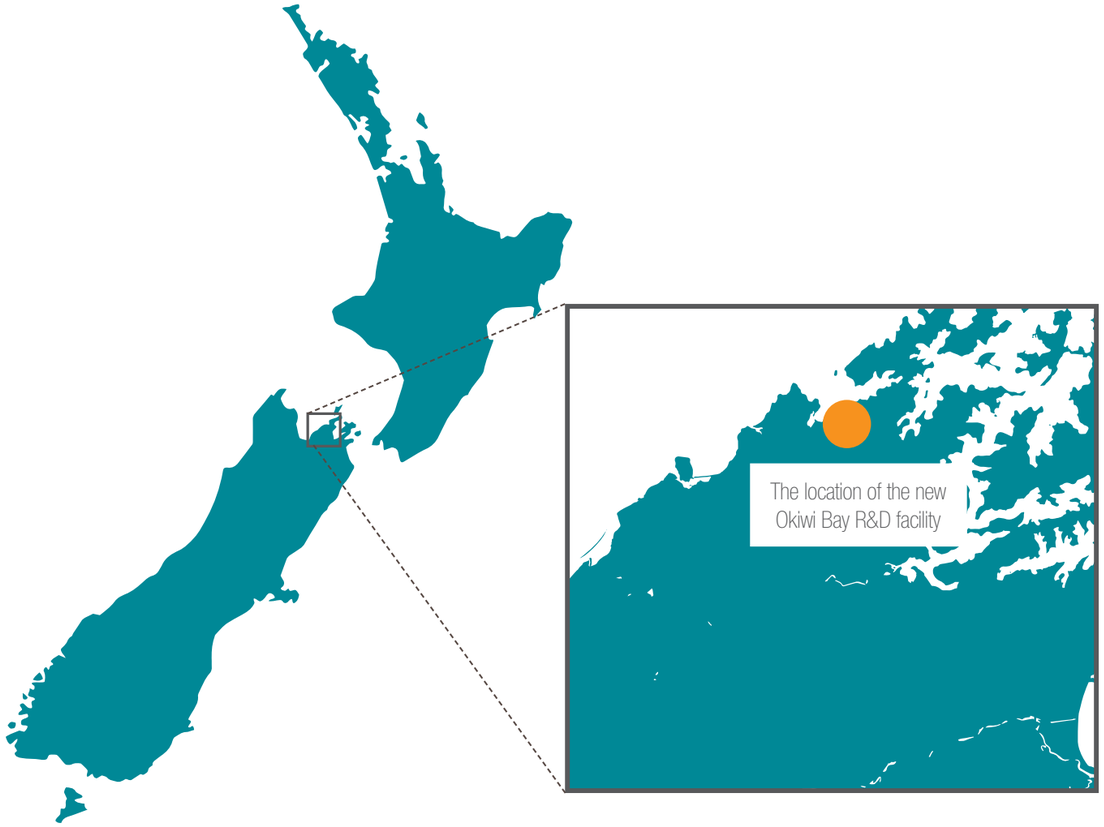
Okiwi Bay is a small coastal settlement of about 200 houses, popular for marine recreation and holiday making. As a result, the application process involved detailed scrutiny of the environmental and amenity effects that could result from the proposal. These were found to be very minor by the local authorities. The system will discharge water that is clearer and actually safer for swimming and shellfish-gathering than the water already in the bay, the system is not visible from outside the Sanford property and will make no more noise than the heat pumps already common in the area.

Skretting's proposal to invest in the future of the New Zealand finfish farming industry in this way has been welcomed and supported by all of our New Zealand customers, and by central and local government. We hope to have the system operational in the first half of 2017. ■

Early R&D targets will include validating the use of zero fish meal diets, improving our knowledge of the protein requirement of king salmon and validating the use of high energy (Premium) diets

Ben Wybourne
Technical Account Manager New Zealand
Skretting Australia

The picturesque Okiwi Bay



Driving innovation with an R&D focus on our local species

DR NICOLE RUFF **PRODUCT MANAGER**

Innovation is central to Skretting and underpins all of our activities. Skretting Australia's Sales and Marketing team comprises six staff with Research Higher Degrees (RHD) in aquaculture and related fields. As such, we have a very active local research and development (R&D) program. Our research partners vary from Universities to Government agencies to our customers, and take the form of financial and mentoring support for RHD student projects, to specifically targeted experiments in research facilities through to semi-commercial on-farm trials.

During 2016 alone, we will invest more than $1 million into R&D across a wide breadth of species we feed in Australia and New Zealand. Below we outline the main R&D according to our key species.

ABALONE

Our targeted R&D for abalone has been conducted in collaboration with the South Australian Research and Development Institute (SARDI) Aquatic Science facility in Adelaide. A particular focus has been on investigating summer diet options. High water temperatures can have particularly deleterious effects on abalone health on some commercial farms, and the research aims to identify options to mitigate those consequences.

Particularly in abalone farming, feed management is an area of great importance due to the grazing nature of the animal and the particulars of the culture systems employed. This, together with functional nutrition to lift abalone performance are potential research areas to focus on going forward.

ATLANTIC SALMON

Our R&D for Atlantic salmon is continuous and covers three broad areas:

- The effect of summer temperatures on growth performance and health
- Reducing our reliance on marine raw materials and improving the available breadth of raw materials
- Reducing the cost of production

To this end, this edition of Nexus reports on current summer diet trials at the EAF (see pages 3-5) and an update on Martin Grunenwald's PhD project investigating the impact of summer water temperatures on salmonid pigmentation (see page 10). While these are specific projects undertaken in dedicated facilities at the University of Tasmania in both the North and South of the state, we engage in commercial summer trials with our customers every year, aiming to make gains in providing ever-refined summer feed solutions.

To further reduce our reliance on marine raw materials we are currently trialling our latest innovative feed technology, MicroBalance FLX, a feed that can contain zero fish meal.

This, together with further work on our high performance winter feed Premium are trials run under commercial and semi-commercial conditions with our Atlantic salmon industry partners.

Our focus on feed management never ends, as it is a critical contributor to the cost of fish production. So our technical team employs our FeedCare program, which includes an ongoing focus on feeding strategies and best practice feed management to achieve zero waste with our customers.

BARRAMUNDI

Our R&D activity in recent years with barramundi has culminated in the launch of many innovative diets, such as transfer and health supporting feeds for fingerlings (Protec), and high performance Nova Premium diets for larger fish.

The Premium launch in barramundi represents a progression of development typical of our feeds, being the application of a global concept into a local solution. The Premium concept had already been soundly proven in global research trials with multiple species; we applied this concept in barramundi in rigorous trials at the NSW Department of Primary Industry's Port Stephens Fisheries Institute, and finally took those results to Marty Philips Innisfail barramundi farm. Barramundi research is ongoing and we are currently pursuing the MicroBalance FLX principles, exploring feeds with reduced marine raw material inclusions. We are also collaborating with our sister Skretting companies in SE Asia who are undertaking research in related species. Utilising our Skretting network gives us a greater capacity to improve our knowledge over a shorter period of time.

KING SALMON

The challenges we face in the Tasmanian salmon industry are not dissimilar to those in king salmon farmed in New Zealand. To this end, refining our raw material base and dealing with adverse summer conditions remain key priorities.

Skretting Australia invests substantially into local research in New Zealand. Currently, we have three separate projects underway: co-funding the PhD of Adelbert DeClercq (see page 11); contributing to a Sustainable Farming Fund project on farmed fish quality (in cooperation with NIWA, Massey University and industry); and sponsoring a student project at Nelson Marlborough Institute of Technology on the environmental impacts of fish farming.

We are also very excited to announce that we have been granted consent to begin the construction of a research facility in New Zealand (see pages 6-7). Initially, this system will allow us to undertake research on king salmon, with initial trials focused on understanding the true FCR potential of the species. Longer term, the facility has been designed to create opportunities to cater for research on marine species such as kingfish, snapper, hapuka and rainbow trout.

RAINBOW TROUT

Based on recent knowledge gained from our sister company, Skretting Italy, we explored the concept of using high energy (Premium) diets in freshwater rainbow trout.

Initial R&D was undertaken at the University of Tasmania's research facilities. Following this was the proof of concept on a commercial scale. The Meggitt family's Goulburn River Trout Farm in Alexandra, Victoria is the largest freshwater trout operation in Australia and the perfect operation to trial our latest innovative feed concepts for this species. The outcome was a successful demonstration that Premium diets are indeed applicable to freshwater trout, and these diets are now used commercially.

In 2016, we will explore the MicroBalance FLX principles for freshwater trout and are confident that we will soon be offering zero fish meal diets for this species too.

YELLOWTAIL KINGFISH

In 2016, Skretting Australia became active participants in a federally funded project, Kingfish for Profit (K4P). The project is facilitated through the Fisheries Research and Development Corporation (FRDC) and it entitled; "Growing a profitable, innovative, collaborative yellowtail kingfish (YTK) industry: bringing 'white' fish to the market".

K4P is a multi-partner project with collaborations from various state institutes, commercial yellowtail kingfish farming companies and Skretting Australia. The aim of the K4P project is to develop more cost effective, sustainable feeds and to identify feeding strategies and practices that enhance YTK productivity and health.

ACKNOWLEDGEMENTS

Our local R&D activities would not be possible without the excellent assistance provided by our research partners and in particular our loyal customers. Our customers provide us with access to their farms, staff and resources and most critically their very valuable time. We are sincerely grateful to have this generous support, thank you.

Skretting sponsored PhD Update

ADDRESSING CRITICAL PRODUCTION ISSUES

Skretting Australia are very proud to support two scientists doing excellent work addressing local industry production issues. A year has passed since we introduced the PhD students currently sponsored by Skretting Australia. Both Martin Grunenwald and Adelbert DeClercq are in the final year of their projects and are making inroads into their respective areas of commercially relevant research. Below is an update of their exciting projects.

MARTIN GRUNENWALD

Martin is studying for his PhD at the Institute for Marine and Antarctic studies, University of Tasmania and his project is supported by key industry partners Skretting Australia, Skretting ARC, DSM Nutritional Products and Petuna Aquaculture. Martin's study is focused on understanding how Atlantic salmon production and nutrition at high temperatures affect fillet pigmentation.

The project's first experiment aimed to establish an experimental model in order to study pigmentation in salmon at high temperature. With this now in place, we can replicate fillet pigmentation changes observed on commercial farms. As part of this initial trial, Martin explored the interactions of different carotenoids and the antioxidant vitamin E on pigmentation success in a high temperature challenge.

Flesh carotenoids were measured before and after high temperature exposure and the subsequent reduction in pigmentation in experimental fish replicated that observed in commercial fish.

The results indicated that pigment loss at high temperature was not induced by pigment oxidation, and that lipid composition of fillets may be linked with pigment retention. Preliminary results were presented at the Skretting AquaScience forum in Hobart, Tasmania in August 2015. The complete data set was presented at the International Symposium on Fish Nutrition and Feeding (ISFNF) in Idaho, USA in June 2016. This research is currently in preparation for publication in an international journal.

Current experiments are investigating the role of different lipid blends and temperatures on the pigmentation success in salmon. The results of these studies will provide detailed metabolic and nutritional context to understand changes in fillet quality under Tasmanian summer conditions. We hope the findings will inform feeding strategies and refine dietary compositions to improve pigment retention in salmon at high temperatures.

ADELBERT DECLERCQ

Adelbert is studying for his PhD at Massey University, New Zealand. His researach is supported by Skretting Australia and king salmon producer, New Zealand King Salmon. His PhD project aims to elucidate the processes involved in the interactions between temperature and skeletal malformations in the early life stages of king salmon.

A detailed understanding of normal skeletal development is necessary before questions can be asked about the development of deformities. Therefore, in his first experiment, Adelbert explored if the presence and characters of vertebral body appendages in the skeleton of juvenile king salmon could be used to refine the system of vertebral column subdivision. He concluded that whilst the postcranial and transitional vertebrae and their respective characters are usually not recognised, they should be considered for subdividing the vertebral column into distinctive regions.

Preliminary results were presented at the Skretting AquaScience forum at Nelson, New Zealand in August 2015. The final outcome of this part of the project was presented just recently at the International Conference of Vertebrate Morphology (ICVM) in Washington D.C. in June 2016.

Building on his findings, Adelbert investigated if temperature influences the number of vertebral bodies in a particular region of the vertebral column of king salmon. Animals reared at 8 and 12°C were studied in the freshwater phase of the life cycle at 1400 and 1530 day degrees.

Anatomy and composition of the vertebral column skeletal tissues were analysed histologically and showed that the means of numbers of vertebral bodies in certain regions were significantly different between temperature groups. These findings may indicate a shift of the transitional region within the vertebral column which could be driven by temperature sensitive mechanisms.

From this, a further experiment has been designed and is currently underway, investigating the constant temperature and growth rate effects on skeletal development and deformities in the early life stages of King salmon. The normal and abnormal development of the vertebral column studied in whole mount stained and cleared fish will be compared within and between temperature groups. This study might reveal if incidences of certain phenotypic deformities are related to differences in developmental temperature and also if there are specific temperature sensitive periods in the development of the cartilaginous and bony elements of the vertebral column. ■

The students' progress has been fantastic. They have made significant scientific contributions internationally and most importantly for our industry. They have found important first answers to some processes underlying local production challenges. We look forward to sharing further results!

Examining the environmental benefits of Skretting's nutritional solutions

DR JENNA BOWYER SUSTAINABILITY & COMMUNICATIONS OFFICER

At Skretting, our nutritional solutions are developed specifically to help farmers achieve high production performances, while simultaneously aiming to reduce the direct and indirect environmental impacts generated by the aquaculture industry. Meeting the growing global demand for protein will require innovative solutions that enable more food to be produced from a fixed resource base. The aquaculture industry offers a viable and sustainable solution to this challenge due to the fact that aquatic animals are much more efficient at feed conversion than terrestrial animals. However, Skretting believes there is always room for improvement, and is determined to help the aquaculture industry become even more efficient. We believe the best way this can be achieved is through continued investment in R&D that focuses on optimising both environmental and economic returns.

PREMIUM
more fish with less feed

WHAT IS IT?

Essentially, our Premium feed range has a higher level of dietary energy plus natural compounds that stimulate fish metabolism compared to a standard energy feed, thereby allowing fish to grow faster on less feed.

THE SCIENCE

Our Premium feed range was developed from the breakthrough R&D discovery of naturally occurring substances that stimulate fish metabolism and increase the utilisation of digestible energy.

THE BENEFITS

By improving a fish's ability to convert energy into fish protein more efficiently, it needs less feed to grow the same amount as it would on a lower energy feed.

Less feed being fed to fish on farms means fewer nutrients entering the waterways from any pellets that the fish may have missed during feeding time, as well as dissolved nutrients such as nitrogen and phosphorous released from the fish after digestion. Less feed also means that fewer raw materials are required to make the feed.

EXAMPLE - PREMIUM FOR BARRAMUNDI

For 1000t of barramundi produced, a reduction in FCR from 1.5 to 1.3 requires 200t less feed for the same amount of growth and the fish grow faster, meaning they can be harvested earlier, allowing extra time for pond fallowing and remediation.

RECIRC READY

WHAT IS IT?

RecircReady is Skretting's dedicated hatchery feed range intended for use in recirculation systems, but it is also applicable in all areas where nutrient recapture is important. The RecircReady technology is incorporated in all freshwater feeds post start-feed.

THE SCIENCE

Our RecircReady concept involves functional feed components that increase the water stability and particle size distribution of fish faeces. This leads to improved mechanical filtration efficiencies in the hatchery, instead of allowing the faeces to dissolve into the water column and release excess nutrients into the environment.

THE BENEFITS

The improved stability of faeces allows it to be mechanically filtered from the system and physically collected and removed from the hatchery for other purposes such as fertiliser for agriculture.

Table 1. Effects of faeces stabilisation on disturbed (pumped faeces) filtration removal rates (data are average for 30, 60, 100 and 200µm screens). Through improved mechanical filtration results, suspended solids and nutrients in the effluent are significantly reduced.

	Improvement of filtration rates by adding faecal binder
Total suspended solids	40.4 %
Total phosphorus	39.3 %
Total kjeldahl nitrogen	16.8 %

Continued over page

MicroBalance®

WHAT IS IT?

MicroBalance is a feed technology that makes it possible for the aquaculture industry to grow without increasing the pressure on the oceans fisheries for natural resources. MicroBalance has helped Skretting to significantly reduce the minimum fishmeal levels in our diets.

THE SCIENCE

In 2016, we improved our technology to a point where we became the first aquafeed company to be able to offer our Atlantic salmon customers a feed that contains zero marine protein (MicroBalance FLX). This is possible because we have advanced our R&D thinking from a macro to a micro way – ingredients are not simply "ingredients" they are carriers of nutritional qualities. Over time, this technology will be applied to feeds for other species.

THE BENEFITS

When all the nutritional qualities of a particular ingredient are known, they can be found in many other raw material sources. Dependence on a certain "ingredient" is no longer required and we have the flexibility to find profitability, quality and sustainability in other ingredient sources.

Fishmeal is still a high-quality ingredient for use in fish feed, but it is important that we have the technology to not rely on it for producing seafood, albeit only Atlantic salmon at this stage.

Raw materials are not simply "ingredients" they are carriers of nutritional qualities

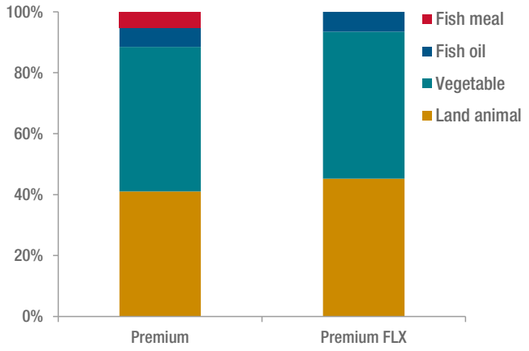


Figure 1: Average ingredient composition of a typical Tasmanian Atlantic salmon high energy grower feed (Premium) compared to our latest feed Premium FLX, with zero fish meal inclusion.

AQUASIM™

WHAT IS IT?

Skretting's innovative, web-based AquaSim management tools combine biology, quality and economics to give qualified references through which all producers can calculate how individual farms are performing as well as the means to further enhance their operations. When populated with fish production-specific data, they effectively forecast the expected growth performance and cost-benefits of an input of fish, as well as the potential impact an aquaculture production system may have on the surrounding environment.

THE SCIENCE

Over the last 20 years, growth data has been collected through hundreds of controlled fish trials to generate highly accurate species-specific growth curves within the AquaSim models.

THE BENEFITS

Based upon appraisals of the farming environment and each farm's production targets, AquaSim provides a number of tailored recommendations, including the most cost-effective stocking patterns, feed selection and feeding strategy to enable each to achieve their desired results. It helps producers to optimise their business in ways and to a level of detail that they have not been able to in the past.

While many Skretting customers already benefit from the technical support provided alongside their feeds, AquaSim extends this offering with the addition of new tools and packages in a way that is much easier for farmers to understand.

By accurately modelling different feed production scenarios, it is possible to calculate the nutrient output into the environment based on the production volume of feed required to grow the fish. This is beneficial to understand, particularly when there are environmental regulations that limit the amount of nutrients that are allowed to enter the environment via fish farming (e.g. nitrogen cap restrictions).

AquaSim is constantly evolving through its inclusion of new Skretting feeds, protocols and ingredients, thereby giving users new objectives to aim for. It is, therefore, a "life product", meaning it is possible for farmers to generate new targets that improve the performance of their stocks year-after-year, thereby improving their environmental and economic results.

Based on the same concept of AquaSim, Skretting's Nutrient Efficiency Model can calculate the nitrogen, phosphorous and carbon outputs of a production cycle scenario. Using the same growth modelled data in Figure 2, fish fed Premium FLX had lower dissolved nitrogen, phosphorus and carbon outputs than fish fed Optiline XE.

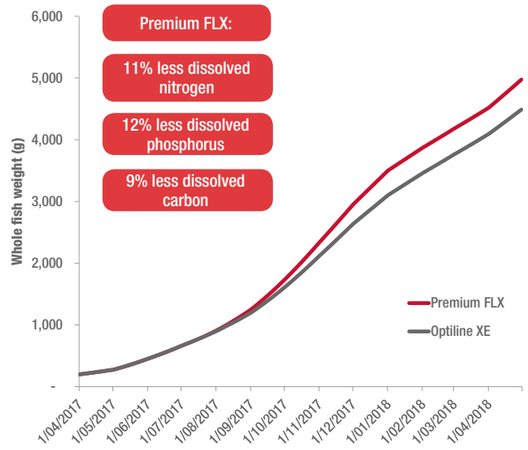


Figure 2: AquaSim analysis comparing the use of two different feeds, Optiline XE and Premium FLX over an Atlantic salmon production cycle (200g to 5000g). The model demonstrates that fish fed Premium FLX will be 500g larger than fish fed Optiline XE over the same time period.

FeedCare

WHAT IS IT?

Skretting's FeedCare program is based on three principles: specific nutrition, perfect condition, and zero waste. As feed costs represent a high cost of fish production, our FeedCare program has been designed to ensure that our feed arrives to the fish as it was intended to maximise on-farm productivity.

THE SCIENCE

FeedCare is conducted by Skretting's Technical Account Managers, Matthew Bransden, Patrick Miller and Ben Wybourne. Based on the three principles, our team can conduct on-farm assessments such as feed audits, which in turn can lead to targeted farm-staff education and training sessions undertaken both formally and informally, that can be the stimulus for on-farm improvements.

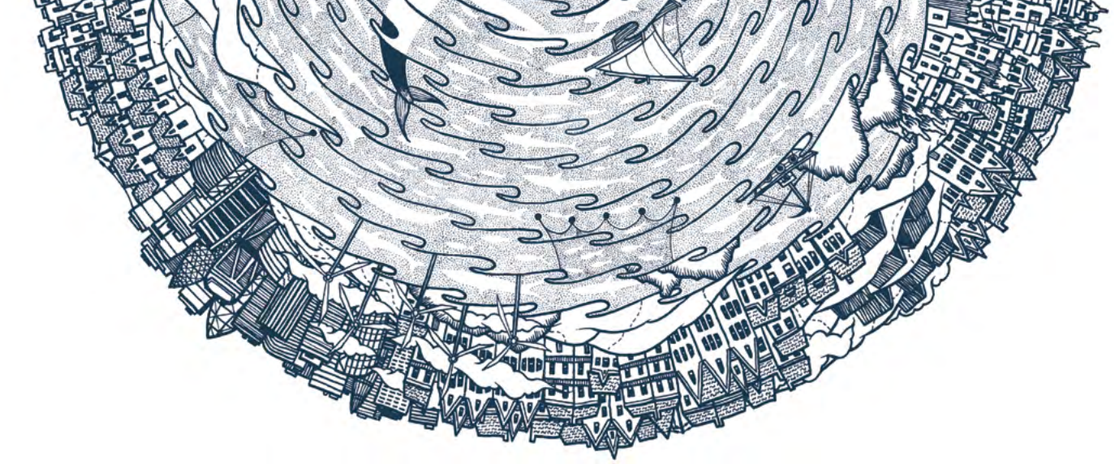
THE BENEFITS

If the fundamental practices of FeedCare are at the core of all aquaculture operations there are many benefits to be unlocked. Examples include: appropriate storage – cool, dry facilities away from direct sunlight to maintain nutritional properties of feed; feed system design and maintenance – reduction in feed breakage; and feed management practices – optimal feeding regimes – reduce feed wastage. ■

AquaVision

Innovation and collaboration will drive the blue revolution forward

In June, Skretting hosted AquaVision 2016, the 11th edition of the world aquaculture business conference, in Stavanger, Norway, attracting more than 375 delegates from 35 countries. Dominating the conference agenda was the global challenge of establishing an increased supply of responsibly farmed fish and shrimp that can make a greater contribution to feeding a population that is widely expected to exceed 9 billion people by 2050.



"There has been one common theme to many of the AquaVision conferences, which have now run for 20 years," said Knut Nesse, CEO of Nutreco, upon opening this year's sold-out event, "and that is how to feed a growing global population in a sustainable way."

With the world's population now standing at almost 7.5 billion people and four babies being born every second, food production needs to increase in order to feed an additional 1.5 billion mouths by 2050, and delegates at AquaVision 2016 heard that sustainable aquaculture growth will be one of main solutions to feeding this expanding population, which Nesse said will continue to provide significant opportunities for businesses in this field.

"The so-called 'blue revolution' – the farming of fish and shrimp – has developed over the last two to three decades with a very high growth rate of 8-9%. And 2014 became something of a milestone year – the first time that the human consumption of aquaculture products exceeded that of wild fisheries. Indeed, we expect aquaculture to be supplying more than 60% of the seafood for human consumption by 2030 [Food and Agriculture Organisation of the United Nations (FAO) forecast]."

BLUE REVOLUTION

The theme for AquaVision 2016 was 'Meeting Tomorrow Today'. With the programme divided into two parts, 'The Blue Revolution' and 'Beyond Tomorrow', guest expert speakers from all continents shared their insights, opinions and visions relating to the expansion of the global aquaculture industry.

Providing insight within the Blue Revolution topic, Alf-Helge Aarskog (CEO of Marine Harvest), Ragnar Tveteraas (Professor at the University of Stavanger) and Avrim Lazar (Global Salmon Initiative – GSI), all stressed the need to increase the level of inventive progress across the aquaculture industry.

Alf-Helge Aarskog pointed to the huge imbalance between the size of the ocean and its current contribution to the human diet – providing just 2% of the food that people eat, despite occupying 70% of the Earth's surface, and further highlighted that the global production of salmon – one of the industry's core species – had fallen into decline this year.

"The salmon industry must get back on the growth track. We need more production areas, we need to find alternative feed sources, new technology, and to solve our biological challenges cost-effectively," he said.

Aarskog gave details of new offshore R&D projects now being developed by Marine Harvest that the company believes could increase its production without impacting marine environments or exposing the fish to biological challenges such as sea lice. "The future is in the ocean; just beneath the surface," he said.

In his presentation, Tveteraas said global aquaculture had made some impressive productivity gains, but also stressed that innovation was essential to maintaining the industry's growth.

"You cannot continue with the existing technologies and the present ways of doing things over time. We need innovations that improve the biological performance of aquaculture species," he said.

Although different species require specific knowledge and technology, the industry as a whole is facing many common challenges, said Tveteraas, who believes that many solutions could be found through greater cross-sector collaboration.

"Knowing when you need friends can make a big difference when it comes to dealing with issues," he said. "I'm not saying that competitors shouldn't compete, but quite often the problems that you are facing can only be dealt with by a group."

BEYOND TOMORROW

By following sustainable growth strategies, the aquaculture industry can provide long-term solutions for many of the most pressing challenges facing the world, according to Yu Sato, Chair of the Board with the Cermaq Group AS.

Speaking within the 'Beyond Tomorrow' conference topic, Sato highlighted some of the key reasons why Cermaq's parent company, the Mitsubishi Corporation, is switching its focus from the wild-catch sector to farmed production.

"Aquaculture is an industry that fits well into the Mitsubishi Corporation strategy," said Sato. "Indeed, sustainable aquaculture, including salmon farming, holds the key to meeting many global challenges, including feeding the world's growing population and helping public health. It also has a low carbon footprint and can provide many local jobs and other social benefits."

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From left: AquaVision host Pellegrino Riccardi, Skretting Managing Director Steven Rafferty and Skretting ARC Managing Director Alex Obach

Kicking off her presentation, Trude Olafsen, Manager of Strategic Innovation with the AKVA Group, stressed the global demand for seafood will keep increasing in the coming years and that there was no doubt that the greatest potential was closely linked to the food chain's ability to cultivate the sea to a greater extent than today, albeit in a sustainable manner.

"Technological innovation is one of the most important building blocks for achieving this worldwide," she said.

While salmon and trout (combined) account for only 3.7% of the world's aquaculture production, salmon is the industry's "technological frontrunner", yet it is also facing a challenging period with "stagnant" production growth and rapidly increasing production costs, thanks largely to the sea lice problem, which is "setting the agenda for salmon production globally", said Olafsen.

"The result is that no growth will be given through the ordinary licensing system before the industry can demonstrate a better handling of the lice situation than today," she said. "Challenges often require new thinking, and this can lead to new opportunities and the innovation necessary to generate growth to meet the future demand of seafood."

While Norwegian authorities are not granting any ordinary licenses at present, they have introduced so-called "Innovation Licenses", which are essentially tools for risk reduction in projects that try to solve the most important environmental impacts of the aquaculture industry while opening up new areas for production, explained Olafsen.

A new generation of submerged cage called "Atlantis" has been developed in close cooperation with Egersund Net and fish farming company Sinkaberg Hansen with the aim to prove that good fish welfare and low production costs can be achieved.

"We have applied for six licenses and have been working on the project since 2014, and we strongly believe that this is possible.

"Atlantis will be able to open up new areas for fish farming in Norway, but the major perspectives are associated with adopting new areas for fish farming in other parts of the world too. We have weekly inquiries from international players interested in submerged fish farms to enable them to avoid typhoons and bad weather in general. The other perspective is to produce species other than salmon and trout in submerged cages. This technology will be relatively easy to adapt to other species," said Olafsen.

ADDRESSING A MEGATREND

Given the forward-looking nature of the multi-stakeholder conference, Nesse also took the opportunity to urge the aquaculture industry to play its part in responding to the global challenge of antimicrobial resistance (AMR), and urged cross-collaboration across the entire aquaculture value chain to reduce the use of antibiotics.

Most global challenges require collaboration between companies and industry leaders, and AMR is no exception, he said. The World Health Organisation (WHO) forecasts that annual deaths attributable to AMR will increase from its current level of 700,000 to 10 million by 2050 if the world continues to use antibiotics in human medicines and animal food chains in the same way as it does today.

"At Nutreco, we believe AMR is a megatrend that will influence the way animal proteins – from both agriculture and aquaculture – will be produced. We also believe that AMR will attract increasing media focus, while consumer pressure will also escalate in the coming years.

TIME TO TALK

AquaVision 2016's keynote speaker, Lord Sebastian Coe, President of the International Association of Athletics Federations (IAAF), said the aquaculture industry's ambition of significantly increasing its contribution to solving the complex challenge of feeding the world's fast growing population could be made a lot easier if it explains what it is doing and what it believes it can achieve.

"The most important thing is to explain what you do, and why you do it. Pose the challenge and then place yourself as the solution to that challenge, explaining the massive difference this can make," said Lord Coe.

Wrapping up the conference, Steven Rafferty, Managing Director of the Skretting Group and Member of the Nutreco Executive Committee, told delegates there should be no doubt that that aquaculture will be an increasingly important contributor of nutritious food for the fast-growing global population, he also underlined Lord Coe's call for the industry to become much more forthcoming with transparent details about its actions and ambitions.

"When John Naisbitt, the bestselling 'Megatrends' author, was our keynote speaker 10 years ago, he told us that aquaculture has a great story to tell, but criticised us for not telling it. At the same time, he recognised that through the efforts of international NGOs, the public was drowning in criticism of aquaculture but starved of positive information from the industry. Fast forward to this year and we have heard many similar messages. I believe we still have a fantastic story to tell and we should all make the effort to become much more vocal," he said.

Equally as important, said Rafferty, is the clear need for all industry players to collaborate more, to ensure that everyone is doing a good job, and to enhance the reputation of aquaculture globally.

"We are in the same water; we cannot operate alone. It is our obligation to look after this industry together, and that has been a constant theme running through this conference and many previous AquaVisions."

The next AquaVision, which will be held in 2018, will mark the 22nd year of the conference. ■

AquaVision delegates during a break in presentations

Marine Harvest CEO Alf-Helge Aarskog

Steven Rafferty during his closing presentation

New Zealand delegation visit Norway during AquaVision

In June this year, Skretting Australia's Managing Director James Rose, and Commercial Manager Rhys Hauler, hosted several of our key customers and a special delegation of NZ dignitaries at Nutreco's biennial AquaVision business conference.

Below is a column written by New Zealand's Kaikoura MP, Stuart Smith, speaking about his experience in Norway and lessons learnt.


New Zealand's Kaikoura MP Stuart Smith

I recently travelled to Norway to attend AquaVision, a global conference on aquaculture. Held in Stavanger, a coastal region in the south of Norway, the conference attracted representatives from more than 40 countries. The trip also gave me the chance to see firsthand how the Norwegians not only farm salmon, but encourage and manage regional development with respect to the aquaculture industry.

This is a country whose wealth has largely been built on the oil and gas industry - which has been used very sensibly to underpin their good standard of living. However, now Norway must look to other industries like aquaculture to support its economy in the future.

Norway's aquaculture industry is substantial. It produces more than 1.2 million tonnes of salmon per annum; in comparison, New Zealand produces 12,000 tonnes. The salmon farm I visited comprised of five, 200-metre circular pens but I was surprised at the minimum visual impact they had. This farm produced the equivalent of almost half of New Zealand's total salmon production.

I also visited a feed research facility which is similar to, but 10 times bigger than, the one proposed for Okiwi Bay. This facility was nestled in a small cove, surrounded by holiday homes and full-time residents. Finally, I was taken to a salmon processing factory and smolt farm. The latter used a water recirculation method which is environmentally friendly, but relies on constant and close monitoring of water quality. This enables them to grow the salmon in tanks for as long as possible to minimise the time the fish are exposed to sea lice, which is the industry's biggest problem. This is however a very expensive option.

Norway farms Atlantic salmon, which are particularly susceptible to sea lice. New Zealand farms King Salmon, the largest of the Pacific salmon (also called Chinook) which has a natural immune response to sea lice.

Other options for the control of the sea-lice threat is the use of "cleaner fish" in salmon cages - lumpfish and Ballan wrasse which are bred for this purpose - which predate on sea lice, picking them off the salmon and the nets. Another method is to put the salmon into fresh water for a short time, killing the lice. It is likely that a combination of some or all of these methods will be used.

Globally, aquaculture really is the way of the future in terms of feeding our growing population in a sustainable way. In fact, the AquaVision conference's main underlying message was that aquaculture is an industry that can be a realistic part of the solution to the global paradox where 1 billion people do not have enough to eat, while another 1 billion people are obese.

Farmed salmon, with its high omega content, is a good, healthy, functional food that does not impact on our wild fisheries, many of which are in decline. New Zealand's own aquaculture industry, while smaller than that of Norway, can nevertheless stand out in the global market with a high-quality product.

Our aquaculture industry, like Norway's, has a very bright future indeed. ■