100% REPLACEMENT OF ARTEMIA IN SHRIMP HATCHERIES (LET'S GET RID OF ALL THAT ALGAE CULTURE, TOO!)

Zeigler, a privately owned feed company in Gardners, Pennsylvania, USA, with customers in more than fifty countries, has been in business for 75 years and currently markets a complete line of aquaculture feeds—including shrimp growout feeds and shrimp hatchery feeds.

Zeigler recently announced a new product that completely replaces the need for Artemia in shrimp hatcheries! Neil Gervais, Hatchery Product Manager at Zeigler, who has managed several large shrimp hatcheries in the Western Hemisphere over the last two decades, developed the product.

The new product announcement sparked a long discussion on the Shrimp List, a mailing list for the shrimp farming industry.

EXCERPTS:

Ifran (microbiologist_bd@yahoo.com): That certainly is good news. I would like to have seen more information on the actual price of the product. Generally, these new things are costlier than traditional options. We heard a lot about the indirect savings, but not much about the actual price.

Neil Gervais (ecneil2@yahoo.com): Feel free to contact Zeigler directly about prices. The product has a direct cost that's lower than traditional options.

Laurence (ecotao@yahoo.com): I recall using this Zeigler product back in 2003 or 2004, so it was probably not the new formulation. I compared its palatability to Cyclop-eeze by simply watching shrimp PL behavior in a white dish. Shrimp PL would respond immediately to the Cyclop-eeze, grabbing and consuming it, swimming right over the EZ particles as if they did not exist. The product back then also leached out color, tinting the water.

Ben Williams (ben.williams@tekni-plex.com): I helped develop that product back then, and I know Neil has made some dramatic changes to it. Neil can probably offer more details.

Josh Wilkenfeld (josh.wilkenfeld@gmail.com): I've been using various Ziegler products during the last year and a half, including the LZP and the EZP lines and the smaller particle size EZ Artemia. I'm kind of an old-timer, so I'm a bit uncomfortable about giving up some of the feeding protocols that I developed over the last 30 years. However, after coming out of the private sector and going to work with Texas AgriLife Research, a shortage of funds and personnel basically forced me into doing things an easier way. I haven't had a chance to run side-by-side trials, but the Ziegler products seem to do very well in terms of palatability and acceptance by the larvae. I'm still not ready to give up on live algae, and I'm not sure I can entirely give up live Artemia between PL-1 and PL-7, when the animals really seem to want and need live pray, but the EZ Artemia definitely seems to work pretty well up through mysis-3.

Again, I did not run controlled trials; I was just taking the easy way out. I'm sure Neil has done his homework, but there still needs to be some outside verification on a commercial scale. It does look promising.

Leland Lai (lelandlai@aquafauna.com): Old ways could be expensive ways and in these cut-the-cost times, it might be worth the trials to see how much replacement can take place. I say this because finding a replacement for Artemia could free us from "Mother Nature" and stabilize the cost of larvae production.

Artemia is not the only thing that shrimp larvae eat. Think about all the algae you are growing the OLD way. Algae culture represents 15% to 20% of the operational costs at a shrimp hatchery. The need to grow your own algae could also be replaced on a 100% basis!

What happens to shrimp hatchery economics when dried or paste forms of Isochrysis, Thalassiosira, Tetraselmis, Chaetocerous and Nanochloropsis come on the market? It's well known that large mollusk hatcheries produce algae for about $60 a kilogram (dry weight). For the rest of the aquaculture industry, the cost is probably $120 to $180 a kilogram.

In the future, your algae may come out of a package!

Josh Wilkenfeld (josh.wilkenfeld@gmail.com): I, and most other hatchery managers, have been very careful about making sweeping changes to our algae and Artemia feeding regimes. New products usually promise more than they deliver, at least in my experience. So far, none of them have been successful as 100% replacements, though they have made great supplements.

The last time I spoke with Neil Gervais was at the WAS meeting in Seattle, Washington, USA, in February 2009. He was on his way to Brazil (I think) to run large-scale studies with the new Artemia product, and I presume the announcement of its availability means he was happy with the results.

I've used the EZ Artemia as a complete replacement for live Artemia out of necessity (time and labor shortages, as mentioned earlier), and it worked great at fairly low larval stocking densities, but in a higher density run, I was still fighting cannibalism issues. However, I only had the smaller size product, and more guidance is needed for its actual use. I have been using Zeigler's products as the only supplement to live algae (from Z-1 thru PL-1) for this year's larval production at our bait shrimp project. There is no hatchery operator alive who wouldn't prefer to pour something out of a bottle or a can, rather than have to deal with growing their own larval feeds and the "Mother Nature" element of Artemia cyst supply (and cost).

Neil Gervais (ecneil2@yahoo.com): As Ben Williams mentioned, he was directly involved with the first generation EZ Artemia product a few years ago. It was part of a package of liquid-based diets and became a quality standard for shrimp hatchery diets. Since then Zeigler has made some important changes to EZ Artemia. While always a good diet, we have changed the formulation and sizes offered to make it a more complete replacement for Artemia—at all stages of shrimp larval development. The original product was offered in the 300-500 micron range only and proved to be too large a particle for zoea and mysis stages. A 50-200 micron size is now offered. There is a feeding table included on the EZ Artemia literature sheet on the Zeigler website that gives an indication of feeding levels for each stage and the many benefits of its use over Artemia. This table is a reference and assumes that hatcheries are only replacing Artemia, not algae and/or supplementary diet regimes. Please feel free to contact me to clarify this or to aid in modifying it for your own use. We are providing samples to interested hatcheries. In tank trials, we have not had palatability or color leaching issues.

Dallas Weaver (deweaver@mac.com): Shifting to 100% replacements for both algae and Artemia may require a shift in feeding strategies and procedures. Living organisms have an advantage in maintaining nutritional status by having intact membranes and active biological pumps along with the ability to synthesize any nutrients lost by diffusion into the medium. All other diets face the problem of diffusion when they are feed to a tank where the concentration of nutrients is low. In other words: leaching.

Using an automated feeding system where small amounts of the artificial feed are constantly added would allow the larvae to consume the feed after it has only been in the tank a short time. With artificial diets, the optimal concentration in the water may be a lot lower than with live food. Having less leaching time per particle may be of greater benefit than having more feed.

With artificial feeds, we can also expect more water pollution issues and may have to do more water flow or treatment and recycling. These minor changes in system design and operation will require a lot of work, but the technology is well understood.

I have always had the feeling that artificial diets should be good enough for our larval shrimp, but leaching meant that what you feed the larvae is not what the larvae eat. With leaching kinetics being a function of the particle diameter squared, cutting the diameter in half decreases the diffusion time by a factor of four.

Josh Wilkenfeld (josh.wilkenfeld@gmail.com): Very good info Dallas. Virtually all of my commercial-scale work has been in Asia and Mexico, where automation is a bit more difficult, but labor is less expensive. Back then, I fed every two hours—24/7—for exactly the reasons you mentioned, primarily to keep the food fresh and minimize water quality issues. It's interesting to note that liquid feeds seem to keep the tanks cleaner, especially when working with reduced or zero-exchange systems, at least up to about PL-1 or PL-2. When you use probiotics, the water tends to look kind of ugly, but the shrimp seem very happy.

I'm still not ready to completely walk away from live algae, at least during the zoea stages (and even early mysis). I do think that EZ Artemia can replace dead and live Artemia nauplii up through PL-1, and the animals can make it all the way without Artemia, but at least using the February 2009 version of the product with Litopenaeus setiferus (part of an ongoing bait shrimp research grant), I think they still do better in terms of survival and growth with the live Artemia. In all fairness to Zeigler, I was using what now is probably an outdated product in terms of their most recent technology, and at the time I received the product, Neil's recommendation was that the product could be used as a 100% substitute for Artemia up to PL-1, at which time live Artemia had to be brought into the mix.

Dallas Weaver (deweaver@mac.com): Keep in mind that when you use probiotics and near zero exchange, the probiotic bacteria may incorporating the leached nutrients into bioflocs that become live foods for the shrimp!

Phil Boeing (pboeing@dc.rr.com): And what's so wrong with old school? Good quality select algae will get you through without Artemia too! It's just not off the shelf and soooo easy as canned whatever.

Henry Sanjuan (henry_sanjuan@hotmail.com): Well, well. Phil Boeing! It seems that everyone came out of the woodwork on this one. Lets hear it for the Old Ways and the Old Timers who suffered through them.

Patrick Wood (patrickjwood@yahoo.com): I agree with Phil on algae—nothing like a pure natural feed for the first stages of life (or so my wife keeps saying). My guess is that it's not just about costs and survivals in the hatchery, but a lot more to do with performance during growout.

Alain Michel (alainhenri@aol.com): It has been reported that most of the shrimp (Penaeus stylirostris) hatcheries in New Caledonia have replaced algae with a microparticulate feed in a kind of bacterial floc for all the zoeal stages at a density of 100/liter—and gotten good survivals.

That's not true. Total replacement of Artemia was not successful.

Josh Wilkenfeld (josh.wilkenfeld@gmail.com): Hi Alain. I've heard about the no-algae approach before, and yet I also remember that this method failed when an attempt was made to introduce it in Mexico at the Aquanova hatchery. I'm not yet fully convinced on the complete elimination of algae.

Alain Michel (alainhenri@aol.com): Hi Josh, I don't remember what kind of microparticulate feed Aquanova used in Mexico. The technique was developed in New Caledonia using a special microparticulate feed developed by IFREMER in France. I think they have moved on to other

microparticules now, but the interesting thing is that the original formula is still being used on a routine basis in New Caledonia after 20 years, so it must be a pretty good algae replacement.

Sources: 1. The Shrimp List (a mailing list for shrimp farmers). 100% Artemia Replacement. August 23 to 28, 2009. 2. Bob Rosenberry, Shrimp News International, September 10, 2009.

(information from
http://www.shrimpnews.com/FreeNewsBackIssues/FreeNewsSeptember2009011.html)

AQUA TT OCTOBER 2009 ANNOUNCEMENTS

This is the Announcement Supplement, which comes with the AquaTT Training News newsletter. These are free e-mail news services provided by AquaTT on European Education, Training and Events in Aquaculture.

Please submit any relevant information for dissemination in the newsletter to news@aquatt.ie

Please check the AquaTT Calendar for a comprehensive overview of all Marine Sector related events, including details.

January 2010
- 6th International Conference on Technology, Knowledge and Society, 15-17 January 2010, Berlin, Germany
- Workshop on extensive and semi-intensive aquaculture production in Southern Europe, 20-21 January 2010, Tavira (Portugal)
- 40th Annual Texas Aquaculture Association Trade Show & Conference, 27-29 January 2010, Texas (USA)
- Seafood Summit, 31 January-3 February 2010, Paris (France)

February 2010
- 12th Fish International – Seafood Exhibition and Marketplace, 21-22 February 2010, Bremen (Germany)
- 61st Pacific Fisheries Technologists Conference, 21-24 February, Washington (USA)

March 2010
- Ecosystem Modelling for Fishery Management, 8-12 March 2010, Copenhagen (Denmark)
- Aquaculture 2010, 1-5 March 2010, San Diego (California)
- 2nd European Fish and Seafood conference, 9-10 March 2010, Stavanger (Norway)

April 2010
- AAG 2010 - Coastal & Marine Remote Sensing & GIS, 14-18 April 2010, Washington (USA)

May 2010
- International Sea Lice Conference, 9-12 May 2010, Victoria (Canada)
- The Mediterranean Science Commission (CIESM) Congress, 10-14 May 2010, Venice (Italy)
- Aquaculture UK 2010, 19-20 May 2010, Aviemore (Scotland)
- European Maritime Day Stakeholder Conference, 19-21 May 2010, Gijón (Spain)
- 2010 Offshore Mariculture Conference, 19-21 May, Dubrovnik (Croatia)
- Australasian Aquaculture International Conference, 23-26 May 2010 Hobart (Tasmania)

June 2010

- AquaVision, 7-9 June 2010, Stavanger (Norway)
- Global Conference on Aquaculture 2010, 9-12 June 2010, Bangkok (Thailand)
- XVIIth CIGR World Congress, June 13-17 2010, Quebec City (Canada)

July 2010
- 14th International Meiofauna Conference, 12-16 July 2010, Ghent (Belgium)
- 15th Biennial Conference of IIFET, 13-16 July 2010, Montpellier (France)
- Fish and Climate Change, 25-30 July 2010, Belfast (Northern Ireland)

August 2010
- Aquacultural Engineering Society Issues Forum, 18-19 August 2010, Virginia (USA)
- The 8th International Conference on Recirculating Aquaculture, 20-22 August 2010, Virginia (USA)

September 2010
- Fish Sampling with Active Methods Meeting, 8-11 September 2009, Ceske Budejovice (Czech Republic)
- 10th Littoral Conference, 21-23 October 2009, London (United Kingdom)

October 2010
- Aquaculture Europe 2010, 5-8 October 2010, Porto (Portugal)
- 9th International Symposium on Tilapia in Aquaculture (ISTA9), 15-19 October 2010, Shanghai (China)

Aqua TT TRAINING NEWS OCTOBER 2009

A free e-mail news service provided by AquaTT on European Education & Training in Aquaculture. Please submit any relevant information for dissemination in the newsletter to news@aquatt.ie

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- Workshop “How to write training units” workshop, 26-27 November 2009, Dublin (Ireland)
- International Symposium on Aquaculture and Fisheries Education (ISAFE), 27-29 November 2009, Bangkok (Thailand)
- Course "Stock assessment (Introduction)", 11-15 January 2010, ICES, Copenhagen (Denmark)
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2. Announcements
Due to the overwhelming amount of Events in the Maritime sector, AquaTT decided to provide you with a supplement to the AquaTT Training News, specifically for the Announcements. The Announcements supplement is sent out together with Training News. Please CLICK HERE to go to the archived Announcement Supplements. Please CLICK HERE for the AquaTT Calendar which gives you

a comprehensive overview of all events in the sector.

3. Collaboration

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Education

Workshop on the ontogeny of the fish immune system, 4-5 November 2009, University of Copenhagen (Denmark)

The Danish Fish Immunology Research Network and the Research School SCOFDA (Sustainable Control of Fish Diseases in Aquaculture) organise a 2-day workshop on the ontogeny of the fish immune system. Participation is free of charge. For registration and abstracts please contact: pwk@life.ku.dk (deadline October 1, 2009)

For more information please visit www.dafinet.dk

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Ph.D. course "Physical and biochemical methods for analysis of fish as food", 16-20 November 2009, Kgs. Lyngby (Denmark)

The aim of the course is to provide insight into the state of the art of advanced laboratory techniques and methods that are recommended for analysis of fish muscle components relevant in studies of ante mortem (e.g. feed, stress) effects on fish as well as for following post mortem changes in fish. Deadline for application to the course is 25 September 2009.

For further information please visit http://www.aqua.dtu.dk/English/Education/PhD/methods_for_analysis_of_fish_as_food.aspx or contact Alice Jensen aj@aqua.dtu.dk or Tel: +45 4525 2581

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Workshop "How to write training units" workshop, 26-27 November 2009, Dublin (Ireland)

The VALLA project has developed a very interesting dedicated software tool based on existing European Best Practise which enables trainers to define non-formal training units (short courses/workshops/placements, etc) in terms of competences and learning outcomes as well as describing level/assessment/evidence requirements/delivery/credit value etc. It is hoped that by using the tool the drafted units could be of sufficient quality to be submitted to competent bodies for validation and credit valuing. By participating in the workshop, you will go through the process and apply the tool on your own unit(s).

If you are interested in attending this workshop, please contact Marieke at marieke@aquatt.ie or Olivia

at olivia@aquatt.ie providing us with information on the type of case study you would like to do and your contact details, before 28th October at the latest.

For full details of the workshop please visit http://www.vallaproject.com/index/9/events.html
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International Symposium on Aquaculture and Fisheries Education (ISAFE), 27-29 November 2009, Bangkok (Thailand)
The symposium will focus on the theme "The Future of Aquaculture and Fisheries Education". Topics include fisheries and aquaculture education, current status of need-base curriculum development, innovative teaching and learning methods, distant/flexible learning, academic and industry partnerships, support for education, research and young fisheries scientists and future direction and strategy.

For more information please visit http://www.aarm-asialink.info/isafe-2009.pdf
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Course "Stock assessment (Introduction)", 11-15 January 2010, ICES, Copenhagen (Denmark)
The International Council for the Exploration of the Sea (ICES) offers courses led by high-profile scientists and instructors. The course Stock assessment (Introduction) provides instruction, demonstration, and exercises in population modelling as applied to fishery resources. The general objective of the course is to train stock-assessment scientists and advisors in basic population dynamics and stock assessment. The deadline for the submission of applications is 4 December 2009. Visit the Training web page: www.ices.dk/iceswork/training/training.asp

Contact ICES Secretariat for more information contact Søren Anker Pedersen, Coordinator for Training at training@ices.dk or tel: (+45) 33 38 67 52
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Workshop on extensive and semi-intensive aquaculture production in Southern Europe, 20-21 January 2010, Tavira (Portugal)
This workshop is targeted to researchers, fish farmers, and other stakeholders interested in sustainable aquaculture practices. The workshop language will be English, with no simultaneous translation available. Please keep in mind the deadlines: Abstracts for Oral and Poster presentations November 12 and Registration December 15

Please consult the provisional programme at www.seacase.org/workshop.html
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Course “Stock assessment (Advanced)", 1-5 February 2010, ICES, Copenhagen (Denmark)
The International Council for the Exploration of the Sea (ICES) offers courses led by high-profile scientists and instructors. The general objective of the “Stock assessment (Advanced)" course is to provide additional training for stock assessment scientists who are familiar with the basic techniques of fishery stock assessment. The deadline for the submission of applications is 12 December 2009. Please register online: www.ices.dk/iceswork/training/registration/

Contact ICES Secretariat for more information contact Søren Anker Pedersen, Coordinator for Training at training@ices.dk or tel: (+45) 33 38 67 52
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Ecosystem Modelling for Fishery Management, 8-12 March 2010, Copenhagen (Denmark)
The ICES Training Programme intends to broaden our approach to fish stock and ecosystem analysis and make all relevant modelling methods available to our community. The course is planned as a five-day activity, and is intended for scientists with some prior experience with ecosystem modelling. Participants are expected to have at least a cursory familiarity with the Ecopath with Ecosim (EwE) approach and software, which can be downloaded freely from www.ecopath.org. The deadline for the submission of applications is 8 January 2010.

For more information please visit http://www.ices.dk/iceswork/training/ecosystem.asp
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Advanced course: Establishment and Management of Marine Protected Areas for Fisheries, CIHEAM, 8-13 March 2010, Zaragoza (Spain)
The objective of the course is to provide managers, planners and researchers of marine protected areas with an understanding of how these areas may function and contribute to local fisheries from experiences acquired in different regions by various management and research teams. The deadline for the submission of applications is 18 December 2009.

For more information e-mail iamz@iamz.ciheam.org or visit www.iamz.ciheam.org
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Advanced Course: New perspectives on marketing chains in small-scale fisheries and aquaculture, 26-30 April 2010, Zaragoza (Spain)
The key aim of the course is to provide small-scale sector participants with an integrated contemporary vision and understanding of the critical factors shaping seafood markets, with special emphasis on the Mediterranean and lessons to be learnt from elsewhere in Europe and the rest of the world. The 5-day course is intensive but selective in its coverage of topics, which span the entire marketing chain from production to consumption.

For more information please visit http://www.iamz.ciheam.org/en/pages/paginas/pag_formacion2.htm
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Collaboration
VALLA project (Validation of All Lifelong Learning in Aquaculture) organises "How to write Training Units" , 26-27 November 2009, Dublin (Ireland)
The VALLA project has developed a very interesting dedicated software tool based on existing European Best Practise which enables trainers to define non-formal training units (short courses/workshops/placements, etc) in terms of competences and learning outcomes as well as describing level/assessment/evidence requirements/delivery/credit value etc. It is hoped that by using the tool the drafted units could be of sufficient quality to be submitted to competent bodies for validation and credit valuing. By participating in the workshop, you will go through the process and apply the tool on your own unit(s).

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For full details of the workshop please visit http://www.vallaproject.com/index/9/events.html
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PESCALEX - Innovative online language tool
The LEONARDO da VINCI Transfer of Technology project PESCALEX (http://www.pescalex.org) has as its primary aim to deliver its materials on fish health/diseases in three of the less widely spoken European languages: Hungarian, Turkish and Galician. The PESCALEX materials (glossary, beginner language units and 4 e-learning fish health units) already exist in English, French, Greek, Norwegian, Polish and Spanish. Its website is currently being reconstructed to deal with the demands of the three new languages.

But as disease outbreaks can spread very fast, causing severe mortalities which can lead to business failure, the PESCALEX partnership is trying to find a way to speed up diagnosis by rapid recognition of symptoms. The partnership is investigating the potential of cell phone applications and would like to hear from individuals or companies who are also interested in this type of development. Please contact Margaret Eleftheriou at margaret@her.hcmr.gr

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AQUA-TNET debated hot topics in education and training at Annual Event 2009 in Spain
Lifelong learning, generic skills training and discussions on how the aquaculture research and education sectors can better interact with NGOs, were just a few of the hot topics discussed during the successful Annual Event 2009 of AQUA-TNET, held in San Feliu de Guixols in Spain last month.

The pan-European education network AQUA-TNET plays a leading co-operative role between higher education institutions and other partners such as academic organisations, research institutions and industry in the European aquaculture, fisheries and aquatic resource management sector. Responding to EC reforms and policies, that emphasise the role of top-quality education as a prerequisite in developing Europe as the most competitive and dynamic knowledge-based economy in the world, AQUA-TNET's multi-faceted approach has enabled the network to make a real contribution to uniting academic and vocational aspects of the Bologna reforms, aiming for greater compatibility and comparability of the systems of higher education in Europe.

During the 3 day event the network was informed about the network's achievements in the past year and goals for the future. Key note speakers addressed topics such as "Aquaculture in the 21st century, trends to be considered in education and training", "How can the Aquaculture Knowledge Generators better interact with NGOs", and "Meeting the Challenge of Providing Lifelong Learning", which led to interesting discussions among speakers and the AQUA-TNET network representatives. The discussion on integration between the AQUA-TNET network and other structures showed that the European Aquaculture Technology and Innovation Platform (EATIP) will be of high importance and value in the future, and participants were encouraged to take an active attitude.

Innovation in teaching experts gave a demonstration of the latest interactive teaching techniques and showcased several new technologies and their potential application in training/education. The interactive session, showcasing numerous new and innovative technologies, such as using backchannel in lectures and conferences, and several online survey methodologies, was of high value to participants.

An integral part of the event was a stakeholder interaction session with the work package groups. This provided an important opportunity to discuss activities and opportunities for collaboration. A lot of feedback and suggestions for progress were generated. The event was brought to a close with an intriguing mix of upcoming projects which were presented by individual participants.

The highly productive and successful event provided a great opportunity for networking of the partners, who have established even more useful contacts for successful future cooperation.

For more information please check the website on www.aquatnet.com or contact the AQUA-TNET Secretariat at info@aquatnet.com
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Other
EU shines beam on single European fleet of research vessels
Work has begun on an EU-funded initiative to link up Europe's research vessels into a single fleet.

Dubbed EUROFLEETS ('European fleets'), the 4-year project has been allocated EUR 7.2 million under the Seventh Framework Programme (FP7). EUROFLEETS will unite 24 marine institutes, universities, foundations and small and medium-sized enterprises (SMEs) in 16 European countries. A major part of the project will see the launch of calls for proposals for scientists wishing to spend time on board a research vessel.

For more information please visit
http://cordis.europa.eu/search/index.cfm?fuseaction=news.document&N_LANG=EN&N_RCN=31337
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Blue carbon – The role of healthy oceans in binding carbon
Out of all the biological carbon captured in the world, over half is captured by marine living organisms. This report suggests that a 'Blue Carbon' fund able to invest in the maintenance and rehabilitation of key marine ecosystems should be considered by governments keen to combat climate change.

To view the full online interactive book launched by the UN Environment Programe (UNEP), the ÚN Food and Agricultural Organization (FAO) and the Intergovernmental Oceanographic Commission of UNESCO please visit http://grida.no/publications/rr/blue-carbon/ebook.aspx
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Call for abstracts - 8th International Conference on Recirculating Aquaculture, VA (USA)
Tech is requesting abstracts for presentations at the Eighth International Conference on Recirculating Aquaculture (20-22 August 2010). In addition to publishing a 1-2 page abstract in the conference proceedings, authors of accepted abstracts will have the opportunity to share their research through an oral presentation or as a poster.

For complete details go to http://www.recircaqua.com/abstract.html For complete details on the conference go to http://www.recircaqua.com/icra.html
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Researchers unlock mystery of European eel's spawning migration
Tracking the movements of individual fish in oceans is not easy, but an international group of scientists has done just that. The research results, published in the journal Science, show how the scientists successfully followed a group of European eels during the first 1,300 km of a 5,000 km journey.

To find out more please visit
http://cordis.europa.eu/search/index.cfm?fuseaction=news.document&N_LANG=EN&N_RCN=31361
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Space technologies in fisheries and maritime affairs: facing the future with confidence
“Be it for fisheries enforcement or border control, for general law enforcement or the prevention of marine pollution, it is clear that the integration of maritime surveillance systems holds the key to important synergies. Pivotal in this process is the collection and sharing of space-generated data and information”. Dr. Joe Borg at the "The Ambitions of Europe in Space" conference, Brussels, 16 October.

To read the full article please visit http://ec.europa.eu/maritimeaffairs/speeches/speech161009_en.html
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The Integrated Maritime Policy for the EU – priorities for the next Commission
On the 15th October 2009 the European Commission presented a Progress Report outlining the achievements of the EU’s Integrated Maritime Policy (IMP) over the past two years and looking out into its future. European Commission President Jose Manuel Barroso commented: *"The first time ever launch of an ambitious integrated maritime policy is a key achievement of the present Commission. It is also a challenge for the next Commission. Maritime policy is an indispensable element of sustainable climate and energy policy.”*

To read the full article and report please visit
http://ec.europa.eu/maritimeaffairs/press/press_rel151009_en.html
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PiscesTT Jobs
Job vacancies, MSc & PhD vacancies and student placements on WWW.PISCESTTJOBS.COM
PISCES TT jobs is a valuable free tool for employers, employees & students in the aquatic resources. Its service aims to foster an efficient means by which to link job-seekers, students, graduates and others seeking work and placements in the aquaculture, fisheries, and related sciences sectors with companies and organisations seeking qualified employees.

Employers can post job vacancies (including permanent, temporary job vacancies, MSc/PhD and student placement positions) facilitating human resource development in the industry.

At the moment there are **13** new vacancies. If you are interested in viewing or posting a job vacancy please go to http://www.piscesttjobs.com/ or contact aquatt@aquatt.ie Subscribe at http://www.piscesttjobs.com/feeds/ for live RSS updates of new job postings.
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Student Corner
Student submissions to AquaTT Training News
We welcome submissions from current students interested in presenting their views and experiences on the industry and education in Europe. The newsletter reaches more than 4000 recipients on a monthly basis and will serve as a good forum to get your ideas out to the differing sectors involved in the industry. An email stating your background and the potential title of your article should be sent to aquatt@aquatt.ie for review.
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INFORMATION OF INTEREST

The Israeli Journal of Aquaculture – Bamidgeh (IJA) ISSN 0792-156X
To our friends and colleagues,

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Dan Mires
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Assessment of National Aquaculture Policies and Programmes in Uganda and Review on national policies and programmes on aquaculture in Ghana: 2 new SARNISSA 2009 project reports

Aquaculture site selection and site management. 2. Guide for the sustainable development of Mediterranean aquaculture. IUCN 2009, 303 pp.

American Fisheries Society Table of Contents Alert
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A METHOD TO DETERMINE PROTEIN DIGESTIBILITY OF MICRODIETS FOR LARVAL AND EARLY JUVENILE FISH
J.M. Hansen, J.P. Lazo, L.J. Kling-2009
Aquaculture Nutrition 15(6) : 615 – 626
Abstract:
A method to evaluate protein quality using in vivo methods was developed for larval fish. FluoSpheres® fluorescent microspheres (10 μm) were incorporated into two test diets, our standard zein microdiet (ZMD) and a microdiet with identical ingredients except for the replacement of high quality fish meal with the same product cooked for 24 h at 80 °C (ZMD-CF). Several trials were performed to design a reliable method to test digestibility using FluoSpheres® as a marker. The developed in vivo technique was tested on 35 days posthatch (dph) larval Atlantic cod (Gadus morhua L.) and two tropical fish species in the early juvenile stage. The method took into account loss of total protein to the faecal pellet and water column. Apparent digestibility of protein in larval cod fed ZMD was significantly higher than that of larvae fed ZMD-CF ($P < 0.05$). A growth study to validate differences between the two diets showed significant differences in growth and survival of larvae fed ZMD versus ZMD-CF ($P < 0.05$). Further validation of our results was indicated through the use of a pH-stat method using enzymes extracted from 35 dph larval cod guts. This novel technique will be advantageous for researchers to evaluate feed ingredients for larval marine fish and is adaptable to many different areas of larval fish nutrition.
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DIETARY MENADIONE NICOTINAMIDE BISULPHITE (VITAMIN K3) DOES NOT AFFECT GROWTH OR BONE HEALTH IN FIRST-FEEDING FRY OF ATLANTIC SALMON (SALMO SALAR L.)
C. Krossøy, R. Waagbø, P.-G. Fjelldal, A. Wargelius, E.-J. Lock, I.E. Graff, R. Ørnsrud-2009
Aquaculture Nutrition 15(6) : 638 – 649
Abstract:
The aim of the present study was to elucidate if increasing levels of added vitamin K in the feed influenced fish growth, health or the incidences of bone deformities in Atlantic salmon (Salmo salar L.) from onset of start feeding to ~100 g in freshwater. Duplicate groups of Atlantic salmon fry (~0.20 g) were fed eight levels (0, 2.5, 5, 7.5, 10, 15, 20 and 50 mg menadione kg−1) of the vitamin K derivate menadione nicotinamide bisulphite (MNB) in a regression design for 28 weeks. All fish maintained high growth rates throughout the experiment, and showed no significant differences in specific growth rate, condition factor, whole body proximate analysis, blood coagulation time, vertebra morphology or mechanical properties of vertebrae. We found a dose-response between whole body vitamin K concentration and the dietary MNB supplementation level. Analysis of liver γ-glutamylcarboxylase activity revealed significant dose-dependent differences between groups given the 0, 10 and 50 mg MNB kg−1 diets. In conclusion, Atlantic salmon seems to require low levels of dietary vitamin K, and the amount of vitamin K found naturally in the presently used feed ingredients may be enough to maintain optimal growth, health and bone strength in Atlantic salmon fry from start feeding.

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FACTORS GOVERNING ALGAL GROWTH IN PHOTOBIOREACTORS: THE "OPEN" VERSUS "CLOSED" DEBATE

Johan U Grobbelaar-2009
Journal of Applied Phycology 21(5): 489-492

Abstract:
Until recently, most large commercial scale microalgal production systems employed open systems. However, several large-scale closed systems have now been built and, for the first time, actual comparisons can be made. There are major operational differences between open and closed photobioreactors and, consequently, the growth physiology of the microalgae is different between the two systems. Several of the factors governing growth can, within certain boundaries, be manipulated while others are specific to the cultivation system. Crucial factors are the optical depth, turbulence, light acclimated state of the organism, nutrient availability and metabolite accumulation. In the final analyses, systems are used for specific purposes and each will determine which system is the most suitable, since there is no universal all-purpose photobioreactor.

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NUTRITIONAL VALUE OF THE CRYPTOPHYTE RHODOMONAS LENS FOR ARTEMIA SP.

Pedro Seixas, Paula Coutinho, Martiña Ferreira, Ana Otero-2009
Journal of Experimental Marine Biology and Ecology 381(1): 1-9

Abstract:
Juvenile or adult Artemia sp. are often used as live prey for the rearing of early life stages of some crustacean, fish and cephalopod species. The improvements of both Artemia growth and its biochemical composition are key issues for the suitable use of Artemia biomass in these rearing processes. In this study we evaluated the growth and survival rates of Artemia fed with the cryptophyte Rhodomonas lens in comparison with different microalgal species commonly used in aquaculture: the prasinophyte Tetraselmis suecica, the prymnesiophyte Isochrysis galbana Parke, and the eustigmatophyte Nannochloropsis gaditana. Microalgae were cultured semi-continuously in nutrient saturated conditions and with a daily renewal rate of 30% of the volume of cultures, to obtain biomass of controlled and optimized composition. Considerable differences in Artemia growth were observed, as well as in the survival rate. At day 8 of rearing, Artemia fed R. lens had the highest length (4.9 ±0.6 mm, $P < 0.001$), followed by individuals fed T. suecica (4.2 ± 0.7 mm), I. galbana (3.6 ± 0.7 mm) and finally those fed N. gaditana (1.5 ± 0.2 mm). The survival rate of Artemia fed N. gaditana (18 ± 3%) was much lower ($P < 0.001$) than values found for the remaining groups (69 to 88%). The growth rate of Artemia obtained with R. lens was in general much higher than with other microalgal diets previously reported in the literature. The higher protein content of R. lens could explain the higher growth obtained with this species, but differences of Artemia growth with the different diets could not be explained solely on the basis of the gross composition of microalgae. Factors such as cell size and digestibility all seem to contribute to the results observed. Another trial was carried out to investigate differences in Artemia growth and on its biochemical composition when fed the best two diets: R. lens or T. suecica. The fatty acid (FA) and total amino acid (AA) composition of both microalgal species and the composition of Artemia were assessed as well. As found in the first experiment individuals fed R. lens (group ARHO) grew faster than those fed T. suecica (group ATET), attaining 3.6 ± 0.3 mm and 3.2 ± 0.4 mm ($P < 0.001$), respectively, after 5 days of rearing. The much higher AA content obtained in R. lens may be on the basis of the higher growth obtained with this species. Protein and carbohydrate levels in Artemia juveniles were very similar in both groups (64–68% of dry weight, and 8–10%, respectively). Lipid was slightly lower in ARHO (12%) than in ATET (15%, $P < 0.01$). Regarding the FA composition, juveniles from group ARHO contained higher levels of eicosapentaenoic acid (EPA, 6.2%) than juveniles from ATET (4.1%, $P < 0.01$), whereas docosahexaenoic acid (DHA) was only found in juveniles from ARHO (1.1%). Taking into account that the daily productivity of R. lens culture was higher than, or at

least equal, the remaining microalgal species this cryptophyte is confirmed as an excellent diet to optimize the growth of Artemia, as well as to improve its biochemical composition.
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COMPARISON OF FECUNDITY, EMBRYO LOSS AND FATTY ACID COMPOSITION OF MANGROVE CRAB SPECIES IN SEWAGE CONTAMINATED AND PRISTINE MANGROVE HABITATS IN MOZAMBIQUE

Gil Penha-Lopes, Paulo Torres, Luis Narciso, Stefano Cannicci, José Paula-2009
Journal of Experimental Marine Biology and Ecology 381(1): 25-32
Abstract:
The effects of anthropogenic activities combined with the lack of technical solutions for sewage treatment have lead to serious contamination problems in the coastal ecosystems of East Africa. However, not all contaminants can be considered pollutants. Determining when contamination results in pollution requires not only chemical but also biological measurements. Because benthos integrates conditions over time, macrobenthic organisms are considered good bioindicators to assess local environmental quality. Crabs constitute one of the most important macrofauna taxa in terms of abundance, species richness and biomass in mangrove ecosystems. In the present study, the reproductive potential and quality of Uca annulipes population inhabiting a peri-urban mangrove, subjected to domestic sewage discharges, was compared to populations inhabiting pristine mangroves. Fecundity, egg quality (fatty acids composition) and potential fertility were evaluated and compared by sampling a representative fraction of ovigerous females captured in each of the mangrove habitats at two seasons (February to March, 2006 — wet season; and August to September, 2006 — dry season). Most of the measured reproductive parameters of U. annulipes were different at Maputo peri-urban mangrove when compared to nearby pristine locations. Although we cannot prove that sewage discharge done at Costa do Sol mangrove was the main factor influencing the reproductive dynamics of U. annulipes populations, at this peri-urban mangrove this fiddler crab species extended its reproductive season, increased fecundity, as well as improved embryo quality, mainly regarding the concentration of SFA and MUFA, in relation to the pristine mangrove populations.
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VISCOSITY AND NOT BIOLOGICAL MECHANISMS OFTEN CONTROLS THE EFFECTS OF TEMPERATURE ON CILIARY ACTIVITY AND SWIMMING VELOCITY OF SMALL AQUATIC ORGANISMS

Poul S. Larsen, Hans Ulrik Riisgård-2009
Journal of Experimental Marine Biology and Ecology 381(2): 67-73
Abstract:
A number of studies have shown that temperature-dependent viscosity of the ambient water controls or strongly affects bio-mechanical activity such as beat frequency of water-pumping cilia in mussels and ascidians, swimming velocity of sperm cells, ciliates and small (micro- and meso-scale) aquatic organisms using cilia or small appendages for propulsion. Here we summarize results from the literature and from own studies on bio-mechanical activities in response to changing temperature or manipulated viscosity at constant temperature, both having the same change in kinematic viscosity. The survey is used to assess to what extent the response is purely physical/mechanical or biological. We argue that a power-law dependence of bio-mechanical activity (a) on kinematic viscosity (ν), i.e. $a \propto \nu^{-m}$, should be applied to available data. Based on a general close matching of the response data to power-law regressions for viscosity manipulation (by means of an additive) and/or temperature we suggest that viscosity and not biological mechanisms often control the response. This knowledge enhances our basic understanding of the effect of temperature not only on the swimming and feeding behaviour of small aquatic organisms, but also on larger ciliary suspension-feeding bivalves and ascidians.

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PHENOLOXIDASE AND TRYPSIN IN GERM-FREE LARVAE OF ARTEMIA FED WITH COOKED UNICELLULAR DIETS: EXAMINING THE ALIMENTARY AND PROTECTIVE EFFECTS OF PUTATIVE BENEFICIAL BACTERIUM, YEAST AND MICROALGAE AGAINST VIBRIOSIS

C.R. Rojas-García, P. Sorgeloos, P. Bossier-2009

Journal of Experimental Marine Biology and Ecology 381(2): 90-97

Abstract:
Three putative beneficial unicellular organisms, the marine bacterium Roseobacter sp, the yeast Saccharomyces cerevisiae mnn9 strain (SC-mnn9) and the microalga Tetraselmis suecica were cooked and offered separately as diets to developing germ-free (GF) Artemia larvae, in order to analyze their alimentary and protective effects. GF Artemia larvae were able to grow with cooked Tetraselmis and SC-mnn9 but failed with cooked Roseobacter. In spite of its high dietary quality, Tetraselmis failed to provide protection against Vibrio proteolyticus infection, while Roseobacter failed as food as well to provide protection. Cooked SC-mnn9 appeared to possess both values, dietary for growth and protective against Vibrio infection. GF Artemia larvae were apparently rapid adapted to dietary swaps; from yeast to algal and from algal to yeast. While the diets swap from algal or yeast, to bacterial diet appeared to be detrimental. Phenoloxidase-L (PO-L) and trypsin-L were used as biochemical indicators of defense and digestive functions, respectively. Developmental trypsin-L patterns were similar when fed on yeast and microalgae diets, suggesting a good digestive adaptation to plant or fungal substrates at early stages. On the contrary, diets swap or Vibrio infection affected PO-L and trypsin-L suggesting a sort of 'alteration' of digestive and defense functions.

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REALIZED HERITABILITY AND GENETIC GAIN ESTIMATES OF LARVAL SHELL LENGTH IN THE CHINESE PEARL OYSTER PINCTADA MARTENSII AT THREE DIFFERENT SALINITIES

Yuewen Deng, Shao Fu, Xiaodong Du, Qingheng Wang-2009

North American Journal of Aquaculture 71(4): 302-306

Abstract:
The second-generation selected (SS) and control (SC) lines of the Chinese pearl oyster Pinctada martensii were established by selecting the 10% of breeders with the largest and mean sizes, respectively, from the first-generation selected group. Larval offspring of the SS and SC lines were reared at 30, 24, and 18‰. Heritability and genetic gains of larval shell length were estimated on the basis of data measured at days 8, 14, and 21. At days 8 and 14, there were no significant differences in mean shell length between the SS and SC lines at 30, 24, and 18‰ ($P > 0.05$). On day 21, however, the SS line displayed significantly larger mean shell length than the SC line at 30‰ and 24‰ ($P < 0.05$). Heritability estimates and genetic gains for larval shell length ranged from 0.22 to 0.64 and from 3.68% to 14.93%, respectively. The results from this study indicate that considerable genetic variability exists in the base population and that mass selection for the second generation is still effective.

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EVALUATION OF ZOOPLANKTON IN HATCHERY DIETS FOR CHANNEL CATFISH FRY

Charles C. Mischke, David J. Wise, Todd S. Byars-2009

North American Journal of Aquaculture 71(4): 312-314

Abstract:

The efficacy of zooplankton as a supplemental hatchery diet for fry of channel catfish Ictalurus punctatus was evaluated. When a commercial diet is used as a reference, fry fed exclusively on zooplankton—either live or dried—performed poorly in their growth rate. However, when live or dried zooplankton were fed to fry in conjunction with the commercial diet, fry weight increased 40–50% over the weight of fry fed the commercial diet alone in a 19-d feeding trial. Data from this study indicate that zooplankton may serve as a sustainable and reliable supplement during hatchery production. These data also reaffirm the importance of zooplankton as a feed source in the growth of channel catfish fry. Zooplankton are important in catfish fry culture, and when zooplankton are present with commercial diets, improved growth results. Based on results of this study, supplemental feeding of zooplankton to hatchery fry and managing fry ponds for increased zooplankton densities should increase fry growth during the nursery phase of culture.
(Thad Cochran National Warmwater Aquaculture Center, Mississippi State University, Box 197, Stoneville, Mississippi 38776, USA; email of Charles C. Mischke: cmischke@drec.msstate.edu)

LABORATORY DOSE CONFIRMATION OF COPPER SULFATE FOR TREATING FUNGUS ON CHANNEL CATFISH EGGS

David L. Straus, Andrew J. Mitchell, Andrew A. Radomski, Ray R. Carter, James A. Steeby-2009
North American Journal of Aquaculture 71(4): 333-338

Abstract:
Two dose confirmation studies are required by the U.S. Food and Drug Administration to verify the effectiveness of a candidate before approval as a new animal drug is awarded; the two studies provide independent substantiation of the results. This laboratory study was designed to compare an untreated control and a 10-mg/L copper sulfate (CuSO4) treatment to control fungus (Saprolegnia spp.) on eggs of channel catfish Ictalurus punctatus at 23.5°C in a flow-through system. The eggs were treated once daily until the embryos reached the eyed stage (five treatments). When hatching was complete for all viable eggs (day 10), the fry were counted to determine the percent survival in each treatment. Infestation by a fungus identified morphologically and by polymerase chain reaction as Saprolegnia spp. was severe in the control fish, resulting in 8% survival. The mean percent survival of fry hatched from the CuSO4-treated eggs was significantly higher (mean, 55%; range, 27–71%).
(U.S. Department of Agriculture, Agricultural Research Service, Harry K. Dupree–Stuttgart National Aquaculture Research Center, Post Office Box 1050, Stuttgart, Arkansas 72160, USA; email of David Straus: dave.straus@ars.usda.gov)

EXPLORING THE NUTRITIONAL DEMAND FOR ESSENTIAL FATTY ACIDS BY AQUACULTURE SPECIES

Brett D. Glencross-2009
Reviews in Aquaculture 1(2): 71-124

Abstract:
Essential fatty acids (EFA) remain one of the least well-understood and enigmatic nutrients in aquaculture nutrition. Of all dietary nutrients none has a greater direct impact on the composition of its consumer. Their importance stems not only to their impact on animal growth, but also to factors such as reproduction, immunity and product quality. Docosahexaenoic acid (DHA; 22:6n-3) has consistently been shown to provide the greatest EFA value to most species. However, the nutritional value of eicosapentaenoic (EPA; 20:5n-3) and arachidonic (ARA; 20:4n-6) acids has also been significantly greater than that exhibited by linolenic (LNA; 18:3n-3) and linoleic (LOA; 18:2n-6) acids. All five fatty acids have been shown to provide EFA value to most aquaculture species, although the optimal dietary inclusion levels and balance among the fatty-acid classes (n-3 and n-6) and fatty-acid chain lengths (18-C, 20-C or 22-C) vary among species. Environmental origin (freshwater, estuarine or marine) appears to be a primary factor influencing the difference in EFA requirements. The role that EFA play in osmoregulation clearly shows how these nutrients affect animals from different aquatic environments. The influence of EFA on growth also appears to be greatest in larval fish and crustaceans, possibly because of their reduced ability to digest and absorb lipids, but also because of a proportionally higher demand for EFA in the development of, in particular, neural tissues. Despite an abundance of research

since the 1970s on the EFA requirements of aquaculture species there remains a need to better define the EFA requirements of most aquaculture species. Of all major aquaculture species only the penaeid shrimp has a comprehensively documented assessment of its nutritional requirements for EFA. The nutritional requirements for EFA in most fish species have not been comprehensively studied and those species that were fully examined in the 1970s and 1980s now need to be reassessed in light of recent changes to the use of high-nutrient-density diets that were not routinely used in either practice or research during that earlier period. In addition to changes in dietary specification strategies, declining dependence on marine-origin lipid sources in recent years has placed an increased imperative on understanding the dietary need for long-chain polyunsaturated fatty acids (lcPUFA). As aquaculture continues to grow there will be an increased use of alternative lipid resources, such as grain, algal and rendered oils, to provide dietary lipids. In addition to dietary dilution of natural EFA sources through the use of these raw materials, they will also bring new challenges, such as increased levels of n-6 and 18-C polyunsaturated fatty acids (PUFA). Introduction of these n-6 and PUFA fatty acids to the diet of aquaculture species will not only influence the nutritional demands of these animals, but will also affect their flesh quality characteristics by reducing their level of n-3 lcPUFA. This dilemma will demand an increased prioritisation on the value of lipid sources rich in n-3 lcPUFA, but is also likely to stimulate the development of alternative sources of lcPUFA.

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