

## INFORMATION OF INTEREST

Aquaculture News 35 (May 2009) published by the Institute of Aquaculture, University of Stirling (Scotland, UK) is now available as electronic version at [www.aqua.stir.ac.uk/aquanews](http://www.aqua.stir.ac.uk/aquanews)

The Spring/Summer 2009 issue of Shellfish News is now available as a [PDF file](#) on the CEFAS web site

Skills development and training [session](#) for the Aquaculture farmer in the Western Cape, South Africa

ICES Mariculture Committee [2009 Report](#) of the Working Group on Pathology and Diseases of Marine Organisms

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[443 June 19, 2009](#)

[444 June 26, 2009](#)

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## AQUATT JUNE 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](mailto:news@aquatt.ie)  
Please check the [AquaTT Calendar](#) for a comprehensive overview of all Marine Sector related events, including details.

August 2009

- Aquaculture Europe 2009, 14-17 August 2009, Trondheim (Norway)
- International Aquaculture Biosecurity Conference: Practical Approaches for the Prevention, Control and Eradication of Disease August 17-18 2009, Trondheim (Norway)
- Aqua Nor 2009, 18-21 August 2009, Trondheim (Norway)
- Sixth International Conference on Marine Bioinvasions, 24-27 August 2009, Oregon (USA)
- SAME11 - 11th Symposium on Aquatic Microbial Ecology, 30 August – 4 September, Piran (Slovenia)

September 2009

- Quality Management web-based courses, September 2009, Newfoundland (Canada)
- International Workshop on the Restoration of Fish Populations, 1-4 September 2009, Düsseldorf (Germany)
- 2nd European Congress of Conservation Biology, 1-5 September 2009, Prague (Czech Republic)
- BOMOSA Conference: Small Scale Cage Farming in Eastern Africa, 2-4 September 2009 Kenya, (East Africa)
- British Science Festival, 5-10 September 2009, Guildford (United Kingdom)
- The 13th European Congress of Ichthyology - ECI XIII, September 6 -11 2009, Klaipeda (Lithuania)
- The White Sea Molecular Zoology Summer School, 6-20 September 2009, Moscow (Russia)
- The Regional European Crayfish Workshop: Future of Native Crayfish in Europe, 7-10 September 2009, Pisek (Czech Republic)
- Larvi 2009 - 5th Fish & Shellfish Larviculture Symposium, 7-10 September 2009, Ghent (Belgium)
- 44th European Marine Biology Symposium, 7-11 September 2009, Liverpool (UK)
  
- Aquaculture Association of Southern Africa 9th Conference, 8-11 September 2009, Namibia (Africa)

- Second International Workshop on Biology of Fish Gametes, 9 - 11 September, 2009, Valencia (Spain)
  - 14th International Conference on Diseases of Fish and Shellfish, 14-19 September 2009, Prague (Czech Republic)
  - Fourth International Tuna Conference, 14-15 September 2009, Vigo (Spain)
  - European Offshore Wind 2009, 14-16 September 2009, Stockholm (Sweden)
  - World Fisheries Summit on Sustainability, 15 September 2009, Vigo (Spain)
  - 3rd Joint Trans-Atlantic Fisheries Technology Conference (TAFT), 15-18 September 2009, Copenhagen (Denmark)
  - The Fifth International Fisheries Ministers Conference, 16 September 2009, Vigo (Spain)
  - Workshop on Ocean Biology Observatories, 16-18 September 2009, Mestre (Italy)
  - World Fishing Exhibition 2009 + Aqua Farming International Exhibition 2009, 16-19 September 2009, Vigo (Spain)
  - NovelQ Seminar: High pressure processing for safe, high-quality seafood, 17 September 2009, Stavanger (Norway)
  - AQA 2009 Conference, 17 September 2009, Vigo (Spain)
  - OceanObs 09 Conference - Ocean information for society, 21-25 September, Venice (Italy)
  - 2009 ICES Annual Science Conference, 21-25 September 2009, Berlin (Germany)
  - Harmonisation of the Care and Use of Fish in Research, 22 - 24 September 2009 Oslo (Norway)
  - 2009 Forum on Fishery Science and Technology, 25-27 September 2009, Guangzhou (China)
  - World Congress on Oils and Fats and the 28th ISF Congress, 27-30 September 2009, Sydney (Australia)
  - Conference: "The Philosophy of Science in Use", 28 September – 2 October 2009, Linköping (Sweden)
  - 24th Annual Texas Shrimp Farming and Marine Finfish Culture Course, 30 September – 6 October 2009, Texas (USA)
- October 2009
- IAFI World Seafood Congress, 5-9 October 2009, Agadir (Morocco)
  - XII Forum of Marine Resources and Aquaculture of the Galician Rias, 8-9 October 2009, Galicia (Spain)
  - GLOBALGAP Tour 2009, 12-16 October 2009, Kuala Lumpur (Malaysia)
  - 2-Day Aquaculture Course, 13-14 October 2009, Southern Africa
  - Asia-Pacific Fishery Commission (APFIC) - Regional Consultative Workshop, 13-15 October 2009, Manila (Philippines)
  - GLOBALGAP Tour 2009, 14-18 October 2009, Kenya (Africa)
  - GLOBALGAP Tour 2009, 26-29 October 2009, Washington D.C. (USA)
  - Acquacultura Med Conference 2009, 22-24 October Verona (Italy)
  - Global Fisheries & Aquaculture Research Conference, 24-26 October 2009, Cairo (Egypt)
  - 6th International Symposium on Sturgeon, 25-30 October 2009, Hubei Province (China)
- November 2009
- China Fisheries and Seafood Exposition, 3-5 November 2009, Qingdao (China)
  - Latin American Conference on Culture of Native Fish, 3-6 November 2009, Province of Buenos Aires (Argentina)
  - Asia Pacific Aquaculture Conference, 3-6 November 2009, Kuala Lumpur, (Malaysia)
  - Third International Barcode of Life Conference, 7-12 November 2009, Mexico City, North America
  - Regional Workshop "Ecosystem Approach to Fisheries and Aquaculture in the Near East and North Africa Region Facing Climate Change" 10-12 November, Abbassa, (Egypt)
  - Science Festival 2009, 12-15 November 2009, Luxembourg-Grund (Luxembourg)
  - Ph.D. course "Physical and biochemical methods for analysis of fish as food", 16 - 20 November 2009, Kgs. Lyngby (Denmark)
  - The XII National Congress of Aquaculture, November 24-26, 2009, Madrid (Spain)
  - First International Symposium on Aquaculture and Fisheries Education, 27-30 November 2009, Bangkok (Thailand)

- World Conference on Biological Invasions and Ecosystem Functioning (BIOLIEF), 27-30 September 2009, Porto (Portugal)

January 2010

- 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)

March 2010

- Aquaculture 2010, 1-5 March 2010, San Diego (California)

May 2010

- Aquaculture UK 2010, 19-20 May 2010, Aviemore (Scotland)
- Australasian Aquaculture International Conference, 23-26 May 2010 Hobart (Tasmania)

June 2010

- Global Conference on Aquaculture 2010, 9-12 June 2010, Bangkok (Thailand)

July 2010

- 14th International Meiofauna Conference, 12-16 July 2010, Ghent (Belgium)
- 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)

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)

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#### EFFECT OF N-ACYL HOMOSERINE LACTONE-DEGRADING ENRICHMENT CULTURES ON MACROBRACHIUM ROSENBERGII LARVICULTURE

Dang To Van Cam, Dinh The Nhan, Siele Ceuppens, Nguyen Van Hao, Kristof Dierckens, Mathieu Wille, Patrick Sorgeloos, Peter Bossierc-2009

Aquaculture 294(1-2) : 5-13

Abstract:

N-acyl homoserine lactone molecules (AHL) are quorum sensing molecules known to be involved in the production of virulence factors. In this study, N-acyl homoserine lactone (AHL)-degrading enrichment cultures (ECs) as bio-control agent in prawn larviculture was investigated. Enrichment cultures EC5(D) and EC5(L), originating from microbial communities of the fish gut of *Dicentrarchus labrax* L. and *Lates calcarifer*, were tested in the larval rearing of *Macrobrachium rosenbergii* through their addition to the rearing water and by bio-encapsulation in *Artemia* nauplii. The ECs were grown at the expense of glycerol released in the medium by hatching *Artemia*. The larval stage index of AHL-exposed larvae was  $4.06 \pm 0.07$  in Experiment 1 and  $6.18 \pm 0.10$  in Experiment 2 and  $5.04 \pm 0.07$  and  $6.50 \pm 0.08$  in the control treatment, respectively. Furthermore, a distinct difference in

survival between AHL-exposed larvae ( $37.3\% \pm 10.6$  and  $64.5\% \pm 2.0$ ) versus non-exposed larvae ( $77.7\% \pm 5.6$  and  $76.8\% \pm 3.2$  in Experiments 1 and 2, respectively) was observed. Both ECs were effective in improving prawn larvae survival under experimental conditions, i.e. when the survival of prawn larvae was compromised through a daily exposure to AHL molecules ( $1 \text{ mg l}^{-1}$ ). Through the addition of ECs, the negative effect of AHL could be counteracted, especially obtaining better larval quality, indicated by ammonia tolerance. These experiments demonstrated that AHL at a concentration of  $1 \text{ mg l}^{-1}$  could have a negative effect on prawn larvae, presumably through their effect on the prevailing opportunistic pathogenic microorganisms, while the selected ECs can counteract this. For this reason, using N-acyl homoserine lactone-degrading microbial communities might be a useful tool in prawn larviculture.

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#### EFFECT OF REARING TEMPERATURES POST HATCHING ON SEX RATIOS OF RAINBOW TROUT (*ONCORHYNCHUS MYKISS*) POPULATIONS

Andreas Magerhans, Andreas Müller-Belecke, Gabriele Hörstgen-Schwark-2009

Aquaculture 294(1-2): 25-29

Abstract:

A comprehensive experiment was carried out to study the effect of an elevated temperature of  $18 \text{ }^{\circ}\text{C}$  for 30 days (starting on day 42 post fertilization) on sex ratios in progenies of six different (I, II, III, IV, V and VI) rainbow trout broodstocks of the Experimental Trout Farm Relliehausen (University of Goettingen, Germany). Further, the repeatability of the obtained results and the effects of mating partners on temperature responsiveness were examined. In total about 7000 temperature-treated ( $18 \text{ }^{\circ}\text{C}$ ) fish and their corresponding 7000 full sibs kept at  $12 \text{ }^{\circ}\text{C}$  were sexed. In general, the mean survival rates after temperature treatment of  $18 \text{ }^{\circ}\text{C}$  did not differ significantly from the corresponding values of the full sibs kept at  $12 \text{ }^{\circ}\text{C}$ . Significant differences to  $18 \text{ }^{\circ}\text{C}$  temperature responsiveness were observed between the progenies of the six broodstock populations. Broodstock population II showed the highest mean female percentage of 60.6% of the temperature-treated progenies, while population III showed the lowest mean female percentage of 36.0%. Single pair matings within the four (I, III, V and VI) populations were repeated and the percentage of females in the  $18 \text{ }^{\circ}\text{C}$ -treated replicated spawns differed only by 0.4%–5.8%. In addition, paternal and maternal half sibs showed that the sensitivity of sex ratios to temperature treatment varied between breeding pairs. Both parents, male and female, seem to contribute to the different sex ratios after treatment. It was concluded that a sensitivity of sex-differentiation to temperature treatments seems to exist in rainbow trout depending on the genotype and the applied temperature treatment.

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#### EVALUATING THE ECONOMIC POTENTIAL OF HORIZONTALLY INTEGRATED LAND-BASED MARINE AQUACULTURE

Stuart W. Bunting, Muki Shpigel-2009

Aquaculture 294(1-2): 43-51

Abstract :

Coastal aquaculture development is frequently associated with negative environmental impacts, competition for resources and conflict. Consequently, a new paradigm of ecologically-sound, socially responsible and economically viable aquaculture development based on systems-thinking, resource use efficiency and joint analysis with stakeholders is needed. Horizontal integration, combining aquaculture production systems to optimise resource use efficiency constitutes a promising approach in this regard. Research shows that an array of horizontally integrated systems are technically viable, however, few studies have combined this with consideration of the managerial, financial and economic demands. A bioeconomic modelling approach was employed here to assess the broader implications of adopting horizontally integrated land-based marine aquaculture in temperate and warm water settings. The temperate system, integrating fish, microalgae and shellfish culture and a

polishing lagoon was developed on the Atlantic coast of France. Modelling outcomes predicted that when all costs were considered this approach failed to generate a positive Internal Rate of Return (IRR) over ten years. Subsequent scenarios showed a worthwhile return (ten-year IRR 19.4%) was generated when land and labour opportunity costs were omitted and a 20% premium on products included. The warm water system developed near Eilat, Israel combined sea urchins, shrimp and seaweed culture with a constructed wetland. Assuming baseline production of one million sea urchins annually from year three onwards, modelling outcomes showed a reasonable ten-year IRR of 18%. Reducing sea urchin mortality from 15% to 9% annually resulted in an IRR of 29.4%, while assuming that *Salicornia* spp. production would reach 33 kg m<sup>-2</sup> y<sup>-1</sup> in the wetland resulted in an IRR of 133.4%. Findings suggest that bioeconomic modelling can contribute to the optimisation of horizontally integrated aquaculture systems, helping elucidate promising scenarios and identify key constraints and priorities for targeted research and development. Bioeconomic modelling of other horizontal integration strategies, such as shrimp culture with shellfish, macroalgae and mangrove wetlands could elucidate economically viable approaches to much needed ecologically-sound and socially responsible practices. However, modelling should be supplemented by market analysis, including assessment of consumer attitudes, comprehensive risk assessment, ethical review, environmental impact assessment and joint assessment with stakeholders. Moreover, an enabling institutional framework is a prerequisite to more widespread adoption of horizontal integration; policy initiatives and regulatory tools focused on internalising environmental costs of aquaculture development will be critical.

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#### SURVIVAL, GROWTH AND FOOD CONVERSION OF CULTURED LARVAE OF PANGASIANODON HYPOPHTHALMUS, DEPENDING ON FEEDING LEVEL, PREY DENSITY AND FISH DENSITY

J. Slembrouck, E. Baras, J. Subagja, L.T. Hung, M. Legendre-2009

Aquaculture 294(1-2) : 52-59

Abstract:

In young fish larvae feeding efficiency is generally proportional to prey density, so feeding in excess is needed to maximise growth and survival. Increasing fish density might contribute to improve food conversion, but it can also impact negatively on fish growth or survival. Larvae of *Pangasianodon hypophthalmus* were raised until 192 h after hatching (hah) in 30-L tanks in a recirculating system (light regime: 12L:12D, 29.6 ± 1.2 °C) at three stocking densities (10, 30 and 90 fish L<sup>-1</sup>), and fed every 3 h with *Artemia nauplii* at 1, 3 or 9 times a reference feeding level (RFL; 50% increase per day), thereby producing five different prey densities (from 10 to 810 RFL L<sup>-1</sup>). Except for the highest prey density, survival (20–60%) was dependent on feeding level, whereas fish growth (12.5–17.6 mm TL at 192 h AH) was more influenced by prey density than by feeding level. Both variables were negatively affected by fish density, but to a much lesser extent than by food availability. At all fish densities, the gross conversion efficiency (GCE, 0.13–0.42) was highest at 1 RFL, and decreased for higher feeding levels, but not between 1 and 3 RFL at 90 fish L<sup>-1</sup>, which provided the best compromise between survival, growth and GCE in this study. Temporal variations in the effects of food availability and fish density are interpreted in respect to the developmental pattern of *P. hypophthalmus*.

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#### PILOT SCALE SEMICONTINUOUS PRODUCTION OF SPIRULINA BIOMASS IN SOUTHERN BRAZIL

M.G. Morais, E.M. Radmann, M.R. Andrade, G.G. Teixeira, L.R.F. Bruschi, J.A.V. Costa-2009

Aquaculture 294(1-2) : 60-64

Abstract:

We evaluated the feasibility of the pilot scale production of *Spirulina* strain LEB-18 in southern Brazil and assessed the quality of biomass produced in relation to its kinetics characteristic, nutritional value, heavy metal content and microbial content. The maximum mean biomass concentration was 1.24 g L<sup>-1</sup> and the maximum productivity was 69.16 g m<sup>-2</sup> d<sup>-1</sup>. The biomass showed 84.0% digestibility, 86.0% (w/w) protein and 3.3% (w/w) lipid content. Analyses showed that the concentration (mg kg<sup>-1</sup>) of heavy metals (As, 0.28 ± 0.01; Cd, < 0.05; Hg, < 0.01; and Pb, 0.17) and the microbial load (7.1 × 10<sup>5</sup> colony forming units per gram) were lower than the internationally accepted standards. These results show that pilot scale cultivation of *Spirulina* LEB-18 in southern Brazil is feasible and that the biomass produced is within the internationally recognized standards for use as a food additive for increasing the nutritional potential of conventional products.

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#### IMMOBILIZATION OF NITRIFYING BACTERIAL CONSORTIA ON WOOD PARTICLES FOR BIOAUGMENTING NITRIFICATION IN SHRIMP CULTURE SYSTEMS

N.J. Manju, V. Deepesh, Cini Achuthan, Philip Rosamma, I.S. Bright Singh-2009

Aquaculture 294(1-2) : 65-75

Abstract:

Shrimp grow out systems under zero water exchange mode demand constant remediation of total ammonia nitrogen (TAN) and NO<sub>2</sub>-N to protect the crop. To address this issue, an inexpensive and user-friendly technology using immobilized nitrifying bacterial consortia (NBC) as bioaugmentors has been developed and proposed for adoption in shrimp culture systems. Indigenous NBC stored at 4 °C were activated at room temperature (28 °C) and cultured in a 2 L bench top fermentor. The consortia, after enumeration by epifluorescence microscopy, were immobilized on delignified wood particles of a soft wood tree *Ailantus altissima* (300–1500 µm) having a surface area of 1.87 m<sup>2</sup> g<sup>-1</sup>. Selection of wood particle as substratum was based on adsorption of NBC on to the particles, biofilm formation, and their subsequent nitrification potential. The immobilization could be achieved within 72 h with an initial cell density of 1 × 10<sup>5</sup> cells mL<sup>-1</sup>. On experimenting with the lowest dosage of 0.2 g (wet weight) immobilized NBC in 20 L seawater, a TAN removal rate of 2.4 mg L<sup>-1</sup> within three days was observed. An NBC immobilization device could be developed for on site generation of the bioaugmentor preparation as per requirement. The product of immobilization never exhibited lag phase when transferred to fresh medium. The extent of nitrification in a simulated system was two times the rate observed in the control systems suggesting the efficacy in real life situations. The products of nitrification in all experiments were undetectable due to denitrifying potency, which made the NBC an ideal option for biological nitrogen removal. The immobilized NBC thus generated has been named TANOX (Total Ammonia Nitrogen Oxidizer).

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#### SUPPLEMENTATION OF TRYPTOPHAN AND LYSINE IN DIPLodus SARGUS LARVAL DIET: EFFECTS ON GROWTH AND SKELETAL DEFORMITIES

Margarida Saavedra, Yoav Barr, Pedro Pousão-Ferreira, Synnove Helland, Manuel Yúfera, Maria T Dinis, Luís E C Conceição-2009

Aquaculture Research 40(10): 1191 – 1201

Abstract:

Amino acids are the building blocks for growth and the major energy source during fish larval stages. Deficient amino acids can be supplemented in the diets, overcoming problems such as low growth rates and skeletal deformities. In this study, three experimental diets were tested: a balance diet supplemented with lysine, a balance diet supplemented with tryptophan and a control with no supplementation. Trials were conducted with *Diplodus sargus* larvae from 1 to 25 days after hatching (DAH). A microencapsulated diet was introduced at 15 DAH in co-feeding with live feed and from 20 DAH larvae were fed only this diet. The effect of the supplemented diets was assessed in terms of

survival, growth rate, skeletal deformities, ammonia excretion and activity of amino acid catabolism enzymes. The results showed a similar survival in all treatments. However, larvae given tryptophan supplementation had a lower weight on 25 DAH. No significant differences were found in ammonia excretion, frequency or type of deformities or enzymatic activity. Tryptophan and lysine supplementation failed to improve larval growth, survival or larval quality.

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#### FATTY ACID NUTRITIONAL QUALITY OF SEA URCHIN *PARACENTROTUS LIVIDUS* (LAMARCK 1816) EGGS AND ENDOTROPHIC LARVAE: RELEVANCE FOR FEEDING OF MARINE LARVAL FISH

J.M. Gago, O.J. Luis, T.R. Repolho-2009

Aquaculture Nutrition 15(4) : 379 – 389

Abstract:

Sea urchin eggs and larvae have been suggested as potential live prey for marine fish larval feeding. This study evaluated the fatty acid composition of *Paracentrotus lividus* eggs, prisms and four-armed plutei, obtained from wild and captive broodstocks fed on raw diets: maize, seaweed and a combination of maize and seaweed. Amounts of essential fatty acids (EFA) for marine fish larvae [arachidonic acid (ARA), eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA)] were determined in eggs and endotrophic larvae. ARA ranged from 3.93% in eggs from combination to 18.7% in plutei from maize diets. In any developmental stage, EPA amounts were always lower than 5% for the raw diets, and DHA showed null or trace amounts including the wild diet. Thus, broodstock-prepared diets had to be formulated based on different lipid sources (Algamac, linseed oil, cod liver oil and olive oil) in order to test eggs and larvae EFA enhancement. EFA improvement was possible for all tested prepared diets. Algamac diet lead to superior EFA enhancement mainly in DHA (7.24%, 4.92% and 6.09% for eggs, prisms and plutei, respectively) followed by cod liver oil diet. Only these two lipid sources should be considered for prepared broodstock diets in order to obtain suitable live prey for fish larval feeding.

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#### ESSENTIAL FATTY ACID ENRICHMENT OF CULTURED ROTIFERS (*BRACHIONUS PLICATILIS*, MÜLLER) USING FROZEN-CONCENTRATED MICROALGAE

L.H. Seychelles, C. Audet, R. Tremblay, R. Fournier, F. Fernet-2009

Aquaculture Nutrition 15(4) :431 – 439

Abstract:

There is a growing interest in preserving microalgal preparations to maintain constant properties over a long period. The aim is to ensure sufficient delivery of essential fatty acids (and other key nutrients) to mollusc and crustacean larvae and to zooplankton used as live prey in the first feeding of fish larvae. For example, the rotifer *Brachionus plicatilis* has to be enriched with polyunsaturated fatty acids (PUFA) prior to fish feeding. We used four microalgal species [*Isochrysis galbana* (T-ISO), *Chaetoceros muelleri* (CHGRA), *Pavlova lutheri* (MONO), and *Nannochloropsis* sp.] both as fresh culture or in a frozen-concentrated form to enrich rotifers. Overall, rotifers had similar relative fatty acid levels when fed the frozen-concentrated or fresh microalgal diets. The levels of 20:4n-6, 22:6n-3, and 20:5n-3 between *B. plicatilis* and the microalgal diets were linearly correlated. The fatty acid 20:4n-6 was the most readily assimilated: the content found in rotifers reached half the level measured in the microalgal diets. Our results indicate that both the fresh and frozen-concentrated forms of the four microalgal species can be used to enrich PUFA levels in rotifers. Further experiments should be conducted to test if assimilation differs when rotifers are enriched with mono- or multispecific microalgal preparations.

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EFFECT OF EIGHT BENTHIC DIATOMS AS FEED ON THE GROWTH OF RED ABALONE (*HALIOTIS RUFESCENS*) POSTLARVAE

Juan Gabriel Correa-Reyes, María del Pilar Sánchez-Saavedra, María Teresa Viana, Norberto Flores-Acevedo, Carlos Vásquez-Peláez-2009

Journal of Applied Phycology 21(4): 387-393

Abstract:

The growth rate of abalone post larvae of *Haliotis rufescens* fed ad libitum with a benthic monoalgal diatom culture maintained as monocultures on a semi-commercial scale, was evaluated and correlated with the biochemical composition of the diatoms. The cell size ( $7.0 \times 4.0 \mu\text{m}$  to  $21.0 \times 7.5 \mu\text{m}$ ), protein percentage (7.42% to 13.66%), and ash content (49.03% to 59.61%) were different among diatom strains; lipid percentage, nitrogen free extract, and energy content (Kcal g<sup>-1</sup>) were similar among diatom strains. The values of essential and non-essential amino and fatty acids composition differed among diatom strains. Differences in the abalone shell length and orthogonal analyses revealed postlarval growth was dependent on the quality of the food source. Postlarvae abalone displaying the longest shell lengths were fed *Nitzschia thermalis* var. *minor* and *Amphiprora paludosa* var. *hyalina* ( $1,712.0 \pm 61 \mu\text{m}$  and  $1,709 \pm 67 \mu\text{m}$ , respectively), followed by *Navicula incerta* ( $1,413.3 \pm 43 \mu\text{m}$ ). The fatty acid content of benthic diatoms and abalone growth rate were not correlated.

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SCREENING FOR MARINE NANOPLANKTIC MICROALGAE FROM GREEK COASTAL LAGOONS (IONIAN SEA) FOR USE IN MARICULTURE

I. Tzovenis, E. Fountoulaki, N. Dolapsakis, I. Kotzamanis, I. Nengas, I. Bitis, Y. Cladas, A. Economou-Amilli-2009

Journal of Applied Phycology 21(4): 457-469

Abstract:

Mediterranean mariculture uses imported strains of marine phytoplankton, raising questions of ecological risk and ability to adapt to local conditions for mass culture outdoors. In this context, we report here on the mass-culture potential and chemical composition of six strains of Prasinophyceae (five strains of *Tetraselmis* sp. and one *Pyramimonas* sp.) isolated from a Greek coastal lagoon. Proximate composition had a pattern of 10–20% ash, 35–65% protein, 6–10% lipids, and 25–45% other organics including carbohydrates. The amino acid profiles were typical for the marine representatives of the class. All strains had a high PUFA content with dominant the  $\omega 3$  fraction in four of them. The fatty acid profiles indicated a *Tetraselmis* strain with high EPA (14%) and a *Pyramimonas* strain with high DHA (6%). These strains might be a good alternative for the common commercial strains used in Mediterranean aquaculture.

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ONTOGENETIC DEVELOPMENT OF DIGESTIVE ENZYMES AND EFFECT OF STARVATION IN MIIUY CROAKER *MIICTHYS MIIUY* LARVAE

Xiu-Juan Shan, Wei Huang, Liang Cao, Zhi-Zhong Xiao, Shuo-Zeng Dou-2009

Fish Physiology and Biochemistry 35(3): 385-398

Abstract:

The ontogenetic development of the digestive enzymes amylase, lipase, trypsin, and alkaline phosphatase and the effect of starvation in miiuy croaker *Miichthys miiuy* larvae were studied. The activities of these enzymes were detected prior to exogenous feeding, but their developmental patterns differed remarkably. Trypsin activity continuously increased from 2 days after hatching (dah), peaked on 20 dah, and decreased to 25 dah at weaning. Alkaline phosphatase activity oscillated at low levels within a small range after the first feeding on 3 dah. In contrast, amylase and lipase activities followed



the general developmental pattern that has been characterized in fish larvae, with a succession of increases or decreases. Amylase, lipase, and trypsin activities generally started to increase or decrease at transitions from endogenous to exogenous feeding or diet changes, suggesting that these enzymatic activities can be modulated by feeding modes. The activities of all the enzymes remained stable from 25 dah onwards, coinciding with the formation of gastric glands and pyloric caecum. These results imply that specific activities of these enzymes underwent changes due to morphological and physiological modifications or diet shift during larval development but that they became stable after the development of the digestive organs and associated glands was fully completed and the organs/glands functioned. Trypsin and alkaline phosphatase were more sensitive to starvation than amylase and lipase because delayed feeding up to 2 days after mouth opening was able to adversely affect their activities. Enzyme activities did not significantly differ among feeding groups during endogenous feeding; however, all activities were remarkably reduced when delayed feeding was within 3 days after mouth opening. Initiation of larvae feeding should occur within 2 days after mouth opening so that good growth and survival can be obtained in the culture.

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DIETARY FISH OIL REPLACEMENT WITH LARD AND SOYBEAN OIL AFFECTS TRIACYLGLYCEROL AND PHOSPHOLIPID MUSCLE AND LIVER DOCOSAHEXAENOIC ACID CONTENT BUT NOT IN THE BRAIN AND EYES OF SURUBIM JUVENILES PSEUDOPLATYSTOMA SP.

M. D. Noffs, R. C. Martino, L. C. Trugo, E. C. Urbinati, J. B. K. Fernandes, L. S. Takahashi-2009  
Fish Physiology and Biochemistry 35(3): 399-412

Abstract:

Triplicate groups of juvenile surubim were fed for 183 days one of four different isonitrogenous (47.6% crude protein) and isolipidic (18.7% lipid) diets formulated using three different lipid sources: 100% fish oil (FO, diet 1); 100% pig lard (L, diet 2); 100% soybean oil (SO, diet 3), and FO/L/SO (1:1:1, w/w/w; diet 4). The tissue levels of fatty acids 18:2n – 6 and 18:3n – 3 decreased relative to corresponding dietary fatty acid values. The 20:5n – 3 and 22:6n – 3 composition of muscle and liver neutral lipids were linearly correlated with corresponding dietary fatty acid composition. In contrast, the 22:6n – 3 composition of the brain and eye were similar among treatments. The 22:6n – 3 level was enriched in all tissues, particularly in the neural tissues. Similar results were observed for tissue polar lipids: fatty acids content reflected dietary composition, with the exception of the 22:6n – 3 level, which showed enrichment and no differences between groups. Given these results, the importance of the biochemical functions (transport and/or metabolism) of 22:6n – 3 in the development of the neural system of surubim warrants further investigation.

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