

COGNIS LAUNCHES INNOVATIVE BREAKTHROUGH IN SUSTAINABLE AQUACULTURE IN PARTNERSHIP WITH AUSTRALIAN GOVERNMENT

(http://www.cognis.com/company/Media+Center/Press+Releases/2010/100413_EN_FP.htm)

((<http://en.mercopress.com/2010/04/29/australia-opens-brine-shrimp-farm-key-component-in-aquaculture-food-chain>)

Cognis Australia unveils its state-of-the-art facility for production of carotenoid-enriched artemia (brine shrimp), a critical food for young fish and prawns. A ribbon-cutting ceremony today recognized the achievement of the joint partnership between the Fisheries Research and Development Corporation (FRDC), Department of Fisheries Western Australia (DoFWA), and Cognis Australia Pty Ltd. This high quality supply of artemia will address the gap in the quality and quantity of this aquaculture feedstock, leading to reliable and sustainable improvements in fish farming practices.

“I am pleased to announce the opening of this new facility made possible by the innovation of Western Australia’s Department of Fisheries, the Fisheries Research and Development Corporation and the commercial expertise of Cognis,” says Norman Moore, the Western Australian Minister for Fisheries. “This project is a fine example of how industry and government can cooperate to achieve environmental and economic advances. Today’s opening is an important step in helping advance current best practices in aquaculture and the long-term preservation of our oceans’ resources.”

The artemia project has been jointly funded by the DoFWA, FRDC and Cognis Australia Pty Ltd. “We are delighted to contribute our production expertise, and facilities, to the partnership, and the support we have received from the Australian and West Australian Governments has been outstanding,” commented Roger Taylor, General Manager of Cognis Australia.

When fish or prawns are grown in hatcheries, they go through a larval stage, during which they need artemia because it is a small, nutrient-dense food source. Cognis’ supply of artemia is nutritionally superior, as well as reliable and renewable. The carotenoid-rich artemia will be sold under the trade name Nutremia™, or through licensed distributors to the aquarium market.

“The sustainability of this project is due to an elegant integration between Cognis’ high-salinity natural algal cultivation lagoons producing mixed carotenoids, and the brine shrimp that thrive on the algae,” comments Boyd King, Nutremia Project Manager at Cognis Australia. “The symbiotic existence of the two cultivation processes makes it uniquely positioned to provide a much-needed natural resource to the aquaculture market. We are currently targeting the Australian market and actively seeking international distribution partners for our products.”

Nutritious and safe

One of the biggest concerns for the aquaculture industry is bio-security. In particular, pathogens can quickly devastate the industry. Using closed systems and naturally hyper-saline conditions, Cognis is able to produce artemia in a way that greatly reduces bio-security risk. Another advantage of this new source is the nutritional profile of the artemia, which are fed a lush diet of carotenoid-rich algae. The bright orange colour of this artemia indicates good health, specifically the presence of carotenoids, which contribute to the colour, fertility, and immunity of prawns and fish.

“Nutremia has become an important component of our balanced hatchery diets, and the prawns feed on it aggressively,” reports Tony Charles, Australian Prawn Farms’ Hatchery Manager. “The addition of Nutremia with other fresh and pellet feeds helps me achieve an effective nutritional balance. Before I started using Nutremia I had been looking for a source of quality artemia biomass for a long time. Nutremia is clean, bright orange which indicates high carotenoid content, and is of the highest quality.”

A sustainable future for the fish industry

The next step for Cognis' artemia project is to commercially produce artemia eggs, or cysts, to supply the aquaculture industry. The cysts are shipped in dry form to fish farms where they are hatched on-site specifically for fish species which thrive on live feed. The global demand for cysts is currently served by harvesting wild blooms of artemia from salt lakes. The annual harvest volumes from salt lakes can vary dramatically in quality and quantity, causing turmoil in the aquaculture industry as it struggles to find alternatives. Cognis' artemia production is a closed system, the first in the world of its kind, and does not rely on harvests from salt lakes which are at the mercy of changing weather and ecological cycles.

Fish are so attracted to the taste and smell of artemia that it is also being developed as an attractant to make plant-derived protein more palatable to fish. Current industry practice is to use fish-meal based feeds to raise fish for human consumption, which has been flagged as unsustainable in the long term.

About Nutremia™ Pure Australian Carotenoid-Enriched Artemia:

Nutremia™ is a trademark of the Cognis Group. Artemia, or brine shrimp, are used as feed for fish and prawn aquaculture, and in aquariums. Nutremia™ is produced using proprietary closed-system hyper-saline cultivation technology and fed algae rich in natural mixed carotenoids. Being rich in nutrients, Nutremia™ helps improve the colour, fertility, and immunity of prawns and fish. To preserve its nutritional value, Nutremia™ is instantly frozen on-site and packed in the high quality, user-friendly packaging on the market.

About Cognis

Cognis is a worldwide supplier of innovative specialty chemicals and nutritional ingredients, with a particular focus on the areas of wellness and sustainability. The company employs about 5,600 people, and it operates production sites and service centers in 30 countries. Cognis has dedicated its activities to a high level of sustainability and provides value adding solutions and products based on renewable raw materials. The company serves the food, nutrition and healthcare markets, and the cosmetics, detergents and cleaners industries. Another main focus is on products for a number of other industries, such as coatings and inks, lubricants, as well as agriculture and mining.

Cognis is owned by private equity funds advised by Permira, GS Capital Partners, and SV Life Sciences. In 2009, Cognis recorded sales of about 2.6 billion euros and an Adjusted EBITDA (operating result) of 364 million euros.

About Department of Fisheries, Western Australia

The Department of Fisheries manages Western Australia's fish, marine and aquatic resources to world-class standards. Our commitment is Fish for the future, and by working with the community and key stakeholders, the Department's resolve is to conserve, develop and share the fish and other living aquatic resources of WA, for the benefit of present and future generations.

About Fisheries Research and Development Corporation (FRDC)

FRDC is Australia's leading agency concerned with planning, investing in, and managing fisheries research, development and extension. The FRDC is a statutory corporation founded in 1991 under the Primary Industries and Energy Research and Development (PIERD) Act 1989. It is responsible to the Minister for Agriculture Fisheries and Forestry. The FRDC's mission is to maximize economic, environmental and social benefits for its stakeholders through effective investment and partnership in research, development and extension.

Contacts: <http://www.cognis.com/>

CHANGES IN RNA, DNA, PROTEIN CONTENTS AND GROWTH OF TURBOT SCOPHTHALMUS MAXIMUS LARVAE AND JUVENILES

X. H. Tong, Q. H. Liu, S. H. Xu, J. Li, Z. Z. Xiao, D. Y. Ma-2010

Journal of Fish Biology 77(3): 512–525

Abstract:

The growth potential of turbot *Scophthalmus maximus* larvae and juveniles was studied using nucleic acid-based indices and protein variables. The experiment was carried out from 4 to 60 days post hatching (dph). A significant increase in instantaneous growth rate during metamorphosis and retarded growth rate during post-metamorphic phase were observed. Ontogenetic patterns of DNA, RNA and protein all showed developmental stage-specific traits. The RNA:DNA ratio decreased up to 12 dph, then increased rapidly till 19 dph and fluctuated until 35 dph followed by a decline to the end. The RNA:DNA ratio was positively correlated with growth rate of juveniles during the post-metamorphic phase, whereas this ratio was not a sensitive indicator of growth during the pre-metamorphic phase and metamorphosis. The protein:DNA ratio showed a similar tendency to the RNA:DNA ratio. Changes of DNA content and protein:DNA ratio revealed that growth of *S. maximus* performed mainly by hyperplasia from 4 to 12 dph and hypertrophy until 21 dph during the pre-metamorphic larval phase. Growth was dominantly hypertrophical from the early- to mid-metamorphosing phase and hyperplastic thereafter. The results show that the DNA content and protein:DNA ratio can evaluate growth rates of larval and juvenile *S. maximus* on a cellular level.

(Center of Biotechnology R&D, Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, P. R. China; email of J. Li: junli@ms.qdio.ac.cn)

CHEMICAL SURFACE DISINFECTION OF EGGS OF BALTIC COD, *GADUS MORHUA* L.

J. L. Overton, M S Bruun, I. Dalsgaard-2010

Journal of Fish Diseases 33(9): 707–716

Abstract:

The effect of two disinfectants on eggs and larvae of Baltic cod, *Gadus morhua*, was investigated. The eggs were disinfected for 10 min using various concentrations of either glutaraldehyde (100, 200, 400, 600 and 800 mg L⁻¹) or iodophor (10, 50, 100 and 150 mg L⁻¹), 1–4-days post-fertilization. Bactericidal effect of disinfection, survival to hatching, hatching success and larval abnormalities were assessed. Larval survival was recorded at 5-, 10- and 15-days post-hatch (dph). Although Baltic cod eggs have an unusually thin chorion, they could tolerate surface disinfection. A reduction in bacterial growth was observed with increased concentrations of disinfectant (3.0×10^7 – 1.6×10^1 CFU mL⁻¹). Abnormalities in newly hatched larvae were not related to disinfection. Survival of the yolk sac larvae was significantly better for eggs treated with 400 mg L⁻¹ glutaraldehyde for 10 min at 10 and 15 dph. Effective disinfection was also recorded using 100 mg L⁻¹ Actomar K30. Egg batch effect rather than initial bacterial concentration, disinfectant type or incubation method determined the survival of the eggs to hatching and survival of larvae. Because of the carcinogenic effect of glutaraldehyde, iodophor is recommended for routine disinfection of cod eggs.

(Aquapri Danmark A/S, Egtved, Denmark; email of I. Dalsgaard: inda@vet.dtu.dk)

EFFECTS OF ALTERNATIVE DIETARY LIPID SOURCES ON GROWTH PERFORMANCE AND FATTY ACID COMPOSITION OF BELUGA STURGEON, *HUSO HUSO*, JUVENILES

Seyed Vali Hosseini, Abdolmohammad Abedian Kenari, Joe M. Regenstein, Masoud Rezaei, Rajab Mohammad Nazari, Morteza Moghaddasi, Seyed Abdollah Kaboli, Amelia A. M. Grant-2010

Journal of the World Aquaculture Society, 41(4)

Abstract:

The main aim of this investigation was to determine the impact of a total dietary fish oil (FO) replacement by vegetable oils (soybean [SO] and canola [CO] oil) on the growth and fatty acid (FA) composition of juvenile Beluga sturgeon, *Huso huso*. Three practical-type diets with equal protein and lipid content were formulated using FO, SO, and CO. Each of the diets was fed to apparent satiation five times daily to *H. huso* (initial weight 206 ± 7.3 g) for 120 d. All groups grew equally well. Fish weight gain, condition factor, daily growth, feed intake, feed conversion, feed efficiency, protein efficiency, and survival were not affected by diet treatment. Fish lipid composition reflected the inclusion of vegetable oils and their respective FA compositions. Monounsaturated FA and polyunsaturated FA significantly increased in fish fed the CO and SO diets, respectively, but the ratio n

– 3/n – 6 were significantly reduced by the inclusion of dietary vegetable oils ($P < 0.05$). This study suggests that FO can be replaced by SO and CO in *H. huso* diets under our test conditions with no significant effect on growth. However, longer assessments of these substitutions are warranted to ensure that these treatments do not have an adverse effect on fish health. In the future, aquaculture will contribute more to global food fish supplies and further
(Department of Fisheries, Tarbiat Modares University, PO Box 46414-356, Noor, Mazandaran, Iran)

PROFITABILITY, MARKETING, AND PRICE BEHAVIOR OF AQUACULTURE FISH FRY AND FEED INPUTS IN BANGLADESH

Shaikh Abdus Sabur, Md. Salauddin Palash, Husna Nasrin Lina, Farhana Islam Haque-2010
Journal of the World Aquaculture Society 41(4)

Abstract:

This study examines the production, marketing, and price behavior of fish fry and feed using primary and secondary data. Eighty-four respondents were interviewed from Mymensingh, Gazipur, and Khulna districts. It is revealed that fish feed producers earned satisfactory profit of Tk 28 by investing Tk 100. On the other hand, fish feed dealers and subdealers seem to be obtained more than normal profit of Tk 140 and 118, respectively, by investing Tk 100 per annum. Fish fry traders' profit was seemingly excessive as their annual rate of return ranged from 267 to 829% and this return was much higher in lean period compared with peak period. Sharp seasonal price variation of fish fry existed because of variation in competition and size of fry. Finally, fry markets were highly integrated, although less integration existed between fry and fish markets.

(Department of Agribusiness and Marketing, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh)

WEANING STRATEGIES FOR STRIPED TRUMPETER, *LATRIS LINEATA*, POSTLARVAE CULTURE

Bryan Y. Choa, Chris G. Carter, Stephen C. Battaglione-2010
Journal of the World Aquaculture Society 41(4)

Abstract:

The striped trumpeter, *Latris lineata*, is a native fish being developed for aquaculture in Tasmania, Australia. Striped trumpeter have a long postlarval stage and rearing has been reliant on the longterm use of *Artemia*. Two experiments were conducted to investigate weaning strategies. The first experiment used 52 d posthatch (dph) postlarvae previously reared on *Artemia* from 16 to 52 dph enriched with either low or high ascorbic acid. The treatments were *Artemia*, a microdiet, or cofeeding. The postlarvae were reared until 67 dph. The *Artemia* treatment yielded significantly higher mean survival, followed by cofeeding, and the microdiet. Feeding *Artemia* yielded significantly heavier postlarvae and the microdiet produced significantly smaller postlarvae. A second experiment used 41 dph postlarvae and investigated the effect of cofeeding duration prior to feeding with *Artemia* and microdiet as controls. Cofeeding periods of 5, 10, and 15 d were tested. Cofeeding for 5 d and microdiet feeding yielded significantly poorer survival compared with *Artemia*. *Artemia* feeding yielded significantly heavier postlarvae. In both experiments, the diets did not have a significant effect on jaw morphology. These experiments are the first to examine weaning strategies for striped trumpeter postlarvae and suggest cofeeding postlarvae from 40 dph and feeding microdiet exclusively at 50 dph.

(Marine Research Laboratories, Tasmanian Aquaculture and Fisheries Institute and Aquafin Cooperative Research Centre, University of Tasmania, Private Bag 49, Hobart, Tasmania 7001, Australia)

THE EFFECT OF CHEMICAL CUES ON LARVAL SETTLEMENT OF THE ABALONE, *HALIOTIS DIVERSICOLOR SUPERTEXTA*

Xiujuan Yu, Yan Yan, Hengxiang Li-2010
Journal of the World Aquaculture Society 41(4)

Abstract:

The abalone, *Haliotis diversicolor supertexta*, is an important aquaculture species in South China Sea. Inducing more rapid or greater degree of settlement of *H. diversicolor supertexta* larvae using chemical cues can significantly improve the commercial hatchery production of this valuable species. In this study, the effects of 11 chemicals on inducing larval settlement of the *H. diversicolor supertexta* were investigated in the laboratory. Among the chemicals tested, K⁺ (10 and 20 mM), Ca²⁺ (1 mM), NH₄⁺ (0.1 mM), γ -aminobutyric acid (at 10⁻⁷ to 10⁻² M), 3-isobutyl-1-methylxanthine (10⁻⁴ M), 3-(3,4-dihydroxyphenyl)-l-alanine (at 10⁻⁶ to 10⁻⁵ M), and dopamine (10⁻⁶ M) induced high percentages of the larvae to settle, while Mg²⁺, choline, acetylcholine, and serotonin showed no obvious induction on larval settlement. Larval settlement was significantly induced after exposure to 20 mM KCl for only 2 h. KCl was not only an effective inducer, but also an inexpensive and easily available chemical, therefore it maybe a potentially economical inducer in the commercial production.

(Key Laboratory of Marine Bio-resources Sustainable Utilization, LED, South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou 510301, China)

STRIPED BASS, *MORONE SAXATILIS*, EGG INCUBATION IN LARGE VOLUME JARS JOURNAL OF THE

Christopher J. Harper, Beth M. Wrege, J. Jeffery Isely-2010

Journal of the World Aquaculture Society 41(4)

Abstract:

The standard McDonald jar was compared with a large volume jar for striped bass, *Morone saxatilis*, egg incubation. The McDonald jar measured 16 cm in diameter by 45 cm in height and had a volume of 6 L. The experimental jar measured 0.4 m in diameter by 1.3 m in height and had a volume of 200 L. The hypothesis is that there is no difference in percent survival of fry hatched in experimental jars compared with McDonald jars. Striped bass brood fish were collected from the Coosa River and spawned using the dry spawn method of fertilization. Four McDonald jars were stocked with approximately 150 g of eggs each. Post-hatch survival was estimated at 48, 96, and 144 h. Stocking rates resulted in an average egg loading rate (± 1 SE) in McDonald jars of 21.9 ± 0.03 eggs/mL and in experimental jars of 10.9 ± 0.57 eggs/mL. The major finding of this study was that average fry survival was $37.3 \pm 4.49\%$ for McDonald jars and $34.2 \pm 3.80\%$ for experimental jars. Although survival in experimental jars was slightly less than in McDonald jars, the effect of container volume on survival to 48 h ($F = 6.57$; $df = 1, 5$; $P > 0.05$), 96 h ($F = 0.02$; $df = 1, 4$; $P > 0.89$), and 144 h ($F = 3.50$; $df = 1, 4$; $P > 0.13$) was not statistically significant. Mean survival between replicates ranged from 14.7 to 60.1% in McDonald jars and from 10.1 to 54.4% in experimental jars. No effect of initial stocking rate on survival ($t = 0.06$; $df = 10$; $P > 0.95$) was detected. Experimental jars allowed for incubation of a greater number of eggs in less than half the floor space of McDonald jars. As hatchery production is often limited by space or water supply, experimental jars offer an alternative to extending spawning activities, thereby reducing labor and operations cost. As survival was similar to McDonald jars, the experimental jar is suitable for striped bass egg incubation.

(Georgia Department of Natural Resources, 110 Hatchery Drive, Richmond Hill, Georgia 31324 USA)

FACTORS INFLUENCING THE GROWTH AND SURVIVAL OF LARVAL AND JUVENILE ECHINOIDS

Abul Kalam Azad, Scott McKinley, Christopher M. Pearce-2010

Reviews in Aquaculture 2(3): 121–137

Abstract:

Many factors can influence the growth and survival of larval and juvenile echinoids (e.g. diet type, food ration, stocking density, temperature, salinity, dissolved oxygen, water chemistry and settlement cues), but most of these factors have not been studied in detail with regard to most species targeted for commercial aquaculture production. This review summarizes the state of knowledge on factors influencing the growth and survival of larval and juvenile echinoids. Sea-urchin larvae are typically reared with either *Dunaliella tertiolecta* Butcher or *Chaetoceros* spp. The optimum food ration is in the range of 3000–9000 cells mL⁻¹ and 20 000–60 000 cells mL⁻¹ for *D. tertiolecta* and *Chaetoceros* spp.,

respectively, the concentration depending on larval stage and stocking density. Larvae have been successfully cultured at densities of 0.25–5.00 individuals mL⁻¹, but the optimum level appears to be 1–2 individuals mL⁻¹. A variety of benthic diatom species, particularly *Navicula* spp., can serve as the initial food source for young juveniles. Older juveniles may be fed with various species of foliose macroalgae and/or prepared diets. Most research on larval and juvenile echinoids has been done using ambient salinity and temperature, but some work has shown the importance of temperature on growth rate.

(Faculty of Land and Food Systems, The University of British Columbia, Vancouver, BC, Canada; email of Christopher M. Pearce: Chris.Pearce@dfo-mpo.gc.ca)

DIATOM DERIVED DISSOLVED ORGANIC MATTER AS A DRIVER OF BACTERIAL PRODUCTIVITY: THE ROLE OF NUTRIENT LIMITATION

Romain Pete, Keith Davidson, Mark C. Hart, Tony Gutierrez, Axel E.J. Miller-2010

Journal of Experimental Marine Biology and Ecology 391(1-2): 20-26

Abstract:

Variable inorganic nutrient concentrations were used to generate silicate (Si) or nitrogen (N) limited conditions in cultures of the marine diatom *Skeletonema costatum*. Dissolved organic matter (DOM) harvested in the nutrient limited phase of these cultures was added to a natural bacterial community. Enhanced bacterial abundance and bacterial production were observed, in comparison to un-supplemented controls, when Si-limited (Si-DOM) rather than N-limited (N-DOM) diatom derived DOM or inorganic nutrients was added. This indicates that the bacterial population was limited by organic rather than inorganic resources but only Si-DOM had sufficient lability to alleviate this. Within the bacterial assemblage, a notable increase in the proportion of γ -Proteobacteria was evident on receipt of only Si-DOM. Assessment of the composition of the added DOM suggested that the observed dynamics were related to organic matter composition rather than molecular size as, within the Si- and N-DOM, the proportions of low and high molecular weight compounds were similar, but the polysaccharide and protein signatures were different.

(Scottish Association for Marine Science, Scottish Marine Institute, Oban, PA37 1QA, Argyll, Scotland; email of Romain Pete: romain.pete@univ-montp2.fr)

VARIATIONS IN LIPID YIELDS AND COMPOSITIONS OF MARINE MICROALGAE DURING CELL GROWTH AND RESPIRATION, AND WITHIN INTRACELLULAR STRUCTURES

Xinxin Lv, Li Zou, Baowei Sun, Jiangtao Wang, Ming-Yi Sun-2010

Journal of Experimental Marine Biology and Ecology 391(1-2): 73-83

Abstract:

To determine variability of marine microalgal lipids during cell growth and respiration, and within intracellular structures, we conducted two series of experiments: (1) batch culturing *Isochrysis* sp., *Gymnodinium* sp., *Platymonas subcordiformis*, *Heterosigma akashiwo* Hada, and *Skeletonema costatum* with lipid analysis for cell samples collected in exponential growth and stationary phase respectively; and (2) batch culturing *Isochrysis* sp. and *Gymnodinium* sp. from exponential growth to stationary phase and followed by dark incubation with progressive lipid analysis. Moreover, membrane and intracellular storage fatty acids were separated using Si-gel chromatography from representative samples of each species in the second experiment (respectively in exponential growth, stationary phase, and dark respiration). Results from the first experiment showed that no matter how differently microalgae grew, their lipid yields were 4–38 \times higher in stationary phase than in exponential growth phase. Progressive lipid analysis in the second experiment indicated that total fatty acid (FA) yields in two microalgal cultures continuously increased throughout exponential and stationary phases but total neutral lipid (NL) yields slowed or stopped to increases in stationary phase. During dark incubations, total FA yields decreased steadily in both *Isochrysis* (with constant cell density) and *Gymnodinium* (with declining cell density) cultures but total NL yields decreased only in *Gymnodinium* culture. Lipid compositions and proportions of membrane vs. intracellular fatty acids varied differently with growth phases and respiration in two cultures. This study suggests that the effect of cell growth phase on cellular lipid yield

and composition is species-dependent and is likely related to the capacity of cells to synthesize membrane vs. intracellular storage lipids.

(College of Environmental Science and Engineering, Ocean University of China, Qingdao, 266003, China; email of Ming-Yi Sun: mysun@uga.edu)

PREDATION OF PSEUDODIAPTOMUS ANNANDALEI (COPEPODA: CALANOIDA) BY THE GROUPE FISH FRY EPINEPHELUS COIODES UNDER DIFFERENT HYDRODYNAMIC CONDITIONS

Chien-Huei Lee, Hans-Uwe Dahms, 1, 2, Shin-Hong Cheng, Sami Souissi, François G. Schmitt, Ram Kumar, Jiang-Shiou Hwang-2010

Journal of Experimental Marine Biology and Ecology 393(1-2): 17-22

Abstract:

Environmental conditions such as illumination, hydrodynamics, and densities of organisms affect behavior of both, fish fry and their prey with impacts on trophic interactions in ecosystems and aquaculture management alike. The present study demonstrated that the copepod *Pseudodiaptomus annandalei* perceived juvenile fry of the grouper *Epinephelus coioides* as predators and exhibited escape reactions mediated mainly by physical and/or chemical signals. Under illumination, prey capture rates were significantly greater ($p < 0.01$, Mann-Whitney U test) at moderate turbulence (747 ± 104 individuals/h, $n = 3$) than in calm water (597 ± 76 individuals/h, $n = 3$). The maximum darting speed of copepods in response to sensing fish fry in calm water was significantly greater (one-way ANOVA, $p < 0.05$) than that in either turbulent or enhanced flow conditions, indicating that the ability of copepods to escape from predators was greater in calm water than in turbulent water or enhanced flow conditions. The maximum number of copepods eaten by the fish larvae increased in slow and medium hydrodynamic turbulence compared to either calm water or strong turbulence, suggesting that intermediate levels of turbulence favor predatory larvae.

(Institute of Marine Biology, National Taiwan Ocean University, Keelung, Taiwan; email of Jiang-Shiou Hwang: Jshwang@mail.ntou.edu.tw)

EVALUATION OF PROBIOTIC EFFECT OF *AEROMONAS HYDROPHILA* ON THE DEVELOPMENT OF THE DIGESTIVE TRACT OF GERM-FREE *ARTEMIA FRANCISCANA* NAUPLII

R.A.Y.S. Asanka Gunasekara, Anamaria Rekecki, Kartik Baruah, Peter Bossier, Wim Van den Broeck-2010

Journal of Experimental Marine Biology and Ecology 393(1-2): 78-82

Abstract:

Gnotobiotic model systems are attracting attention as they facilitate the unraveling of mechanisms involved in host-microbe interactions. Here morphological and stereological tools were incorporated to contribute to the study on the mode of action of putative probiotic bacteria. In this study, the effect of live probiotic bacteria on the early development of the digestive tract of gnotobiotic *Artemia franciscana* was investigated. Germ-free *Artemia* nauplii were cultured for 6 days using Baker's yeast and dead *Aeromonas hydrophila* (LVS3, a putative probiotic strain for *Artemia franciscana*) as major feed sources. For the other group, live *Aeromonas hydrophila* was added on day 1 (day of hatching), while all the other parameters were analogous to the germ-free group. The survival on day 6 was significantly higher in the group in which live probiotic bacteria were used than in the control group. Individual length and total biomass production were always significantly larger in the same group. Midgut volume/individual length and the midgut length/individual length were not significantly different between both groups on all the sampling points. Hindgut volume/individual length and the hindgut length/individual length were not significantly different between both the groups on days 2 and 4 while those were significantly larger at day 6 in the cultures fed with live bacteria, suggesting that live bacteria have a positive effect on cell proliferation in the gut. However, the morphology of the mid- and the hindgut did not show important differences between both groups.

(Department of Morphology, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, B-9820, Merelbeke, Belgium; email of Wim Van den Broeck: wim.vandenbroeck@UGent.be)

ROTIFER (BRACHIONUS “CAYMAN”) CULTURE PERFORMANCE IMPROVEMENT THROUGH L-CARNITINE ADDITION IS NOT RELATED TO FATTY ACID METABOLISM

Ruben De Wilde, Kristof Dierckens, Peter Bossier-2010

Journal of Experimental Marine Biology and Ecology 393(1-2): 114-123

Abstract:

The purpose of this paper was to investigate the nature of the effect of l-carnitine on the cultures of the marine rotifer *Brachionus* “Cayman” and its microflora. Xenic and gnotobiotic experiments were set up with rotifers, fed axenic wild-type yeast (*Saccharomyces cerevisiae*) or xenic microalgae (*Tetraselmis suecica*) and incubated with l-carnitine concentrations of 0.1, 1, 10, 60, 100 and 1000 mg L⁻¹. Axenic neonates were obtained by separating amictic eggs from the rotifers by blending, prior to disinfection with glutaraldehyde and hatching. The gnotobiotic cultures had a significantly lower growth rate and egg ratio (%), compared to both xenic trials. The xenic cultures fed algae performed significantly better than those fed baker's yeast, when comparing population density, growth rate and egg ratio. A significant effect of l-carnitine addition was only found in yeast-fed cultures. Microbial assays, conducted with similar doses of autoclaved l-carnitine, revealed that several bacterial species present in the community of conventional *Brachionus* “Cayman” cultures, could possibly utilize l-carnitine for growth. These results suggest that the improvement of population density, growth rate and egg ratio in xenic rotifer cultures supplemented with l-carnitine, is most likely due to the stimulation by this compound of certain species of (beneficial) microorganisms, which are in turn valorized by the rotifers, yielding improved culture performance. Because of the absence of a positive effect under gnotobiotic conditions, a direct effect of l-carnitine on fatty acid metabolism, as suggested in literature, is unlikely. (Laboratory of Aquaculture and Artemia Reference Center, Faculty of Bioscience Engineering, Ghent University, Rozier 44, 9000 Ghent, Belgium; email of Ruben De Wilde: ruben.dewilde@ugent.be)

EFFECT OF TEMPERATURE ON THE DEVELOPMENT OF SKELETAL DEFORMITIES IN GILT HEAD SEABREAM (*SPARUS AURATA* LINNAEUS, 1758)

E. Georgakopoulou, P. Katharios, P. Divanach, G. Koumoundouros-2010

Aquaculture 308(1-2) : 13-19

Abstract:

The development of skeletal deformities is an important problem for finfish hatcheries. In the present paper, the effect of water temperature on the development of skeletal deformities in *Sparus aurata* was examined. Six combinations of three temperatures (16, 19, and 22 °C) were applied during three ontogenetic windows: the autotrophic (embryonic and yolk-sac larval stages), the exotrophic larval (first feeding to metamorphosing larvae of 14–16 mm TL) and the juvenile (metamorphosing larvae of 14–16 mm TL to juveniles of 40–45 mm TL) periods. The results demonstrated a significant effect ($p < 0.05$) of water temperature on the development of inside folded gill-cover, haemal lordosis, as well as of mild deformities of the caudal and dorsal fin-supporting elements. The prevalence of gill-cover deformities was elevated when 16 °C water temperature was applied during the autotrophic and exotrophic larval periods ($50.0 \pm 2.8\%$, mean \pm SD), or only during the autotrophic period ($14.0 \pm 0.0\%$). Haemal lordosis development, the second most severe skeletal deformity, presented fluctuating response against water temperature up to 14–16 mm TL (3.0 ± 4.2 to $13.0 \pm 9.9\%$). However, the application of 22 °C during the juvenile period resulted in the lowest and less variable incidence of haemal lordosis (1.0 ± 0.0 to $5.0 \pm 1.4\%$). The mild deformities of caudal and dorsal fins presented different responses to water temperature. The prevalence of caudal-fin deformities was elevated when 16 °C temperature was applied during the exotrophic larval period ($54.0 \pm 8.5\%$), while dorsal-fin deformities were favoured when 22 °C temperature was applied during the autotrophic and exotrophic phases (35.0 ± 9.9 to $39.0 \pm 4.2\%$). In the examined thermal range, growth rate was significantly elevated with the temperature increase. Fish survival was higher in the treatments where temperature after yolk-consumption increased from 16 or 19 °C to 19 or 22 °C, respectively. The results are discussed in respect to the onset of ontogeny of the different skeletal elements and the need of applying different thermal conditions during the development of *S. aurata*.

(Biology Department, University of Patras, 26500 Rio, Patras, Greece; email of G. Koumoundouros:

SHORT COMMUNICATION

REPRODUCTIVE PERFORMANCE OF THE CRAYFISH PROCAMBARUS (AUSTROCAMBARUS) ACANTHOPHORUS VILLALOBOS 1948 UNDER CONTROLLED CONDITIONS

E. Cervantes-Santiago, M.P. Hernández-Vergara, C.I. Pérez-Rostro, M.A. Olvera-Novoa-2010
Aquaculture 308(1-2): 66-70

Abstract:

Aspects of the reproductive biology of the crayfish *Procambarus acanthophorus* were documented under controlled conditions to determine this species' culture potential. A completely random experimental design with three replicates was used to evaluate three different male/female sex ratios (1 M:1F, 1 M:3F and 1 M:5F) with 12 organisms (TL > 30 mm) per replicate. The experimental culture system was a closed recirculating system with constant water flow (2 L.min⁻¹), and once daily ad libitum feeding with a 35% protein commercial diet. Recorded reproductive parameters were peak reproduction season, fertility index, egg viability and female length at first sexual maturity. Peak reproduction activity occurred during November–December, the lowest activity in February–March, and no differences were observed between treatments. Fertility was estimated as a function of egg count per female (n = 25) and hatch rate. The highest (p < 0.05) number of ovigerous females was produced at the 1 M:3F ratio, and the lowest at the 1 M:5F. Average egg count per female was 240.9 (± 93.1) and average egg viability was 29.1% (± 31.7). The relationship between total length and egg count was positive and significant (r² = 0.654), although the relationship between length and egg viability was not (r² = 0.1132). Average female length at first sexual maturity was 34 mm. The study results indicate *P. acanthophorus* can be effectively reproduced in captivity under controlled conditions and is therefore a candidate for use in commercial aquaculture activities.

(Instituto Tecnológico de Boca del Río, Carretera Veracruz- Córdoba Km. 12, 94290 Boca del Río Veracruz, Mexico; email of M.P. Hernández-Vergara: mphv1@yahoo.com.mx)

INTENSIVE CULTURE OF ARTEMIA URMIANA IN SEMI-FLOW THROUGH SYSTEM FEEDING ON ALGAE DUNALIELLA AND WHEAT BRAN

Behrooz Atashbar, Naser Agh, Ehsan Kmerani-2010

Int. J. Aqu. Sci. 1(1): 3-9

Abstract:

Artemia is a tiny crustacean that lives in salty lakes. *Artemia urmiana* is one of the important species of it. Its high nutritional values and various forms with many applications have caused this creature to be considered as the most valuable live food for the cultured aquatic animals. Current research was carried out in order to find out the bio-technique for intensive culture of *Artemia* with semi-flow through system using unicellular algae (*Dunaliella*) and wheat bran as food source. The tanks inoculated with 5000 newly hatched *Artemia* larvae/liter. *Artemia* were harvested for 14 days. The average production of live *Artemia* in each three tanks reached to 7116.7 g. The mean length of *Artemia* in the last day of culture period was 4.09 mm and mean survival rate 42 percent. It was concluded that partial removal of waste material from culture medium helps in higher production rate of live biomass.

(*Artemia* and Aquatic Animals Research Institute, Urmia University, Urmia, Iran; email of Behrooz Atashbar: atashbarb@yahoo.com)

SHORT COMMUNICATION-

DIFFERENT SALINITIES EFFECT ON BIOMETRY OF NAUPLII AND META-NAUPLII OF TWO ARTEMIA (CRUSTACEA; ANOSTRACA) POPULATIONS FROM URMIA LAKE BASIN

Alireza Asem, Nasrullah Rastegar-Pouyani-2010

Int. J. Aqu. Sci. 1(1): 10-13

(Protectors of Urmia Lake National Park Society (NGO), Urmia, Iran; email of Alireza Asem: alireza_1218@yahoo.com)

SHORT COMMUNICATION-

A 200,000-YEAR RECORD OF THE BRINE SHRIMP ARTEMIA (CRUSTACEA: ANOSTRACA) REMAINS IN LAKE URMIA, NW IRAN

Morteza Djamali, Philippe Ponel, Thomas Delille, Alain Thiéry, Alireza Asem, Valérie Andrieu-Ponel, Jacques-Louis de Beaulieu, Hamid Lahijani, Majid Shah-Hosseini, Abdolhossein Amini, Lora Stevens-2010

Int. J. Aqu. Sci. 1(1): 14-18

(Institut Méditerranéen d'Ecologie et de Paléocologie UMR CNRS 6116 - Europôle Méditerranéen de l'Arbois – Pavillon Villemin - BP 80, 13545 Aix-en-Provence Cedex 04, France ; email of Morteza Djamali : morteza_djamali@yahoo.com)

REVIEW

THE BRINE SHRIMP ARTEMIA AND HYPERSALINE ENVIRONMENTS MICROALGAL COMPOSITION: A MUTUAL INTERACTION

Fereidun Mohebbi-2010

Int. J. Aqu. Sci; 1(1):19-27, 2010

Abstract:

Hypersaline environments are essential, integral and dynamic part of the biosphere. Their management and protection depend on an understanding of the influence of salinity on biological productivity and community structure. The aim of this study was to review the relationships between the two basic biological components of hypersaline environments (micro-algae and Artemia) to provide a better understanding the dynamics of these unique ecosystems. Algal composition as the main food source of Artemia determines Artemia growth, reproduction rates, brood size, density, lipid index and cysts yields. Furthermore, the reproduction mode of Artemia depends on food levels, so that at the low food levels the main reproduction going into cysts. On the other hand, seasonal fluctuations of algal abundance influence Artemia population in temperate large hypersaline lakes such as the Great Salt Lake (USA), Urmia Lake (Iran) and Mono Lake (USA). However, Artemia grazing pressure has significant effects on microalgal density.

(Iranian Artemia Research Center, Urmia, Iran; mohebbi44@yahoo.com)

NOTE

THE STATUS KNOWLEDGE OF CHILEAN ARTEMIA POPULATIONS: FUTURE TRENDS FOR STUDIES AND MANAGEMENT

Patricio De los Rios-2010

Int. J. Aqu. Sci. 1(1): 28-30

(Universidad Católica de Temuco, Facultad de Recursos Naturales, Escuela de Ciencias Ambientales, Casilla 15-D, Temuco ; prios@uct.cl)
