
IN MEMORIAM DR. M. PETER MARIAN

With deep grief we were informed by Dr. Sivaram Veeramani (Institute for Artemia Research and Training, Centre for Marine Science and Technology, Manonmaniam Sundaranar University, Rajakkamangalam 629 502, K. K District, Tamil Nadu, India, shiva_jr@yahoo.com) that Dr. M. Peter Marian passed away on 29th April, 2006.

We have known Peter Marian for more than 15 years since his first attendance at one of the international Artemia training courses at Ghent University, at the end of the 1980's. Since that date we have been in very regular contact, he came many times back to Ghent and I met him several times in India at his institute as well as at national or international meetings. He was one of the partners in the EU-INCO Concerted Action on Artemia Biodiversity (2002-2004), which grouped excellent Artemia scientists from all over the world. Peter Marian has spent a lifetime to set up his "Institute for Artemia Research and Training IART", and develop it into a modern research center. Over the years he has educated a lot of good scientists and several papers co-authored by IART staff have been published since. IART's present position as one of the leading Artemia research centers of the Indian subcontinent is largely due to its dynamic driving force, Dr M. Peter Marian.

Through this way we extend our sincere condolences to his wife, son and daughter, and relatives.

Patrick Sorgeloos
Peter Bossier
Gilbert Van Stappen
and all partners of the Artemia Biodiversity Consortium: D. Delbare, T. Abatzopoulos, F. Amat, G. Mura, G. Cohen, N. Van Hoa, M.S. Romdhane, H. Kaiser, Xin N., N. Agh, T. Castro Barrera, M.R. Camara, G. Gajardo, J. Beardmore, and all their collaborators.

SWIM-UP FRY PRODUCTION IN THE AFRICAN CATFISH CLARIAS GARIEPINUS (BURCHELL) BROODSTOCKS FED WITH DIFFERENTLY HEATED SOYBEAN-BASED DIETS
Abeni A Adewumi, Victor F Olaleye, Esther A Adesulu-2006
Aquaculture Research 37(6): 543-549
Abstract:
Four hundred and eighty matured yearlings of Clarias gariepinus (Burchell) (female=182±10 g; males=208±5 g) distributed into groups of 30 specimens (sex ratio 1:1) were fed differently heated soybean-based diets. Seven approximately iso-nitrogenous (31% crude protein) and iso-caloric (13.97

kJ g1) diets were prepared from either raw soybean (SAMSOY 2, TGX 636–02D) or soybean seeds autoclaved for 5, 10, 15, 20, 25 and 30 min. The untreated and the variously heat-treated soybean meals were mixed with other ingredients to prepare diets designated as DSoy0, DSoy5, DSoy10, DSoy15, and DSoy20, DSoy25 and DSoy30 according to the treatment time of the soybean portion of the diets, and were fed to the fish broodstocks for 84 days. The fishmeal-based diet (DFM) served as the reference diet. The duration of heating soybean component of the experimental diet significantly ($P<0.05$) affected the growth performance and the number of eggs produced by the broodstocks, the percentage number of eggs fertilized and hatched as well as the survival of the progenies. The progenies of the brood fish fed diets DFM and DSoy25 with a yolk sac size of 2.78±0.6 and 2.42±0.5 mm, respectively, had significantly ($P<0.05$) larger yolk sacs, which were also absorbed at a significantly faster rate of 0.61±0.02 and 0.51±0.03 mm day1, respectively, than progenies of broodstocks fed other experimental diets. Swim-up fry survival rates were also better in hatchlings from broodstocks fed DFM (89.5%), DSoy25 (83.8%) and Dsoy 20 (80.5%) diets than progenies from other experimental diets. This study showed that soybean meal portion processed at 116°C and 1.2 kg cm2 pressure for 25 min in the diet, which ensures normal reproductive function and production of healthy progenies in C. gariepinus, could serve as a substitute for fishmeal in the broodstock diets.
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FEEDING RHYTHM AND GROWTH OF THE TONGUE SOLE, CYNOGLOSSUS SEMILAEVIS GÜNTHER, DURING ITS EARLY LIFE STAGES
Ma Ai-Jun, Liu Xue-Zhou, Xu Yong-Jiang, Liang You, Zhuang Zhi-Meng-2006
Aquaculture Research 37(6): 586-593
Abstract:
The feeding rhythm and growth characteristics of the early life stages of the tongue sole, Cynoglossus semilaevis Günther, were studied. Larvae began to prey on rotifers about 2–3 days after hatching at 23°C. About 12 days after hatching, larvae had grown to 8–9 mm in total length and were able to prey on Artemia larvae. As the larvae grew, they showed an increasing feeding capacity and a distinct feeding rhythm. Feeding intensity for day-6 larvae was highest at 12:00 and 18:00 hours, about 2–3 h after the maximum feeding incidence. The highest levels of feeding intensity for day-16 larvae occurred between 09:00 and 18:00 hours. By day 26, when the larvae had metamorphosed, feeding capacity had again increased considerably and, in contrast to the earlier stages, feeding intensity peaked at 18:00 and 24:00 hours concurrently with feeding incidence. Thus, tongue sole were found to have different feeding rhythms in the pre- and post-metamorphosis stages, with the highest feeding activity in the daytime during the larval planktonic stage, and at night during the juvenile benthic stage. The estimated maximum daily feeding rates were 65%, 40% and 11% of body weight on days 6, 16 (larvae) and 26 (juveniles) respectively. Size variation increased markedly with development.
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INFLUENCE OF STORAGE CONDITIONS ON VIABILITY OF QUIESCENT COPEPOD EGGS (ACARTIA TONSA DANA): EFFECTS OF TEMPERATURE, SALINITY AND ANOXIA
Martin Holmstrup, Johannes Overgaard, Thomas F. Sørensen, Guillaume Drillet, Benni W. Hansen, Hans Ramløv, Kirsten Engell-Sørensen-2006
Aquaculture Research 37(6): 625-631
Abstract:
Copepods have proven to be an ideal source of live food for the production of marine fish larvae in aquaculture. Therefore, there is a need to develop new methods for production and storage of copepod eggs that can be hatched and used at fish farms. In the present study quiescent eggs of Acartia tonsa were stored for periods up to 35 weeks at different temperatures, salinities and oxygen conditions in a

full factorial experiment. None of these storage conditions seemed to induce diapause in eggs even though this has been reported by other authors. The most promising storage conditions were those involving low temperature (<5°C), medium salinity (10–20 ppt) and anoxia. The practical aspects of these results for aquaculture are discussed.
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EFFECTS OF FOUR EGG DESTICKING PROCEDURES ON HATCHING RATE AND FURTHER SURVIVAL AND GROWTH OF LARVAE IN THE TENCH (TINCA TINCA L.)
Jose M Carral, Jesús D Celada, Maria Sáez-Royuela, Ruth Rodríguez, Amelia Aguilera, Pedro Melendre-2006
Aquaculture Research 37(6): 632-636
Abstract:
Four desticking procedures for tench eggs (A: tannic acid solution (1 g L1) for 15 s; B: alcalase enzyme solution (8 mL L1) for 60 s; C: alcalase enzyme solution (15 mL L1) for 120 s; D: Woynarovich and Woynarovich (1980) solution for 58 min followed by tannic acid solution (1 g L1) for 15 s) were tested to obtain data about influence on embryo survival to hatching stage and further survival and growth of the larvae. In the tannic acid and Woynarovich and Woynarovich (1980) treatment (A and D) few eggs stuck together and some were adhered to the incubator walls, whereas in the alcalase treatments (B and C) eggs neither stuck together nor adhered to the incubator walls. Percentages of hatched larvae did not show significant differences (mean values ranged between 47.4% in treatment A to 37.0% in treatment C). Larvae deformities observed were <0.5% in all cases. There were no significant differences among survival and growth rates of the larvae from different egg desticking origin, reaching, after 30 days, mean survival values around 90% and total length and weight of 12.5 mm and 19 mg respectively.
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SHORT COMMUNICATION
GROWTH AND SURVIVAL OF TONGUE SOLE (CYNOGLOSSUS SEMILAEVIS GŰNTHER, 1873) LARVAE FED A COMPOUND DIET WITH DIFFERENT PROTEIN SOURCES
Qing Chang, Mengqing Liang, Jialin Wang, Siqing Chen, Xiumei Zhang, Xudong Liu-2006
Aquaculture Research 37(6): 643-646
(Fisheries College, Ocean University of China, Qingdao, Shandong266071, China; email of C. Qing: Changqing@ysfri.ac.cn)

SHORT COMMUNICATION
ENDOCYTOSIS OF INDIGENOUS BACTERIA AND CELL DAMAGE CAUSED BY VIBRIO ANGUILLARUM IN THE FOREGUT AND HINDGUT OF SPOTTED WOLFFISH (ANARHICHAS MINOR OLAFSEN) FRY: AN ELECTRON MICROSCOPICAL STUDY
Einar Ringø, Helene Mikkelsen, Turid Kaino, Rolf Erik Olsen, Terry M. Mayhew, Reidar Myklebust-2006
Aquaculture Research 37(6): 647-651
(Aquaculture Protein Centre, Department of Food Safety and Infection Biology, Norwegian School of Veterinary Science, Stakkevollveien 23 b, PO 6204, NO 9292 Tromsø, Norway; email of E. Ringø: Einar.Ringo@veths.no)

SHAPE ONTOGENY AND VARIATION IN THE SHARPSNOUT SEABREAM, DIPLODUS PUNTAZZO (CETTI 1777)

Savoula Kouttouki, Eustathia Georgakopoulou, Panagiotis Kaspiris, Pascal Divanach, Georgios Koumoundouros-2006

Aquaculture Research 37(7): 655-663

Abstract:
Shape ontogeny of Diplodus puntazzo was studied during the larval and metamorphosis phase (2.6–33.0 mm total length (TL)) by means of geometric morphometrics. Additionally, shape comparison was performed between newly settled wild individuals of D. puntazzo (11.0–18.0 mm TL) and reared of the same TL range. Results clearly demonstrated that shape ontogeny of D. puntazzo is not continuous during the studied period, but it is characterized by the presence of two inflection points (at 6.2 and 11.4 mm TL), which define three phases of significantly different rates of shape development ($P<0.05$). Spline diagrams demonstrated that shape ontogeny mainly correlated with the development of fins, caudal peduncle, snoot and the ventral abdominal profile. Concerning the comparison of reared fish with wild fish, morphometric analysis revealed a significant effect of fish origin on the shape of D. puntazzo (Wilks' $\lambda=0.147$, $P<0.001$). Shape differences between the two populations were mainly demonstrated at the caudal peduncle and at the ventral profile of the abdominal area. Combined with the results of shape ontogeny, spline diagrams showed that shape differences between the two populations were related to the comparatively more advanced ontogenetic state of reared fish, at the studied size range.

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COMBINED EFFECTS OF WATER EXCHANGE REGIMES AND CALCIUM CARBONATE ADDITIONS ON GROWTH AND SURVIVAL OF HATCHERY-REARED JUVENILE SPOTTED BABYLON (BABYLONIA AREOLATA LINK 1807) IN RECIRCULATING GROW-OUT SYSTEM

S. Kritsanapuntu, N. Chaitanawisuti, W. Santhaweesuk, S. Y. Natsukari-2006

Aquaculture Research 37(7): 664-670

Abstract:
To determine a suitable culture environment to maximize growth and survival, the hatchery-reared juvenile spotted babylon, Babylonia areolata, were held in plastic rearing tanks at four calcium carbonate additions of 0, 100 and 300 g tonne1, and four water exchange regimes of 0-, 15-, 30- and 60-day intervals in a recirculating grow-out system for 120 days. The results clearly showed that growth was greatest between water exchange regimes of 15- and 30-day intervals and all calcium carbonate additions, with water exchange regimes of 0- and 60-day intervals resulting in poor growth. Final survival was highest between water exchange regimes of 15- and 30-day intervals, and all calcium carbonate additions, with water exchange regimes of 0-day intervals and all calcium carbonate additions resulting in high mortalities. This study showed that water exchange regimes had a stronger influence on the growth of juvenile B. areolata than calcium carbonate additions. It is recommended that B. areolata juveniles be maintained within the water exchange regimes range of 15–30-day intervals and at calcium carbonate additions between 0 and 500 g tonne1, providing optimum conditions for production of this species in a recirculating grow-out system.

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MOLECULAR SYSTEMATICS OF BISEXUAL ARTEMIA POPULATIONS

Lin Hou, Xiangdong Bi, Xiangyang Zou, Chongbo He, Lei Yang, Ruozhu Qu, Zhanjiang Liu-2006

Aquaculture Research 37(7): 671-680

Abstract:

To help resolve phylogenetic relationships among bisexual Artemia populations, phylogenetic analysis was conducted using DNA sequences from the nuclear DNA internal transcribed spacer 1 (ITS-1) and portions of the mitochondrial genome corresponding to the cytochrome oxidase I (COI). DNA sequences were generated for nine bisexual Artemia populations living in different regions of the world. Phylogenetic trees based on ITS-1 and COI sequences indicated that bisexual Artemia populations consist of four groups. The bisexual Artemia populations from Tibet and Kazakstan always clustered with Artemia urmiana in the same group; there is small sequence divergence and genetic distance among them. Therefore, we deduced that bisexual Artemia populations from Tibet and Kazakstan may belong to the A. urmiana group. Our study did not support that bisexual Artemia populations from Tibet are a new, separate species A. tibetiana. We also found that A. sinica and A. urmiana have a small genetic distance. Based upon these findings, we conclude that A. urmiana may have played an important role in the evolution of A. sinica.
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THE INFLUENCE OF DIETARY PROTEIN AND ENERGY LEVELS ON GROWTH, SURVIVAL AND THYROID HORMONE (T3 AND T4) COMPOSITION OF LATES CALCARIFER LARVAE
L. Nankervis, P.C. Southgate-2006
Aquaculture Nutrition 12(3): 219-226
Abstract:
Two growth trials were conducted to determine the effects of different dietary protein (450–550 g kg1) and energy contents (18–22 MJ kg1) on growth, survival and carcass thyroid hormone (T3 and T4) levels of barramundi (Lates calcarifer) larvae. Larvae fed diets containing 21 and 22 MJ kg1 dietary energy performed consistently better than those fed diets containing 18 and 19 MJ kg1 dietary energy in terms of final dry weight and total length, while those fed 20 MJ kg1 had intermediate values for both the parameters. No effects of dietary protein level were discernable from the physical parameters measured; however, larvae fed diets containing the lowest protein and energy combination (450 g kg1 protein/18 MJ kg1 energy) had significantly lower carcass T4 levels than larvae in all other treatments, except for those fed the 500 g kg1 protein/18 MJ kg1 diet, which had an intermediate value. The results indicate that the optimum diet for L. calcarifer larvae from 14 to 28 days after hatch should contain 500 g kg1 protein and a minimum of 21 MJ kg1 dietary energy. Carcass T4 content was influenced by macronutrient inclusion level, and correlated significantly with growth, described by the total length. Reduced T4 levels may indicate a depressed larval status in this species.
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GROWTH, OXYGEN CONSUMPTION, AND PROTEIN AND RNA SYNTHESIS RATES IN THE YOLK SAC LARVAE OF THE AFRICAN CATFISH (CLARIAS GARIEPINUS)
Richard W. Smith, Colin Ottema-2006
Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology 143(3): 315-325
Abstract:
Rapidly growing African catfish yolk sac larvae were investigated during the first 22 h after hatching. Body compartment protein concentration increased fourfold yet oxygen consumption remained constant (mean = 21.3 ± 3.2 nmol O2 mg− 1 protein h− 1), suggesting fast growth results mainly from yolk sac protein absorption. The protein synthesis rates at 1–2 and 5–6 h also equaled the highest conceivable rates of muscle protein synthesis; 11.6–11.9% and 7.4–7.9% day− 1, respectively. Therefore the corresponding energetic costs of protein synthesis were almost the theoretical minimum; 13.0 ± 1.7–16.3 ± 2.8 μmol O2 mg− 1 protein synthesised. Total protein synthesis expenditure (74.5–77.7 μmol O2 g− 1 protein h− 1) was also less than other yolk sac larvae. These

protein synthesis rates resulted from high RNA concentrations (113.2 ± 3.4 μg RNA mg− 1 protein) and were also correlated with RNA translational efficiency. High translational efficiency (1 h; 1.2 ± 0.1 mg protein synthesised μg− 1 RNA day− 1) equaled high synthesis rate (36.8 ± 5.4 μg RNA μg− 1 DNA day− 1) and both declined over 22 h. This investigation suggests rapid growth combines growth efficiency and compensatory energy partitioning. This accommodates the ontogenetic and phylogenetic standpoints imposed by energy budget limitations.
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LATE ONSET OF NMDA RECEPTOR-MEDIATED VENTILATORY CONTROL DURING EARLY DEVELOPMENT IN ZEBRAFISH (DANIO RERIO)
J. Turesson, T. Schwerte, L. Sundin-2006
Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology 143(3): 332-339
Abstract:
Increased ventilation frequency (fV) in response to hypoxia in adult fish depends on ionotropic N-methyl-d-aspartate (NMDA) receptors. Nonetheless, the ontogeny of central control mechanisms mediating hypoxic ventilatory chemoreflexes in lower vertebrates has not been studied. Therefore, the aim of this study was to determine when the hypoxic ventilatory response during zebrafish (Danio rerio) development is mediated via NMDA receptors, by performing physiological experiments and western blot analysis of NMDA receptor subunits. Zebrafish larvae at stages 4–16 days post-fertilisation (dpf) were exposed to an hypoxic pulse in control groups and in groups treated with MK801 (NMDA receptor antagonist). The hypoxic increase in fV was present at all larval stages, and it matured during development. The reflex became MK801 sensitive at 8 dpf, but did not completely rely on a glutamatergic transmission until 13 dpf. This, together with changing subunit composition during the different stages (increasing amounts of NMDAR1 subunits and appearance of NMDAR2A subunits in adults), suggests that the amount of functional NMDA receptors needed to achieve a fully developed reflex is not attained until later stages. Furthermore, our results suggest that other non-NMDA receptor mechanisms are responsible for the hypoxia-induced increase in fV during the earlier developmental stages.
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GROWTH HORMONE AND INSULIN-LIKE GROWTH FACTOR GENE EXPRESSION PRIOR TO THE DEVELOPMENT OF THE PITUITARY GLAND IN RAINBOW TROUT (ONCORHYNCHUS MYKISS) EMBRYOS REARED AT TWO TEMPERATURES
Mao Li, James Greenaway, Jason Raine, James Petrik, Ann Hahnel, John Leatherland-2006
Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology: 143(4): 514-522
Abstract:
Real time RT-PCR was used to measure the changes in the rates of synthesis of mRNA encoding for growth hormone-1 (GH1) and -2 (GH2) and insulin-like growth factor-1 (IGF-1) and -2 (IGF-2), and whole embryo GH content was measured in early stage rainbow trout (Oncorhynchus mykiss) embryos reared at two incubation temperatures (8.5 and 6.0 °C). Particular attention was paid to the phase of embryo development that preceded the appearance of the pituitary gland. GH was present in zygotes, and there were no significant changes in whole embryo GH content of the two temperature treatment groups from fertilization (t0) until the time at which GH was detectable in the pituitary gland by immunostaining. The expression of the two GH genes decreased during the first 24 h post-fertilization, and then increased significantly by 17 dpf in embryos reared at both temperatures. There was a subsequent steep increase in the number of copies of GH1 and GH2 mRNA associated with the formation of the pituitary gland evident at 23 and 34 dpf in the 8.5 and 6.0 °C groups, respectively.

The number of copies of mRNA encoding for IGF-1 and IGF-2 did not change during the first 24 h post-fertilization; however, there was a significant increase in the numbers of transcripts for both genes evident by 13 dpf in embryos reared at the two incubation temperatures. The differences in the timing of the increases in GH and IGF mRNA may suggest that IGF gene expression is not GH-dependent at that stage. Moreover, the increased expression of the GH genes prior to the formation of the pituitary gland suggests that tissues other than the pituitary are expressing these genes in early embryos. The pattern of changes in GH content was similar to the pattern of GH gene expression in embryos reared at the two incubation temperatures when the age of embryos was plotted using degree-days. There were no apparent compensatory responses in GH1, GH2, IGF-1 or IGF-2 gene expression related to altered growth rates. The number of copies of IGF-2 mRNA was higher than that of IGF-1 mRNA during the early developmental period; this is consistent with the hypothesis that IGF-2 predominates during embryonic development. A differential expression of GH2 and GH1 was also observed with the overall copy numbers of GH2 mRNA being consistently higher than those of GH1.
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CHARACTERIZATION OF A PARTIAL A-AMYLASE CLONE FROM RED PORGY (PAGRUS PAGRUS): EXPRESSION DURING LARVAL DEVELOPMENT
M.J. Darias, H.M. Murray, J.W. Gallant, A. Astola, S.E. Douglas, M. Yúfera, G. Martínez-Rodríguez-2006
Comparative Biochemistry and Physiology Part B: Biochemistry and Molecular Biology 143(2): 209-218
Abstract:
A partial α-amylase cDNA was isolated from red porgy (Pagrus pagrus, Teleostei: Sparidae) and its tissue specific expression during larval development was examined. The cDNA was 949 bp long and showed 90% identity with other fish amylases. A 545 bp fragment was used to study amylase expression using in situ hybridization and RT-PCR techniques. Both methods showed a similar pattern: high and relatively constant expression for the first 30 days after hatching (dah), subsequently decreasing until the end of the experiment at 60 dah. The goal of this work was to extend the existing knowledge of the functionality of larval fish digestive systems and to provide new information about α-amylase gene expression.
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CHANGES IN LIPID AND FATTY ACID COMPOSITION OF LATE LARVAL AND PUERULUS STAGES OF THE SPINY LOBSTER (PANULIRUS CYGNUS) ACROSS THE CONTINENTAL SHELF OF WESTERN AUSTRALIA
Bruce F. Phillips, Andrew G. Jeffs, Roy Melville-Smith, Chris F. Chubb, Matthew M. Nelson, Peter D. Nichols-2006
Comparative Biochemistry and Physiology Part B: Biochemistry and Molecular Biology 143(2): 219-228
Abstract:
The feeding of the late larval stages of the spiny lobster, Panulirus cygnus, and the energy reserves used by the non-feeding post-larvae for crossing the continental shelf of Western Australia were examined through their lipid composition. Lipid was a significant component of the biomass of all larval and post-larval samples (range 63–213 mg g− 1 of dry biomass). The fatty acid profiles of late stage larvae (8–9) suggest that they were feeding on salps and small crustaceans, such as euphausids, from oligotrophic pelagic communities where herbivorous and microbial grazing is an important basis to the food web. There was a marked decrease in lipid content of post-larvae progressively across the continental shelf, and this corresponded closely with decreasing dry mass, suggesting that post-larvae

were using lipid as an energy source during cross-shelf movement at a rate of 1.6 J km− 1. This is considerably lower than for other spiny lobster species, suggesting that the post-larvae of the western rock lobster may use physical processes as well as active swimming for onshore transport. This may help to explain the large inter-annual variability in the post-larval settlement of this species, which is closely related to differences in weather patterns capable of greatly varying onshore advection processes
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DIETARY NEUTRAL LIPID LEVEL AND SOURCE IN SENEGALESE SOLE (SOLEA SENEGALENSIS) LARVAE: EFFECT ON GROWTH, LIPID METABOLISM AND DIGESTIVE CAPACITY
S. Morais, M.J. Caballero, L.E.C. Conceição, M.S. Izquierdo, M.T. Dinis-2006
Comparative Biochemistry and Physiology Part B: Biochemistry and Molecular Biology 144(1): 57-69
Abstract:
Contrary to larval essential fatty acid (EFA) requirements, the effect of dietary neutral lipid supply has been little investigated in marine fish larvae. The present work investigates the effect of feeding Senegalese sole larvae on Artemia enriched with higher or lower doses of lipid emulsion. Two lipid sources — soybean oil and fish oil — were compared. From 16 days after hatching (DAH) onwards, larvae were fed one of four experimental treatments: Artemia enriched on a high or low dose of soybean oil emulsion (HS and LS) or Artemia enriched on a high or low dose of fish oil emulsion (HF and LF). In terms of growth, the dietary lipid level did not have a significant effect while the soybean oil treatments induced a lower growth than the fish oil-enriched Artemia. The fatty acid (FA) composition of the larvae closely reflected the dietary quantitative and qualitative FA profile. Only slight dietary effects were noted in the activity of trypsin, lipase and alkaline phosphatase. A higher amount of lipid droplets was noticeable in the posterior intestine epithelia and in the hepatocytes of larvae fed Artemia enriched with higher lipid doses, while LS-Artemia induced the lower lipid accumulation on the basal zone of the enterocytes, in accordance with the lowest total lipid level measured in this treatment. These results suggest an important effect of dietary total lipid level on lipid accumulation in the enterocytes and on FA absorption. At 33 DAH a tube feeding trial was conducted with 14C-labelled oleic acid (OA) or triolein (TRI), showing that the lower accumulation of lipid droplets in the larvae fed LS was associated with a significantly higher absorption and retention in the gut and body tissues of the TRI label. For OA no significant differences between treatments were found. TRI label was considerably more evacuated than OA, indicating that sole larvae may have a lower capacity to incorporate a triacylglycerol, which needs to be digested. Finally, OA appears to be preferentially utilized for energy production, accumulating more in larval tissues when absorbed in higher amounts.
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APPLICATION OF RFLP ANALYSIS TO IDENTIFY CYST POPULATIONS OF ARTEMIA URMIANA GÜNTHER, 1899 (BRANCHIOPODA, ANOSTRACA) FROM URMIA LAKE, IRAN
Amin Eimanifar, Sohrab Rezvani, Jirair Carapetian-2005
Crustaceana 78(11): 1311-1323
Abstract:
A rapid and reliable PCR-RFLP method was optimized to identify cyst batches of Artemia urmiana collected from different regions of Urmia Lake. Following DNA extraction, a 1564 bp region of a mitochondrial gene encoding the ribosomal RNA was successfully amplified by the PCR technique. Eleven restriction endonucleases were subsequently employed in order to digest the PCR product. These enzymes gave specific restriction patterns for discriminating cyst batches collected from top

and bottom layers of three main geographical areas of Urmia Lake. Detailed analysis revealed that the RFLP patterns of four restriction enzymes (HinfI, TaqI, MspI, and MboI) were sufficient to differentiate between the samples studied. The method described is sensitive, rapid, and reliable, and can be a useful tool for the identification of various populations of A. urmiana existing in the ecosystem of Urmia Lake.

LOW IMPACT OF INFECTIOUS HYPODERMAL AND HEMATOPOIETIC NECROSIS VIRUS (IHHNV) ON GROWTH AND REPRODUCTIVE PERFORMANCE OF PENAEUS MONODON

Boonsirm Withyachumnarnkul, Kanokporn Chataburakul, Supak Lao-Aroon, Pornthep Plodpai, Kallaya Sritunyalucksana, Gary Nash-2006

Diseases of Aquatic Organisms 69(2-3): 129-136

Abstract:
No controlled studies on the effect of infectious hypodermal and necrosis virus (IHHNV) on Penaeus monodon have been previously reported. Here we describe domesticated P. monodon that became positive for IHHNV and other viruses at variable levels of prevalence during cultivation in 16 open-air, earthen ponds. These were stocked with domesticated postlarvae (PL) that tested negative for 7 shrimp viruses including IHHNV at 6% prevalence in 3 checks using polymerase chain reaction (PCR) methods. These PL were derived from domesticated female broodstock that individually tested negative for the same viruses. At 4 mo of culture, the shrimp in some ponds without obvious mortality tested positive by PCR methods for IHHNV and 3 other viruses at variable levels of maximum estimated prevalence (MEP). Stained tissue sections showed no lesions typical of IHHNV, but in situ hybridization tests with an IHHNV-specific DNA probe were positive. There was no significant difference in mean body weight (i.e. ca 25 g) between shrimp groups positive or negative for IHHNV. Similar results were obtained with IHHNV negative and positive adults at 1 yr. Adults that individually tested negative for all 7 viruses and some that tested lightly positive for IHHNV were bred for the next generation. There were no significant differences in the number of eggs (> 600 000) and nauplii (ca. 300 000) produced by females negative and positive for IHHNV. From these females, 11/49 (22%) IHHNV PRC-positive PL batches were obtained from PCR-negative spawners, while 8/11 (73%) were obtained from IHHNV PCR-positive spawners. The results suggested that IHHNV infection can be transmitted vertically but does not seriously retard growth of P. monodon or affect fecundity or lightly infected broodstock.

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IMMUNOHISTOCHEMISTRY OF GREAT SCALLOP PECTEN MAXIMUS LARVAE EXPERIMENTALLY CHALLENGED WITH PATHOGENIC BACTERIA

Nina Sandlund, Lise Torkildsen, Thorolf Magnesen, Stein Mortensen, Oivind Bergh-2006

Diseases of Aquatic Organisms 69(2-3): 163-173

Abstract:
Three challenge experiments were carried out on larvae of the great scallop Pecten maximus. Larvae were bath-challenged with Vibrio pectenicida and 5 strains resembling Vibrio splendidus and one Pseudoalteromonas sp. Unchallenged larvae were used as negative controls. The challenge protocol was based on the use of a multidish system, where the scallop larvae (10, 13 and 15 d post-hatching in the 3 experiments, respectively) were distributed to 2 ml wells with stagnant seawater and exposed to the bacterial cultures by bath challenge. Presence of the challenge bacteria in the wells was verified by polymerase chain reaction (PCR). A significantly increased mortality was found between 24 and 48 h in most groups challenged with V. pectenicida or V. splendidus-like strains. The exception was found in larval groups challenged with a Pseudoalteromonas sp. LT13, in which the mortality rate fell in 2 of the 3 challenge experiments. Larvae from the challenge experiments were studied by immunohistochemistry protocol. Examinations of larval groups challenged with V. pectenicida

revealed no bacterial cells, despite a high degree of positive immuno-staining. In contrast, intact bacterial cells were found in larvae challenged with V. splendidus. In the case of larvae challenged with the Pseudoalteromonas sp., positive immuno-staining was limited to visible bacteria inside the digestive area and cells of the mucosa. The experiments confirm that V. splendidus and V. pectenicida are pathogenic to scallop larvae, and that the Pseudoalteromonas strain is probably not a primary pathogen, although it cannot be ruled out as a secondary pathogen.
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REPRODUCTIVE AND LIFESPAN CHARACTERISTICS OF ARTEMIA FROM LIBYAN ABU KAMMASH SABKHA
Mohamed O. El-Magsodi, Hassan M. El-Ghebli, Mohamed A. Enbaya, Mohammed Hamza, Usama A. Drebika, Patrick Sorgeloos-2005
Libyan Journal of Marine Science: 10:1-8
Abstract:
The reproductive performance of the Abu Kammash Artemia was tested in three salinities (100, 140 and 180 ppt) of Instant Ocean solution at constant
temperature of 25±1'C. Six reproductive and four lifespan characteristics were studied, they were: offspring per brood, brood per female, offspring per female per day during the reproductive period, days between broods, percent offspring encysted, total offspring per female, pre-reproductive period, reproductive period, post-reproductive period and total lifespan.
The results indicated that Abu Kammash Artemia shows a preference to high salinity. The reproductive and lifespan characteristics have no significant differences m the three salinities• (100, 140 and 180 ppt). These characteristics were found to be closer to A. tunisiana (salina). A high level of encysted offspring was observed which suggests the possibilities of it's commercial use. Also it is expected that these studies could contribute towards the more general understanding about the productivity of these animals, and prove helpful in developing this natural resource in Abu Kammash subkha. At the same time, it will provide Libya with the opportunity to explore the practical use of the Artemia population from Abu Kammash for the country needs.
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CHARACTERIZATION OF LIBYAN ARTEMIA FROM ABU KAMMASH SABKHA
Mohamed O. E1-Magsodi, Hassan M. El-Ghebli, Mohammed Hamza, Gilbert Van Stappen, Patrick Sorgeloos-2005
Libyan Journal of Marine Science 10:19-3
Abstract:
Artemia cysts have been collected from -Abu Kammash sabkha at the westren part of Libya. The cyst material was processed and used for the following characterization analyses: cyst and naupliar biometrics, cyst hatching characteristics, sex ratio and mode of reproduction, survival and naupliar growth rate.
The cross - breeding tests have been performed with different other well known sibling species. These tests with cyst biometrics showed that Abu Kammash Artemia belonged to the Artemia salina (tunisiana) sibling species complex.
This identification of Libyan Artemia is of critical importance before considering any transplantation or inoculation of other Artemia strains to new habitats in Libya. Although quality improvements may be expected through improved harvesting and processing, Libyan Artemia demonstrated acceptable hatching characteristics with decapsulation treatment or cold storage and might be a good food source in aquaculture.
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