

INFORMATION OF INTEREST

Brussels September 10-11, 2008 **International Aquaculture Conference - [presentations](#)**

Conference organized by the European Bureau for Conservation and Development (EBCD) and the International Union for Conservation of Nature (IUCN) in partnership with the European Economic and Social Committee (EESC) and promoted by the Spanish Ministry of Environment, Rural and Marine Affairs

VLIZ Library Acquisitions no

[417 Nov 21, 2008](#)

[418 Nov 28, 2008](#)

[419 Dec 05, 2008](#)

[420 Dec 12, 2008](#)

A REVIEW OF RECENT PROGRESS TOWARD DEVELOPMENT OF A FORMULATED MICROBOUND DIET FOR MUD CRAB, SCYLLA SERRATA, LARVAE AND THEIR NUTRITIONAL REQUIREMENTS

May-Helen Holme, Chaoshu Zeng, Paul C. Southgate-2009

Aquaculture 286(3-4): 164-175

Abstract:

This article presents an overview of recent progress on the nutrition of *Scylla serrata* larva and its implications in feed formulation. Recently published results of dietary trials with *S. serrata* larvae have helped build a basic framework of knowledge concerning the dietary requirements of this species, and these advances will undoubtedly upgrade hatchery production which traditionally has depended heavily on live food such as rotifers and *Artemia nauplii*. However, many aspects of larval mud crab nutrition is still not fully understood and further studies are required in order to develop an optimized diet. The purpose of this review is to summarize the information that has been published to date, and to highlight areas where more research is needed. Key subjects are assessed under the following major headings; problems associated with use of live food in larval culture; development of a formulated diet for hatchery production of *S. serrata* larvae; and nutritional requirements for protein, lipid and carbohydrates.

(Australian Institute of Marine Science, School of Marine & Tropical Biology, James Cook University, Townsville, Queensland 4811, Australia; email of May-Helen Holme: may.holme@ewos.com)

DEVELOPMENT OF BACTERICIDAL AND VIRUCIDAL TESTING STANDARDS FOR AQUACULTURE DISINFECTANTS

David W. Verner – Jeffreys, Claire L. Joiner, Nicola J. Bagwell, R. Allan Reese, Asbjorn Husby, Peter F. Dixon-2009

Aquaculture 286(3-4): 190-197

Abstract:

There is a need for standardised comparative data on the efficacy of aquaculture disinfectants to guide their use by farmers and health professionals, as well as Competent Authorities for authorisation or listing purposes. Towards this aim, two already available CEN (Comité Européen de Normalisation) quantitative suspension test standards for the evaluation of bactericidal and virucidal activity of disinfectants and antiseptics for use in the veterinary field were modified by using agents and testing conditions representative of aquaculture conditions. For evaluating bactericidal activity, BS EN1656:2000 was modified to test disinfectant activity against *Aeromonas salmonicida* subsp. *salmonicida* (ATCC 14174), *Yersinia ruckeri* (ATCC 29473), *Carnobacterium piscicola* (ATCC 35586) and *Lactococcus garvieae* (NCIMB 702927) for a contact time of 30 min and temperature of 4

°C. Interfering substance was used as described for dirty conditions in the standard (10 g l⁻¹ yeast extract plus 10 g l⁻¹ bovine serum albumin solution).

The substituted organisms could be stored and readily resuscitated. They were not adversely affected by the assay conditions (except exposure to the disinfectant) and could be readily prepared as suspensions. Four example products, coded A–D, were tested using both methods (including a peroxygen system, a product containing a mixture of hydrogen peroxide and peracetic acid, an acidic iodophore and a Chloramine T containing product). The neutralisation-dilution method, preferred in the standard, was appropriate for all products. Although there was greater test-to-test variation at the higher end of effective dilutions, repeat testing gave reliable results for four products as bactericides. *L. garvieae* and *C. piscicola* were the most resistant bacterial pathogens tested, requiring concentrations between 0.1–0.5% of the four products tested to achieve 5 log₁₀ inactivation. For evaluating virucidal activity, BS EN 14675:2006 was modified to use infectious pancreatic necrosis virus (IPNV), Spjarup serotype, using the same products with testing conditions as for BS EN1656:2000. The acidic iodophore-containing product (C) gave rise to cell cytotoxicity problems with the recommended neutralisation dilution method for titration of remaining viral activity. The other three products were reliably tested for virucidal activity using the modified assay. A further assay modification for virus mixed with Product C involved membrane dialysis for 48 h following test exposure and neutralisation by dilution. This reduced cell cytotoxicity enough to allow titration of the remaining viable IPNV.

(Cefas Weymouth Laboratory, The Nothe, Weymouth, Dorset, DT4 8UB, UK; email of David W. Verner – Jeffreys: david.verner-jeffreys@cefass.co.uk)

EFFECT OF DIFFERENT SUPPLEMENTAL FEEDS ON PROXIMATE COMPOSITION AND ARTEMIA BIOMASS PRODUCTION IN SALT PONDS

Nguyen Thi Ngoc Anh, Nguyen Van Hoa, Gilbert Van Stappen, Patrick Sorgeloos-2009

Aquaculture 286(3-4): 217-225

Abstract:

Experiments were conducted to evaluate the effect of different pond supplements on Artemia biomass production in earthen ponds. Twelve experimental ponds (300 m²) were randomly designed. Green water as a natural food source for Artemia was supplied once every 2 days to each treatment. The treatment without supplementation was referred to as the control (GW), the second treatment (GW + PM) consisted of green water supplemented with pig manure; in the third treatment (GW + PM + RB) green water was supplemented with pig manure and rice bran. In the final treatment (GW + PM + SB) green water was supplemented with pig manure and soybean meal.

Three weeks post-inoculation, growth performance in terms of Artemia length and weight in the three groups receiving supplemental feed were significantly higher than in the control ($P < 0.05$). A similar pattern was observed for maturation rate and fecundity of the brine shrimp adults. After 12 weeks of culture, the value for biomass production in the control was lower (1.06 ton ha⁻¹) as compared to the three supplemental groups. No statistical difference in biomass production was found among the groups fed complementary feeds ($P > 0.05$) although PM + RB and PM + SB gave better results (2.21 and 2.44 ton ha⁻¹, respectively) than PM alone (1.79 ton ha⁻¹). At the same culture period, the proximate composition of Artemia biomass was similar in all treatments. However, these values slightly changed over the culture period (i.e. protein and lipid levels were in the range of 54.9–57.8% and 10.7–11.6 %, respectively, at week 3 and 49.4–50.6% and 9.4–10.2% at week 12), indicating a fair drop in protein and lipid contents in the last week of culture while ash content slightly increased. The Artemia biomass in this study shows a proximate composition comparable with data reported in other studies, and can be considered as a suitable food source for aquatic species. Our results show that the combination of pig manure and rice bran or soybean meal can be applied in the cultivation of Artemia in salt ponds.

(Laboratory of Aquaculture & Artemia Reference Center, Faculty of Bioscience Engineering, Ghent University, Belgium; email of Patrick Sorgeloos: patrick.sorgeloos@UGent.be)

EFFECTS OF WATER HARDNESS ON SKELETAL DEVELOPMENT AND GROWTH IN JUVENILE FATHEAD MINNOWS

C. Blanksma, B. Eguia, K. Lott, J.M. Lazorchak, M.E. Smith, M. Wratschko, T.D. Dawson, C. Elonen, M. Kahl, H.L. Schoenfuss-2009

Aquaculture 286(3-4): 226-232

Abstract:

Skeletal growth in vertebrates is partially controlled by the availability of minerals. The correlation between aqueous calcium content and fish skeletal growth (“ossification”) is especially important as calcium absorption from water is an essential route to acquire this mineral. In this study, we test the hypothesis that a calcium-abundant aquatic environment will expedite larval skeletal development in fathead minnows beyond the skeletal development in a low-calcium environment. Fathead minnows were chosen for this study as they are a widely used toxicological model organism with well established rearing protocols. We divided three batches each of fathead minnow eggs from a colony supplied with calcium-abundant water ($\text{Ca} = 65 \pm 1.5 \text{ mg/L}$ as CaCO_3 ; hardness $> 175 \text{ mg/L}$) and one with a low, yet adequate calcium content ($\text{Ca} = 15 \pm 0.11 \text{ mg/L}$ as CaCO_3 ; hardness $< 50 \text{ mg/L}$) to rear fish. Half of each egg batch was exchanged between laboratories and fish were then reared to 60 days post-hatch under similar conditions. At 60 days, juveniles were sacrificed, cleared and stained. Ossification patterns for cranial (jaw) and caudal (fin) structures were quantified using NIH Image (<http://rsb.info.nih.gov/nih-image/>). Fish reared in calcium-abundant water had significantly increased survival but lower whole body mass when compared to their conspecifics in low-calcium water. Cranial ossification patterns did not vary. Caudal fin ossification was statistically significant, but slightly and surprisingly enhanced in juveniles reared in low-calcium water. All observed differences were independent of the origin of fish and imply differences in fish growth among cultures maintained under similar rearing conditions for the purpose of this study. Results of this investigation have implications for the rearing of model organisms for toxicological studies and need to be amended by physiological explorations.

(Aquatic Toxicology Laboratory, St. Cloud State University, St. Cloud, MN, United States; email of H.L. Schoenfuss: hschoenfuss@stcloudstate.edu)

SPERM COMPETITION AND FERTILIZATION SUCCESS OF ATLANTIC HALIBUT (HIPPOGLOSSUS HIPPOGLOSSUS L.)

Oddvar H. Ottesen, Igor Babiak, Geir Dahle-2009

Aquaculture 286(3-4): 240-245

Abstract:

Sperm competition trials were conducted to study the fertilization ability of sperm from four Atlantic halibut (*Hippoglossus hippoglossus* L.) males. Sperm from four males were mixed using equal number or equal volume of sperm from each of the males to fertilize eggs from two females. The proportions of larvae sired by the different males were quantified using DNA microsatellite analyzes. Larvae sired by Male 2 dominated the offspring in the trials; this male sired 79% and 78% of the DNA-analyzed offspring of two females. Reducing the number of sperm cells to below 105 did not significantly alter the relative proportion of offspring sired by the different males. Male 2 provided 25 and 27% of the total sperm in experiments with equal volumes and equal numbers of sperm, respectively. However, Male 2 provided 47% to 50% of the motile spermatozoa in the mixtures. Furthermore, Male 2 also had the highest sperm velocity ($115.7 \mu\text{m/s}$). Motility-related sperm traits may partly explain why offspring from Male 2 dominated the larvae. In both control and experimental groups, fertilization rates were high ($> 90\%$) when sufficient numbers (105–106) of spermatozoa per egg were used, and the fertilization success did not depend on whether sperm from one, or from a mixture of four males were used. Uncritical use of pooled sperm from different males during fertilization may cause unexpected results with only a few parents represented in an offspring population. Mixing sperm from different males without exact knowledge of sperm motility parameters may ultimately lead to low genetic variability, inbreeding, and strains with low fitness.

(Bodø University College, Department of Fisheries and Natural Sciences, 8049 Bodø, Norway; email of Oddvar H. Ottesen: Oddvar.Ottesen@hibo.no)

BIOCHEMICAL COMPOSITION AND DIGESTIVE ENZYME ACTIVITY DURING NAUPLIAR DEVELOPMENT OF ARTEMIA SPP FROM THREE SOLAR SALTWORKS IN GREECE

Maria Moraiti-Ioannidou, Jeanne Castritsi-Catharios, Hellen Miliou, Patrick Sorgeloos-2009

Aquaculture 286(3-4): 259-265

Abstract:

Three parthenogenetic brine shrimp *Artemia* populations from saltworks in Greece (Messolongi, Milos and Polychnitos) were studied with regard to their biochemical composition and the activity of digestive enzymes in four developmental stages from decapsulated cysts to nauplii instar III. The content of protein and RNA was highest in nauplii instar II (65.10 and 6.23% dry weight, respectively), while that of total lipid was highest in nauplii instar I (11.40% dw). The carbohydrate content was highest in decapsulated cysts (10.30% dw) and about one half that value in nauplii instar I. The DNA content was ten-fold higher in nauplii instar I than in decapsulated cysts with the highest levels in nauplii instar III (3.67% dw). The activity of alkaline phosphatase, leucine aminopeptidase, valine aminopeptidase, cystine aminopeptidase, β -galactosidase, β -glucosidase, esterase lipase (C8), esterase (C4), N-acetyl- β -glucosaminidase, α -fucosidase, acid phosphatase and naphthol-AS-BI-phosphohydrolase increased significantly from decapsulated cysts to nauplii instar II and remained constant or decreased in nauplii instar III. In nauplii instar II, leucine aminopeptidase, β -galactosidase, alkaline phosphatase and esterase (C4) demonstrated higher activity levels (140.90, 133.62, 66.01 and 45.47 nmoles/100 μ g dw within 5 min, respectively) of the aforementioned enzymes. The *Artemia* population of Messolongi had significantly higher levels of DNA, protein and alkaline phosphatase activity per individual, as well as body weight, compared to the *Artemia* populations of Milos and Polychnitos. The latter population showed the lowest level of lipid and the highest esterase activity (C4) per individual. There was a reverse relationship between the protein content and leucine aminopeptidase activity, lipid content and esterase (C4) activity, carbohydrate content and β -galactosidase activity among the three *Artemia* populations. The variations observed in the biochemical composition and the activity of some specific enzymes should be taken into consideration in selecting these *Artemia* populations from Greece for application in aquaculture.

(Department of Zoology — Marine Biology, Faculty of Biology, National and Kapodistrian University of Athens, Panepistimiopolis, Athens 157 84, Greece; email of Jeanne Castritsi-Catharios: cathario@biol.uoa.gr)

VITAMIN A AND E CONTENT IN EARLY STAGES OF CEPHALOPODS AND THEIR DIETARY EFFECTS IN OCTOPUS VULGARIS PARALARVAE

R. Villanueva, J.M. Escudero, R. Deulofeu, A. Bozzano, C. Casoliva-2009

Aquaculture 286(3-4): 277-282

Abstract:

The present study was designed to provide a look at the vitamin content of the early stages of cephalopods as an approach to their vitamin requirements in culture. Vitamin A and E profiles of the European cuttlefish *Sepia officinalis*, European squid *Loligo vulgaris* and common octopus *Octopus vulgaris* laboratory hatchlings and wild juveniles were analyzed. In addition, for *O. vulgaris* we determined vitamin A and E profiles of mature ovaries and eggs at different stages of development, and followed their possible dietary effects during the first month of paralarval rearing. We also analyzed vitamin A and E content of the live prey, i.e. *Artemia* nauplii, *Maja brachydactyla* hatchling crab zoeae and the mysidacean shrimp *Leptomysis buergii*. In the octopus ovaries and eggs, the vitamin A and E concentrations remained globally higher compared to paralarvae and wild juveniles. The vitamin A content in early stages of cephalopods was not much different from that observed in other marine molluscs and fish larvae and is expected to come from the carotenoid pool of their crustacean prey. Relatively high content of vitamin E was observed in the octopus ovaries, eggs, hatchlings and juveniles of the three cephalopod species analyzed. These levels are probably related to the high percentage of long chain polyunsaturated fatty acids (PUFA) that are particularly high in paralarval and juvenile cephalopods. The vitamin E content of the natural prey, *M. brachydactyla* and *L. buergii*, seemed to match or exceed the dietary needs of the three species of cephalopods analyzed. The vitamin E content of the *Artemia*-fed *O. vulgaris* increased during the rearing period and the

content of the one month of age paralarvae did not differ from the content in wild octopus juveniles, suggesting that this prey may provide sufficient tocopherol for the young octopuses.
(Institut de Ciències del Mar (CSIC), Passeig Marítim 37-49, E-08003 Barcelona, Spain; email of R. Villanueva; roger@icm.csic.es)

AN OVIPOSITION ALARM SYSTEM FOR THE CRAB ERIOCHEIR JAPONICA

Tai Hung Lee-2009

Aquaculture 286(3-4): 324-327

Abstract:

This paper describes an electronic system for obtaining mature, unfertilized eggs from decapods. The system was a by-product of the author's many years of research on in vitro artificial fertilization in crabs (brachyurans). Based on the results of multiple tests, the system has proved to be highly utilizable for research involving the use of mature, unfertilized eggs. The greatest advantage of this system is that it saves researchers a tremendous amount of time and trouble, as the collection of mature, unfertilized eggs is an extremely exhausting procedure that requires 24-hour monitoring over a period of days or weeks. Although the system was originally designed for research with the fresh water mitten crab *Eriocheir japonica*, it can be used with other decapods with slight modifications.

(Laboratory of Aquaculture Genetics and Genomics, Faculty of Fisheries Sciences, Hokkaido University, 3-1-1 Minato-cho, Hakodate, Hokkaido, 041-8611, Japan; thlee@fish.hokudai.ac.jp)

EFFECT OF TEMPERATURE ON HEART RATE IN DIPLOID AND TRIPLOID BROOK CHARR, *SALVELINUS FONTINALIS*, EMBRYOS AND LARVAE

T.J. Benfey, L.E. Bennett-2009

Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology 152(2): 203-206

Abstract:

Increased cell size in triploid fish likely affects rates of respiratory gas exchange. Respiratory deficiencies can be addressed in fish by adjustments in cardiac output, through changes in heart rate and stroke volume. The aim of this study was to determine whether heart rate differs between triploid and control (diploid) brook charr, *Salvelinus fontinalis*, at embryo-larval stages, when the heart is easily visible and the fish are relatively inactive. Heart rate was measured at 6, 9 and 12 °C at three developmental stages: eyed-egg, hatch and yolk absorption. Heart rate was unaffected by ploidy, but increased with temperature and age from a low of 43.4 ± 2.2 beats/min (6 °C, eyed egg) to a high of 73.3 ± 1.5 beats/min (12 °C, yolk absorption). The Q₁₀ for heart rate was unaffected by ploidy and age, but decreased with temperature from 1.99 ± 0.28 at 6–9 °C to 1.72 ± 0.17 at 9–12 °C. Triploid brook charr thus do not use adjustments in heart rate as a mechanism to deal with the physiological consequences of altered haematology at embryo-larval stages.

(Department of Biology, University of New Brunswick, P.O. Box 4400, Fredericton, New Brunswick, Canada E3B 5A3; email of T.J. Benfey: benfey@umb.ca)
