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**larvi 2009
5th fish and shellfish larviculture symposium
second and final announcement**

**september 7-10, 2009
ghent university, belgium**

organizers

Patrick Sorgeloos
UGent Aquaculture R&D Consortium
Ghent University, Belgium

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National Center for Mariculture, IOLR, Eilat, Israel

secretariat

Laboratory of Aquaculture & Artemia Reference Center
Ghent University, Belgium

conference chairman

Patrick Sorgeloos
Laboratory of Aquaculture & Artemia Reference Center
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scope

Successful larviculture of fish and shellfish remains a bottleneck in the industrial farming of several species of commercial interest, e.g. survival is still too low, larval quality not enough predictable, diseases occurring too often. In order to make the industry more cost effective and at the same time supply it with high quality fingerlings, we need to complement the empirical research of the past with more knowledge-based approaches and take more advantage of the successful research tools that have been developed in other farming sectors.

Capitalising on the previous “larvi” symposia (in ’91, ’95, ’01, ’05), the new Aquaculture R&D Consortium of Ghent University, the Norwegian University of Science and Technology and the new COST action “LARVANET” have joined in the organising committee for “larvi’09” and are inviting the academic as well as the private sector to attend the 5th Fish and Shellfish Larviculture Symposium. Bringing together European and non-European stakeholders, the latest progress in the sector will be reviewed, problems identified and avenues for future collaboration explored.

scientific committee

Peter Bossier, Kristof Dierckens, Gilbert Van Stappen, Mathieu Wille, Dominique Adriaens, Wim Van Den Broeck, Patrick Sorgeloos
Ghent University, Belgium

Peter Britz
Rhodes University, Grahamstown, South Africa

Ronaldo Cavalli
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Hiroshi Fushimi
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Giorgos Koumoundouros
University of Patras, Greece

Karin Pittman
University of Bergen, Norway

Amos Tandler
National Center for Mariculture, IOLR, Eilat, Israel

scientific program

Over 400 contributions from 60 different countries were submitted for an oral or poster presentation at larvi 2009. The Scientific Committee has performed a selection and finalized a program of 40 oral presentations (limited to pertinent reviews and/or discussions of multiple experiments with one or preferably several species), six poster discussion sessions covering about 120 posters and two evening workshops.

The following participants have been selected by the Scientific Committee to present an oral contribution at larvi 2009: Haffray Pierrick (*France*), Hamre Kristin (*Norway*), Masuma Syukei (Japan), Peixoto Silvio (*Brazil*), Sui Liying (*China*), Cheng Yongxu (China), Taylor John (*United Kingdom*), Huy Q. Nguyen (*Norway*), Pavlidis Michalis (*Greece*), Pittman Karin (*Norway*), Sæle Øystein (*Norway*), Uriarte Merino Iker Gerardo (*Chile*), Lenzi Francesco (*Italy*), Wold Per-Arvid (*Norway*), Trond M Kortner (*Norway*), Cobcroft Jennifer (*Australia*), Alver Morten Omholt (*Norway*), Boglione Clara (*Italy*), Russo Tommaso (*Italy*), Øie Gunvor (*Norway*), Ritar Arthur

(*Australia*), Rønnestad Ivar (*Norway*), Sanchez-Vazquez Javier (*Spain*), Conceição Luis (*Portugal*), Koedijk Roeland (*Norway*), Nguyen Van Tien (*Vietnam*), Nordgreen Andreas (*Norway*), Penglase Sam (*Norway*), Thompson Ernst (*South Africa*), Evjemo Jan Ove (*Norway*), Kolkovski Sagiv (*Australia*), Vagner Marie (*France*), Darias Maria (*Spain*), Fernandez Ignacio (*Spain*), Ginzbourg Boaz (*Israel*), Koven William (*Israel*), Haga Yutaka (*Japan*), Le Vay Lewis (*United Kingdom*), Kotani Tomonari (*Japan*), Kovatcheva Nikolina (*Russia*), Portella Maria Celia (*Brazil*), Yoshimatsu Takao (*Japan*), Mai Kangsen (*China*), Hall Michael (*Australia*), Makridis Pavlos (*Greece*).

In order to ensure that the posters will make up an integral part of the conference, much attention will be given to provide time for viewing and discussing the posters. The posters can be displayed as of Sunday afternoon and first viewing will be possible on Tuesday morning; 40 min coffee breaks in the morning and in the afternoon guarantees enough time is available to study the posters, and arrangements will be made that lunches can be taken in the poster area. For each conference topic a specialist will be invited to review the posters and present his/her comments during special poster discussions.

During the symposium banquet an award will be given to the author of the best poster selected on its scientific value and layout qualities.

tentative program

Sunday September 6

Early registration and setting up of posters from 2 until 5 pm

Monday September 7

Registration of participants at the Conference Center and setting up of posters from 8.30 am onwards

Official Opening Session at 6pm with keynote presentations by Goro Yoshizaki (Tokyo University of Marine Science and Technology) on “Germ Cell Transplantation in Fish”, and Peter Bossier (UGent Aquaculture R&D Consortium and Promicrobe FP7 project) on “Interdisciplinary Research in Microbial Management in Fish and Shellfish Larviculture” followed by welcome reception.

Tuesday September 8

Session 1 - BROODSTOCK MANAGEMENT (zootechniques, nutrition, egg and larval quality, domestication, sperm quality, genetics, germplasm preservation, genomics and proteomics, ...)

Session 2 - GENERAL LARVAL ONTOGENY, PHYSIOLOGY & ECOLOGY (ontogeny, developmental biology, genetic expression behavior, ...)

Wednesday September 9

Session 3 - LARVAL NUTRITION AND FEEDING (Live food, formulated feeds, nutritional requirements, feeding schemes, ...)

Session 4 – LARVAL DEFORMITIES (role of biotic and abiotic factors, genome expression, ...)

Thursday September 10

Session 5 - LARVICULTURE ZOOTECHNIQUES (culture systems, environmental requirements, socio-economic aspects, ...)

Session 6 - MICROBIOLOGY AND HEALTH MANAGEMENT (prebiotics, probiotics, diseases and pathogens, viral and bacterial challenge tests, ...)

Session summaries & concluding remarks

Symposium Banquet

special events in conjunction with larvi 2009

Plans are made for the organisation of the following workshops: "FINEFISH project meeting" on Monday Sept 7, "LARVANET project meeting" on Tuesday Sept 8, "Backyard hatchery production of fish and shellfish" on Wednesday Sept 9).

Updated information on these workshops will be posted on the Larvi'09 website

www.larvi.UGent.be

publications

All Symposium participants will receive the "larvi 2009 - CD" comprising the abstracts of the oral presentations and the mini-papers of the poster presentations which will be reviewed/selected by the Scientific Committee.

Full-length papers of the oral presentations will be peer-reviewed and published as Symposium Proceedings in a special issue of "Aquaculture". Copies of this volume of "Aquaculture" will be available at a special discount price for participants of larvi 2009 if ordered and paid at the conference registration desk.

The best poster presentations will be selected by the Scientific Committee and invited for submission of full-length papers for peer review and publication in a special issue of "Aquaculture Research".

sponsoring

Larvi 2009 will be organized under the patronage of His Majesty King Albert II of Belgium.

The following institutes & organizations are supporting the organization of the symposium:

- Research Foundation - Flanders (FWO)
- Flemish Interuniversity Council – University Cooperation for Development (VLIR-UOS)
- Ghent University (Belgium)
- Province of East Flanders
- the Norwegian University of Science and Technology (Norway)

Fund raising from the private sector is still ongoing. The list of private sponsors will be published in the program brochure. INVE Aquaculture N.V. (Belgium) is the gold sponsor of the symposium.

registration

The conference facilities cannot accommodate more than 400 participants. People interested in attending larvi 2009 are therefore requested to fill in the online registration form (www.larvi.UGent.be) as soon as possible.

Only registrations accompanied by a full pre-payment will be handled on a first come first served basis. On-site registrations will not be accepted.

registration fees in Euro

	prior to June 1, 2009	prior to July 15, 2009	later
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Private company	375.00	460.00	590.00
Academic	230.00	290.00	590.00
Student *	145.00	200.00	590.00

Accompanying person (social activities and banquet only)	135.00	165.00	200.00
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The registration fee includes admission to all symposium sessions, social activities**, coffee breaks, symposium banquet*, and receipt of a symposium map, program brochure, CD with short communications and abstracts.

*pending sponsorship approval, student registration will include banquet

**not included in the student's registration fee)

Payment of the registration fees should be in Euro. Payment can be done online with credit cards (using a secure site) or with a bank transfer. Check the website (www.larvi.UGent.be section 'registration') for calculation of the appropriate registration & reservation costs. Payment details for the bank transfer and credit card payment procedure are also explained on the website.

Please note: all banking expenses are to be charged to the participant.

accommodation

Participants are requested to book hotel accommodation directly with the hotel of their choice. Block-reservations for larvi participants have been made in a number of hotels. Details on the price category and distance from the symposium venue, as well as contact details to make reservations can be found at the symposium website www.larvi.UGent.be. A wider selection of hotels can be found at www.gent-hotels.be, which also offers online reservation facilities. Because Ghent is a touristic city, rooms should be booked well in advance.

Cheap but comfortable lodging facilities will also be available at the university dormitories at the price of 27 Euro per night. Reservations for the student dormitory can be made online together with registration. Only reservations accompanied by a full pre-payment will be handled on a first come - first served basis.

meals

Several restaurants and snack bars can be found in the vicinity of the symposium venue. However for those who prefer to take lunch at the venue itself the organisation offers regular and vegetarian lunches at the price of 10 Euro per lunch. These onsite lunches need to be ordered beforehand (see online registration form).

travel arrangements

For European participants, it is interesting to know that several low-cost carriers fly into Brussels. Please check the symposium website for details.

There are direct trains from the airport to the railway station Gent St. Pieters, 4 minutes past each hour and 8 minutes before each hour between 5.30 am and 11 pm. The trip takes 57 minutes and costs 9.20 € (more information: <http://www.b-rail.be>).

Special pick-up service from the airport to the hotel can be arranged, for more information see: www.larvi.UGent.be

Note that regular taxis are very expensive in Belgium: to go from Brussels airport to Ghent will cost you well over 140 Euros.

excursions

Situated in the centre of Flanders, Ghent is very well located as a base for several tourist excursions (visit of the historic city centre of Ghent, the medieval city of Bruges, Brussels or a boat trip on the river Leie; for more information visit www.visitflanders.be). For more information and instructions for bookings please contact the symposium secretariat.

Conference website

www.larvi.UGent.be



INFORMATION OF INTEREST

US National Algae Association - [website](#)

2009 [Report](#) of the ICES Working Group on the Application of Genetics in Fisheries and Mariculture (WGAGFM)

2009 [Report](#) of the ICES Working Group on Marine Shellfish Culture (WGMASC)

new “Regional Aquaculture Information System”: www.RAISaquaculture.net

The RAIS groups all Member countries of the Regional Commission for Fisheries (RECOFI) (Bahrain, Islamic Republic of Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates) which has decided to establish a web-based information system to facilitate the exchange of aquaculture information in the Gulf area and to develop an informal, flexible and functional network of regional experts to promote and develop the sector in the region.

Strategy for the sustainable development of European aquaculture: [April 2009 communication](#) including interesting [video](#) and strategy document for the sustainable development of European aquaculture

FISH – project in Uganda to stimulate development of a commercial aquaculture industry: [project presentation](#) and project [website](#)

The Asian Fisheries Science E-journal volume 22 number 1 is now available ([ToC](#)) at the AFS website: www.asianfisheriessociety.org

US National Science Foundation [partnership](#) with Bill & Melinda Gates Foundation for the support of science research projects that address drought, pests, disease and other serious problems facing small farmers and their families in developing countries.

Workshop: Larvanet (COST Action FA0801) May 11-12, 2009

Lately we had a 2 day meeting in Athens which dealt with Larvanet preparations of the deliverables of our COST action. The WG leaders invited about thirty experts in the field of marine fish larval research that will help write these deliverables. Should you want to have a peek at their presentations .Click on the names to get the presentation of the given person.

PhD Portal Ghent University Lab of Aquaculture: see website

The latest edition of Shellfish News is now available as a PDF file on the CEFAS website

VLIZ Library Acquisitions no

436 April 30, 2009

437 May 08, 2009

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439 May 22, 2009

440 May 29, 2009

441 Jun 05, 2009

EVALUATION OF DIKE-TYPE CAUSEWAY IMPACTS ON THE FLOW AND SALINITY REGIMES IN URMIA LAKE, IRAN

Mostafa Zeinoddini, Mohammad Ali Tofighi, Fereydon Vafae-2009

Journal of Great Salt Lakes Research 35: 13-22

ABSTRACT:

Urmia Lake, located in a closed basin in north-west Iran, is the largest lake (5000-6000 km²) in the Middle East. It is very saline with total dissolved salts reaching 200 g/l compared with a normal seawater salinity of about 35 g/l. The construction of a causeway, which was initiated in 1979 but then abandoned until the early 2000s, is near completion and will provide road access between the western and eastern provinces. The causeway has an opening 1.25km long and divides Urmia Lake into a northern and southern basin and restricts water exchange. The flow and salinity regimes are affected by the presence of this new causeway, and there are concerns over the well being of the Artemia population. This study investigates the effects of the construction of the causeway on flow and salinity regimes, considers remedial actions, and examines the effects of climatic variability on salinity and flow. Flow and salinity regimes were numerically simulated by using a commercially available two and three-dimensional (2D and 3D) MIKE model. The validity of the numerical model was assessed through sensitivity analysis of the model and comparing the simulated results against field measurements; the 3D model provided the higher correlation between simulated and actual data. Wind input was the main climatic and hydrologic factor influencing flow regime while river discharge, evaporation and rainfall were the key parameters affecting salinity distribution in the lake models. The 3D model was subsequently used to predict lake conditions in typical dry, wet and normal climates, to examine the environmental impacts from the new causeway, and to evaluate possible improvements that some remedial measures may provide.

(KNT University of Technology, Faculty of Civil Engineering, Tehran, 19697, Iran)

ANALYSIS OF THE EVOLUTION OF MICROBIAL COMMUNITIES ASSOCIATED WITH DIFFERENT CULTURES OF ROTIFER STRAINS BELONGING TO DIFFERENT CRYPTIC SPECIES OF THE BRACHIONUS PLICATILIS SPECIES COMPLEX

Zizhong Qi, Kristof Dierckens, Tom Defoirdt, Patrick Sorgeloos, Nico Boon, Zhenmin Bao, Peter Bossier-2009

Aquaculture 292(1-2): 23-29

Abstract:

The evolution of the composition of microbial communities associated with cultures of 3 different strains belonging to different cryptic species of the rotifer *Brachionus plicatilis* was monitored during four subsequent cycles of batch cultivation using denaturing gradient gel electrophoresis, cluster analysis, multidimensional scaling and principal component analysis. The data suggest that the

evolving microbial communities are different with different *B. plicatilis* strain cultures. Moreover, large changes in rotifer growth rate were found to be associated with large changes in the microbial community composition, suggesting that there might be a causal link. Finally, Lorenz curves and Gini-coefficient analysis revealed that good performing *B. plicatilis* cultures showed a more even microbial community structure.

(Key Laboratory of Marine Genetics and Gene Resource Exploitation of Ministry of Education (MaGGR), Ocean University of China, Qingdao 266003, China; email of Zhenmin Bao: zmbao@ouc.edu.cn)

CLOSING THE REPRODUCTIVE CYCLE: GROWTH OF THE SEAHORSE *HIPPOCAMPUS REIDI* (TELEOSTEI, SYNGNATHIDAE) FROM BIRTH TO ADULTHOOD UNDER EXPERIMENTAL CONDITIONS

Maik dos Santos Cividanes da Hora, Jean-Christophe Joyeux-2009

Aquaculture 292(1-2): 37-41

Abstract:

The seahorse *Hippocampus reidi* is one of two seahorse species occurring in Brazil, and is in demand for the ornamental aquarium and curio trades. Juvenile *H. reidi* siblings ($n = 615$) born in captivity were raised on a diet of wild zooplankton, enriched *Artemia* and wild mysid from birth to 109 days. Growth averaged 0.77 ± 0.01 mm day⁻¹ for the whole period. However, after the onset of sexual maturation at about 60 days of age, growth decreased to 0.31 ± 0.10 and 0.53 ± 0.09 mm day⁻¹ in males and females respectively. The first births of F3 juveniles were observed after 81 days of growth. All individuals were adult at the end of the study and sex ratio was 1M:1.2F. Total mortality was 11.7%, with mortality peaks apparently caused by changes in the offered diet; gradual dietary shifts may reduce the occurrence of such mortality peaks. This study indicates that *H. reidi* may be raised in captivity from birth to adulthood with relatively fast growth rate, low mortality and early maturity, thus, increasing the potential application of this seahorse species to commercial aquaculture and conservation initiatives.

(Departamento de Oceanografia e Ecologia, Universidade Federal do Espírito Santo, Av. Fernando Ferrari, 514, Goiabeiras 29075-910, Vitória, ES, Brazil; email of Maik dos Santos Cividanes da Hora: maik_oceano@yahoo.com.br)

EFFECTS OF TEMPERATURE ON REPRODUCTION AND SURVIVAL OF THE CALANOID COPEPOD *PSEUDODIAPTOMUS PELAGICUS*

Andrew L. Rhyne, Cortney L. Ohs, Erik Stenn-2009

Aquaculture 292(1-2): 53-59

Abstract:

Four experiments were conducted on the calanoid copepod, *Pseudodiaptomus pelagicus*, to determine the effects of temperature (24, 26, 28, 30, 32, and 34 °C) on survival, development time, reproductive output, and population growth in order to define the optimal temperature for culture. The first experiment stocked early stage nauplii into 1 L beakers and cultured them using standard procedures until five days after the first mature adults were observed; from this survival, sex ratio, time to maturation, and fecundity were measured. The second and third experiments evaluated the effects of temperature on nauplii production by stocking individual pairs and 25 pairs of adults, respectively; in both experiments nauplii production was determined daily for 10 days. The fourth experiment determined the effects of temperature on population growth and composition of the population produced by stocking 10 adult pairs and culturing them for 10 days at six temperatures. Results indicate survival from early nauplii to adult was significantly affected by temperature and those cultured from 24–30 °C had the highest mean survival. Time to first maturation and maturation of the entire population was significantly influenced by temperature and took from 6.8 to 12.8 days. Temperature significantly affected nauplii production in both individual and groups of paired adults. Temperature affected the mean daily nauplii production by decreasing the brood interval but did not affect the mean brood size. The number of nauplii produced by 25 adult pairs was significantly influenced by temperature; the optimal temperature was 27.5 °C at which 1861 nauplii were

produced. The distribution of developmental stages in the population was also affected by temperature; at lower temperatures the population consisted of a greater proportion of nauplii while at 32 °C the population was comprised of more advanced staged individuals. When developing production objectives, aquaculturists must consider temperature because it has multiple effects on the culture of *P. pelagicus*. The optimal temperature range to achieve high survival and the greatest nauplii production is 26–30 °C. To maintain long-term stock cultures the best temperature may be 24 °C to slow maturation and growth while 28–32 °C may be used to maximize nauplii production by decreasing time to maturation and decreasing brood intervals.

(University of Florida, Indian River Research and Education Center, 2199 South Rock Road, Fort Pierce FL 34945, USA; email of Andrew L. Rhyne: arhyne001@hotmail.com)

LARVAL PERFORMANCE OF AQUACULTURED FLORIDA POMPANO (*TRACHINOTUS CAROLINUS*) FED ROTIFERS (*BRACHIONUS PLICATILIS*) ENRICHED WITH SELECTED COMMERCIAL DIETS

Fernando G. Cavalina, Charles R. Weirich-2009

Aquaculture 292(1-2): 67-73

Abstract:

Selected rotifer enrichment diets were compared on the basis of growth, survival, and fatty acid content of larval Florida pompano, *Trachinotus carolinus* L. Two 9-day larval rearing trials were conducted using a recirculating aquaculture system. In Trial 1, two microalgae concentrates (*Isochrysis* sp., ISO; and *Pavlova* sp.), a semi-moist paste (Protein Selco Plus, PS+), and a combination of the three diets were compared. In Trial 2, PS+ and three dry enrichment diets (Ori-Green, OG; Protein HUFA, PH; and AlgaMac 3050, AM) were compared. Larvae were fed rotifers 4 times daily at a rate of 2.5 rotifers/ml/feeding at 2–9 days post-hatch (DPH). Although larval growth in both trials was likely influenced by differences in culture density resulting from variable survival, in Trial 1 at 9 DPH standard length (SL) of larvae fed *Pavlova*-enriched rotifers (4.60 ± 0.39 mm, mean \pm SD) was greater ($P < 0.05$) than that of larvae fed rotifers enriched with ISO (4.29 ± 0.48 mm); and the combined treatment (4.31 ± 0.48 mm) and body depth (BD) of larvae fed *Pavlova*-enriched rotifers (1.21 ± 0.16 mm) was greater than that of larvae fed rotifers enriched with the combined treatment (1.08 ± 0.18 mm). In Trial 2 at 9 DPH, SL and BD of larvae fed rotifers enriched with PH (5.00 ± 0.23 and 1.24 ± 0.12 mm, respectively) was greater than that of larvae fed rotifers enriched with other diets. Survival of larvae fed rotifers enriched with PS+ was highest in both Trial 1 ($24.1 \pm 10.2\%$) and Trial 2 ($34.4 \pm 1.6\%$) and was significantly greater than that of larvae fed rotifers enriched with *Pavlova* ($7.3 \pm 1.6\%$) and the combined treatment ($6.0 \pm 1.6\%$) in Trial 1 and larvae fed rotifers enriched with PH ($21.8 \pm 6.3\%$) and AM ($14.1 \pm 4.9\%$) in Trial 2. While lipid content and fatty acid composition of PS+ enriched rotifers closely resembled that of pompano yolk-sac larvae, $n = 3$ HUFA content of PS+ enriched rotifers as well as larvae fed PS+ enriched rotifers was not significantly greater than that of other diets tested in both trials.

(USDA-ARS Sustainable Marine Aquaculture Systems Research Program, Harbor Branch Oceanographic Institute at Florida Atlantic University, 5600 US 1 North, Ft. Pierce, FL 34946, USA; email of Charles R. Weirich: charles.weirich@ars.usda.gov)

EFFECT OF LIGHT SPECTRUM AND PHOTOPERIOD ON THE GROWTH, DEVELOPMENT AND SURVIVAL OF EUROPEAN SEA BASS (*DICENTRARCHUS LABRAX*) LARVAE

N. Villamizar, A. García-Alcazar, F.J. Sánchez-Vázquez-2009

Aquaculture 292(1-2): 80-

Abstract:

This study investigates how the characteristics (spectrum and photoperiod) of artificial light affect European sea bass eggs and larvae from – 1 to 40 days post-hatching. Fertilised eggs and larvae were reared under five different light treatments: 12L:12D red light (LDR; half-peak bandwidth = 641–718 nm), 12L:12D blue light (LDB; half-peak bandwidth = 435–500 nm), 12L:12D broad-spectrum white light (LDW; $367 < \lambda < 1057$ nm), 24L:0D broad-spectrum white light (LL) and 0L:24D (DD). The results showed that total length at day post-hatching 40 was significantly larger in larvae reared under

LDB (15.4 ± 0.6 mm) and LL (15.2 ± 0.6 mm) than in larvae reared under LDR (11.7 ± 0.7 mm). Overall wet weight was highest under LDB (21.6 ± 2.02 mgr) and lowest in LDR larvae (13.6 ± 1.48 mgr). Yolk sac and oil globule absorption occurred more slowly in LDR and DD larvae, while LDB larvae developed their fin, teeth and swim bladder significantly earlier than the rest of the groups. DD larvae were unable to capture food and mortality was 100% by day post-hatching 18, while LDR larvae did not feed on rotifers, but fed on Artemia from day post-hatching 16 onwards. The best survival was obtained with the LL treatment, although significantly more problems with swim bladder development and lower jaw malformations were also identified in this group. In summary, these results highlight the key role of the light spectrum and photoperiod for European sea bass larvae, the best performance being achieved under the light conditions that best approached those of their natural aquatic environment (LDB). These findings should be considered when designing rearing protocols for larvae in aquaculture.

(Spanish Oceanographic Institute (IEO), 30860, Puerto de Mazarrón, Spain; email of F.J. Sánchez-Vázquez: javisan@um.es)

STUDIES ON THE OCCURRENCE OF WHITE TAIL DISEASE (WTD) CAUSED BY MRNV AND XSV IN HATCHERY-REARED POST-LARVAE OF PENAEUS INDICUS AND P. MONODON

M. Ravi, A. Nazeer Basha, M. Sarathi, H.H. Rosa Idalia, J. Sri Widada, J.R. Bonami, A.S. Sahul Hameed-2009

Aquaculture 292(1-2): 117-120

Abstract:

White tail disease (WTD) caused by *Macrobrachium rosenbergii* nodavirus (MrNV) and extra small viruses (XSV) is a major problem. It is responsible for severe mortality in post-larvae of *M. rosenbergii* in the hatcheries and nurseries. These viruses have a wide host range including marine shrimp. Recently, WTD has been observed in hatchery reared post-larvae of marine shrimp (*Penaeus monodon* and *P. indicus*). Clinical signs observed in these animals were found to be similar to those found in the post-larvae of *M. rosenbergii*. The infected post-larvae showed positive for MrNV and XSV by RT-PCR. The inoculum prepared from these infected post-larvae caused 100% mortality in the post-larvae of freshwater prawn.

(OIE Reference Laboratory for WTD, Department of Zoology, C. Abdul Hakeem College, Melvisharam, Tamil Nadu, India; email of A.S. Sahul Hameed: cah_sahul@hotmail.com)

OBSERVATIONS OF REPRODUCTIVE DEVELOPMENT AND MATURATION OF MALE PENAEUS MONODON REARED IN TIDAL AND EARTHEN PONDS

Shi-Gui Jiang, Jian-Hua Huang, Fa-Lin Zhou, Xu Chen, Qi-Bing Yang, Wei-Geng Wen, Zi-Ming Ma-2009

Aquaculture 292(1-2): 121-128

Abstract:

To evaluate the effect of age and body size on the development and maturation of male *Penaeus monodon*, *P. monodon* males from the same cohort at age of 100, 120, 135, 156, 175, 205, and 236 days in a tidal pond (TP), and 100, 123, 140, 157, 185, and 258 days in an earthen pond (EP) were examined. The minimal body size and age of males from TP and EP that produced spermatophore were investigated. The earliest time of spermatophore production of the TP males (120 days) was significantly earlier ($P < 0.001$) than the EP males (157 days). The minimum of shrimp carapace length, body length and body weight of produced spermatophore were similar between the two environments (3.1 and 3.2 cm, 11.1 and 11.5 cm, 19.9 and 24.2 g, respectively for EP and TP).

The gonad weight, spermatophore weight, sperm count and percentage of normal sperm were positively correlated to body weight and age. The sperm count was also positively correlated to both the gonad weight and the spermatophore weight. When compared reproductive variables of males among different ages and the same age but different sizes under the same culture conditions, and males of similar age from different types of ponds, the results showed that the age and size of male

P.monodon significantly influenced the formation, development and maturation of male spermatophore, the sperm count and the percentage of normal sperm. Culture conditions also influenced these reproductive parameters of males. Males with age of 236 (TP) and 258 days old (EP) had superior sperm quality than younger ones within the same environment, based on observations of larger spermatophore weight, higher sperm count, and higher percentage of normal sperm. When ANCOVA with body weight as the covariable followed by adjusted means comparisons, the same results were obtained except for the sperm count. Although sperm counts were not significantly different ($P > 0.05$) among different age groups except for the 185- and 258-day-old (EP), the percentages of normal and abnormal sperms were significantly different. The results indicated that it is important to consider the age and size of males and the culture conditions under which domesticated male broodstocks will be obtained.

(Aquaculture and Biotechnology Division, South China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Guangzhou 510300, China; email of Shi-Gui Jiang: jiangsg@21cn.com)

MORPHOMETRIC CHANGES IN A STRAIN OF THE LINEAGE 'NEVADA', BELONGING TO THE BRACHIONUS PLICATILIS (ROTIFERA) COMPLEX

Venetia Kostopoulou, Helen Miliou, George Verriopoulos-2009
Aquaculture Research 40(8): 938 – 949

Abstract:

The rotifer *Brachionus plicatilis* is an important component of aquaculture as a larval feed. Its taxonomic status has been recently re-defined as a species complex, consisting of at least 14 new species/lineages. This study deals with the lineage *Brachionus*'Nevada', which has been shown to occur in European hatcheries. A strain of *B. 'Nevada'* was mass cultured using two commonly applied feeding regimes and analysed in terms of its morphometry. A new formula was proposed for the calculation of volume, which can be used as an index of adequacy of rotifers as feed for fish larvae. The results were related to life cycle parameters. The pre-reproductive and reproductive phases were divided into distinct size groups. Differences were also found between the two diets in morphometry and demography. Rotifers of a larger size (yeast-based diet) showed a lower growth rate and a longer reproductive period, lifespan and mean generation time compared with smaller-sized rotifers (Culture Selco®-based diet). In terms of lorica length, the present study's strain of *B. 'Nevada'* (238.5 μm) was intermediate between values reported for *Brachionus ibericus* (193.5 μm) and *B. plicatilis sensu stricto* (299 μm).

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INGESTION OF ARTEMIA NAUPLII BY CHINESE MITTEN CRAB ERIOCHEIR SINENSIS ZOEAL LARVAE

Li-ying Sui, Mathieu Wille, Xu-gan Wu, Yong-xu Cheng, Patrick Sorgeloos-2009
Aquaculture Research 40(8): 950 – 954

Abstract:

A series of ingestion trials were conducted to determine the ingestion rate of *Artemia nauplii* by *Eriocheir sinensis* zoeal larvae with increasing densities of *Artemia* and with or without rotifers as a co-feed. At each zoeal stage, 10 groups of 10 larvae were reared individually in glass beakers and fed with increasing densities of newly hatched *Artemia nauplii* (0.5, 2.5, 5, 10 and 20 individual (ind.) mL^{-1}) with or without rotifers (15–25 ind. mL^{-1}) as a co-feed. The average number of ingested *Artemia* was measured over 24 h. In addition, the average larval development rate (Larval Stage Index, LSI) over a longer period (time needed for the best treatment to reach 100% moult or metamorphosis to the next larval stage) was compared. The results showed that *Artemia* ingestion rate of *E. sinensis* larvae increased with increasing prey densities and larval development, and had a significantly negative correlation with rotifer consumption for all zoeal stages. Rotifers as an alternative prey significantly affected the intake of *Artemia* at early larval stages (Z1 and Z2) and

promoted LSI at a lower *Artemia* density. Further experiments are needed to clarify the effect of prey density on survival and larval development when larvae are reared communally.
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SPAWNING OF THE TEMPERATE SEA CUCUMBER, *AUSTRALOSTICHOPUS MOLLIS* (LEVIN)

Andrew David Morgan-2009

Journal of the World Aquaculture Society 40(3): 363 – 373

Abstract:

The spawning of sea cucumbers is related to the interaction of environmental cues and reproductive maturity. Groups of *Australostichopus mollis* were collected every 2 wk during the summer reproductive season from mid-October to early February. They were observed for spawning in the hatchery during heat-shock trials conducted 3–5 C above ambient seawater temperature. Lunar periodicity existed with spawning being most prominent in the week following a full moon. In the week prior to a spawning event, there was also a decrease in ambient incoming seawater temperature. More than 75% individuals spawned during most trials in which spawning occurred. In total, 40% of the 270 individuals spawned during the reproductive season. Reliable spawners were females with a yellow gonad color and large numbers of vitellogenic oocytes, and males with large numbers of spermatocytes and an absence of motile spermatozoa. Furthermore, the percentage germinal vesicle breakdown of oocytes exposed to starfish radial nerve extract compared to seawater was greater for the more orange-colored gonad of nonspawners. Gonad color is useful in determining the likelihood of spawning over a 2-wk period in the presence of a cue. Sea cucumbers held for short periods in the hatchery during the reproductive season maintain a natural rhythm of spawning that can be monitored using visual indices and augmented using heat shock.

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EFFECT OF INITIAL STOCKING DENSITY ON LARVICULTURE PERFORMANCE OF THE OCELLATE PUFFER, *TAKIFUGU RUBRIPES*

Tomonari Kotani, Yoshiyuki Wakiyama, Tatsuhiro Imoto, Hisahide Suzuki, Hiroshi Fushimi-2009

Journal of the World Aquaculture Society 40(3): 383 – 393

Abstract:

Depending on the initial stocking density, ocellate puffer larvae exhibit the cannibalism that resulted in high mortality. We aimed to clarify the relationship between stocking density of larvae, mortality, and the effect of density on cannibalism. Ocellate puffer larvae were reared at five different stocking densities between 5 and 25 larvae/L with duplicate 1-m³ tank for each treatment. Larvae were stocked at 0 d after hatch (d.a.h.), and the experimental cultures lasted for 55 d. In larvae stocked initially at more than 10 larvae/L, cannibalism was evident from 11 to 17 d.a.h., and the survival rate at 55 d.a.h. was less than 15%. The survival rate was 25.5% at 5 larvae/L, and cannibalism was observed from 31 to 32 d.a.h. Consequently, an initial density of 5 larvae/L was the most efficient in terms of survival and the prevention of cannibalism. On the other hand, when cannibalism is still observed at 5 larvae/L, it is necessary to lower the stocking density before the onset of cannibalism.

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GLOBAL AQUACULTURE AND ITS ROLE IN SUSTAINABLE DEVELOPMENT

Rohana Subasinghe, Doris Soto, Jiansan Jia-2009

Reviews in Aquaculture 1(1):2 – 9

Abstract:

Aquaculture is the fastest growing food-producing sector in the world. It is developing, expanding and intensifying in almost all regions of the world. The global population is increasing, thus, the demand

for aquatic food products is also increasing. Production from capture fisheries has levelled off and most of the main fishing areas have reached their maximum potential. Sustaining fish supplies from capture fisheries will, therefore, not be able to meet the growing global demand for aquatic food and aquaculture is considered to be an opportunity to bridge the supply and demand gap of aquatic food in most regions of the world. However, in our efforts to achieve this potential, the sector will face significant challenges. Key development trends indicate that the sector continues to intensify and diversify and is continuing to use new species and modify its systems and practices. Markets, trade and consumption preferences strongly influence the growth of the sector, with clear demands for the production of safe and quality products. As a consequence, increasing emphasis is placed on enhanced enforcement of regulation and better governance of the sector. It is increasingly realized that sustainable development and responsible production of aquaculture, in the long run, cannot be achieved without the full participation of the producers in the decision-making and regulation process, which has led to efforts to empower farmers and their associations and move toward increasing self-regulation. These factors are all contributing to an improvement in the management of the sector, typically through the promotion of 'better management' practices of producers. This review discusses the role of aquaculture, as at large a small-scale farmer driven production sector, in the quest for sustainable development, reducing poverty and improving food security on a global scale. (Room F506, Aquaculture Management and Conservation Service, Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Rome, Italy; email of Rohana Subasinghe: rohana.subasinghe@fao.org)

FISH OIL REPLACEMENT IN FINFISH NUTRITION

Giovanni M. Turchini, Bente E. Torstensen, Wing-Keong Ng-2009

Reviews in Aquaculture 1(1): 10 – 57

Abstract:

Unsustainable fishing practices have placed a heavy emphasis on aquaculture to meet the global shortfalls in the supply of fish and seafood, which are commonly accepted as the primary source of health-promoting essential omega-3 (n-3 highly unsaturated fatty acids). However, dietary fish oil is required for the production of omega-3-rich farmed fish and this commodity, in a vicious circle, is at present derived solely from wild fisheries. Decreasing global availability coupled with the highly variable price of this resource has forced the aquaculture industry to investigate the possibilities of alternative dietary lipid sources. This review attempts to compile all principal information available regarding the effects of fish oil replacement for the diets of farmed finfish, analysing the findings using a comparative approach among different cultured fish species. The review initially focuses on the present situation with regard to the production, availability and main nutritional characteristics of fish oil and the principal alternative lipid sources (such as vegetable oils and animal fats). Following this, the effects of fish oil replacement in finfish nutrition on feed quality, fish performance, feed efficiency, fish lipid metabolism, final eating quality and related economic aspects are presented and discussed.

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METHODS FOR REDUCING STRESSORS AND MAINTAINING WATER QUALITY ASSOCIATED WITH LIVE FISH TRANSPORT IN TANKS: A REVIEW OF THE BASICS

Todd S. Harmon-2009

Reviews in Aquaculture 1(1): 58 – 66

Abstract:

Fish culture operations, public aquariums, fish biologists and aquatic researchers often have the need to transport live fish. These fish are frequently transported in live-haul boxes by ground transportation. Activities involved with transporting fish, such as handling, confinement and exposure to sub-optimal water quality, have the potential to create physiological changes in the fish because of increased stress. Because of the affiliation between stress and fish health, it is important to minimize

the amount of potential stressors as well as to minimize the duration of exposure to stressors during these procedures. Furthermore, understanding aberrant environmental conditions and how they affect fish often leads to establishing new protocols that reduce stress. Increased survival rates and the arrival of healthy fish are dependent on transport and on the pre-handling and post-handling procedures associated with fish-hauling operations.

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EXPLORING THE NUTRITIONAL DEMAND FOR ESSENTIAL FATTY ACIDS BY AQUACULTURE SPECIES

Brett D. Glencross-2009

Reviews in Aquaculture 1(2): 71 – 124

Abstract:

Essential fatty acids (EFA) remain one of the least well-understood and enigmatic nutrients in aquaculture nutrition. Of all dietary nutrients none has a greater direct impact on the composition of its consumer. Their importance stems not only to their impact on animal growth, but also to factors such as reproduction, immunity and product quality. Docosahexaenoic acid (DHA; 22:6n-3) has consistently been shown to provide the greatest EFA value to most species. However, the nutritional value of eicosapentaenoic (EPA; 20:5n-3) and arachidonic (ARA; 20:4n-6) acids has also been significantly greater than that exhibited by linolenic (LNA; 18:3n-3) and linoleic (LOA; 18:2n-6) acids. All five fatty acids have been shown to provide EFA value to most aquaculture species, although the optimal dietary inclusion levels and balance among the fatty-acid classes (n-3 and n-6) and fatty-acid chain lengths (18-C, 20-C or 22-C) vary among species. Environmental origin (freshwater, estuarine or marine) appears to be a primary factor influencing the difference in EFA requirements. The role that EFA play in osmoregulation clearly shows how these nutrients affect animals from different aquatic environments. The influence of EFA on growth also appears to be greatest in larval fish and crustaceans, possibly because of their reduced ability to digest and absorb lipids, but also because of a proportionally higher demand for EFA in the development of, in particular, neural tissues. Despite an abundance of research since the 1970s on the EFA requirements of aquaculture species there remains a need to better define the EFA requirements of most aquaculture species. Of all major aquaculture species only the penaeid shrimp has a comprehensively documented assessment of its nutritional requirements for EFA. The nutritional requirements for EFA in most fish species have not been comprehensively studied and those species that were fully examined in the 1970s and 1980s now need to be reassessed in light of recent changes to the use of high-nutrient-density diets that were not routinely used in either practice or research during that earlier period. In addition to changes in dietary specification strategies, declining dependence on marine-origin lipid sources in recent years has placed an increased imperative on understanding the dietary need for long-chain polyunsaturated fatty acids (lcPUFA). As aquaculture continues to grow there will be an increased use of alternative lipid resources, such as grain, algal and rendered oils, to provide dietary lipids. In addition to dietary dilution of natural EFA sources through the use of these raw materials, they will also bring new challenges, such as increased levels of n-6 and 18-C polyunsaturated fatty acids (PUFA). Introduction of these n-6 and PUFA fatty acids to the diet of aquaculture species will not only influence the nutritional demands of these animals, but will also affect their flesh quality characteristics by reducing their level of n-3 lcPUFA. This dilemma will demand an increased prioritisation on the value of lipid sources rich in n-3 lcPUFA, but is also likely to stimulate the development of alternative sources of lcPUFA.

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