
INFORMATION OF INTEREST

The importance of fish and DHA in Alzheimer disease – [Am. J. Clinical Nutrition 2007](#)

Profet Policy workshop “Coldwater Marine Aquaculture Workshop, Bergen (Norway), March 15-16 2007: [presentations](#)

Soy in aquaculture [newsletter](#): info on the use of soybean products in the aquaculture industry

[Speech](#) of U.S. Secretary of Commerce at the International Boston Seafood Show, March 12, 2007

2007 USA National Offshore [Aquaculture Act](#)

[e-Newsletter](#) The FishSite Latest News

Technical efficiency of prawn farms in the Mekong Delta, Vietnam: [conference paper](#) by Do Thi Den et al., 2007

The Biofloc Workgroup of the Aquacultural Engineering Society has a new [website](#) with several conference presentations (San Antonio 2007, Firenze 2006, Las Vegas 2006 and Roanoke 2006)

Feed Technology Update April 2007 – [free electronic newsletter](#)

EFFECTS OF INLET AND OUTLET FLOW CHARACTERISTICS ON MIXED-CELL RACEWAY (MCR) HYDRODYNAMICS

Rodrigo A. Labatut, James M. Ebeling, Rajesh Bhaskaran, Michael B. Timmons-2007

Aquacultural Engineering 37(2): 158-170

Abstract:

A series of experimental trials were conducted in a large-scale (5.5 m × 16.5 m × 1.2 m) mixed-cell raceway (MCR) to evaluate the effect of nozzle diameter and the rate of bottom-center drain discharge on the magnitude and uniformity of water velocities in the mixed-cell. Three nozzle diameters, 10, 15, and 20 mm, and three bottom-center flows, 0, 15, and 20% of the system flow rate (64–257 m³/h), were evaluated. Measurements of water velocities in the mixed-cell were made at 5 cm from the bottom of the tank. While the nozzle diameter was found to have a highly significant influence ($p < 0.01$) on the magnitude of the water velocities, the percentage of bottom flow did not ($p > 0.05$). Also, results suggested that uniformity of water velocities in terms of the radial-wise profile is not affected by either the nozzle diameter or the percentage of bottom flow.

This study indicates that the flux of momentum is the driving force controlling water velocities in a jet-forced circulation vessel, and therefore jet velocity and nozzle diameter become the main variables to control. It was found that the linear influence of the jet velocity on water velocities reported in previous studies remained valid provided that the nozzle diameter was maintained constant. An equation to predict water velocities of the mean rotating flow was derived from the flux of momentum approach and a set of iso-curves was constructed to predict water velocities as a function of the jet velocity and nozzle diameter. The iso-curves, or directly, the equation derived, can be used to facilitate the design of a MCR where a particular water velocity is desired.

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OZONATION FOLLOWED BY ULTRAVIOLET IRRADIATION PROVIDES EFFECTIVE BACTERIA INACTIVATION IN A FRESHWATER RECIRCULATING SYSTEM

Mark J. Sharrer, Steven T. Summerfelt-2007

Aquacultural Engineering 37(2): 180-191

Abstract:

Recirculating aquaculture systems may require an internal disinfection process to control population growth of pathogens and heterotrophic bacteria. Ozonation and ultraviolet (UV) irradiation are two technologies that have been used to treat relatively large aquaculture flows, including flows within freshwater systems that recirculate water. The objective of the present study was to evaluate the effectiveness of ozone application alone or ozone application followed by UV irradiation to reduce abundance of heterotrophic and total coliform bacteria in a water reuse system. Results indicate that when only ozone was applied at dosages – defined by the product of the ozone concentration times the mean hydraulic residence time (Ct) – that ranged from 0.10 to 3.65 min mg/L, the total heterotrophic bacteria counts and total coliform bacteria counts in the water exiting the contact basin were reduced to, respectively, 3–12 cfu/mL (1.1–1.6 LOG₁₀ reduction) and 2–18 cfu/100 mL (1.9–3.1 LOG₁₀ reduction). Bacteria inactivation appeared to be just as effective at the lowest ozone ct dosage (i.e., 0.1 mg/L ozone after a 1 min contact time) as at the highest ozone ct dosage (i.e., 0.2 mg/L ozone after a 16.6 min contact time). As with our previous research on UV inactivation of bacteria, we hypothesize that the recirculating system provided a selection process that favors bacteria that embed within particulate matter or that form bacterial aggregates that provides shielding from oxidation. However, when ozonation was followed by UV irradiation, the total heterotrophic bacteria counts and total coliform bacteria counts in the water exiting the UV irradiation unit were reduced to, respectively, 0–4 cfu/mL (1.6–2.7 LOG₁₀ reduction) and 0–3 cfu/100 mL (2.5–4.3 LOG₁₀ reduction). Thus, combining ozone dosages of only 0.1–0.2 min mg/L with a UV irradiation dosage of approximately 50 mJ/cm² would consistently reduce bacteria counts to near zero. These findings were orders of magnitude lower than the bacteria counts measured in the system when it was operated without disinfection or with UV irradiation alone. These findings indicate that combining ozonation and UV irradiation can effectively disinfect recirculating water before it returns to the fish culture tank(s).

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THE HUSBANDRY OF ZEBRAFISH (DANIO RERIO): A REVIEW

Christian Lawrence-2007

Aquaculture 269(1-4): 1-20

Abstract:

The zebrafish (*Danio rerio*) has recently emerged as a pre-eminent vertebrate biomedical research model. The same favorable characteristics that have contributed to its popularity as a model of human disease and development; i.e. high fecundity, small size, rapid generation time, optical transparency during early embryogenesis, have also long endeared it to investigators in numerous other disciplines, including animal behavior, fish physiology, and aquatic toxicology. Despite this, the scientific rigour of zebrafish husbandry techniques is poorly developed. While there is a considerable body of literature on zebrafish that has both direct and indirect relevance to their husbandry, this information is from disparate sources,

and little of it is has been applied to developing standard protocols. This review is an attempt to integrate the available scientific information related to zebrafish biology and culture into an overview of the field that can be used to improve the efficiency with which this important model animal is used in research. The review also highlights those areas in which further studies are needed.

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INGESTION RATE OF POSTLARVAE PENAEUS MONODON FED APOCYCLOPS DENGIZICUS AND ARTEMIA

Omidvar Farhadian, Fatimah Md. Yusoff, Aziz Arshad-2007

Aquaculture 269(1-4): 265-270

Abstract:

Three different live diets including; Apocyclops copepodids, Artemia nauplii, and combination of Apocyclops copepodids and Artemia nauplii were offered to two groups of Penaeus monodon larvae viz PL3–6 and PL9–12. The prey diets were offered to each group at three density levels (6, 13 and 20 µg dry weight/ml). The results showed that PL3–6 P. monodon larvae consumed Apocyclops copepodids (CII–CIV) at 5.1–14.3 ind./day, the Artemia nauplii at 18.4–39.2 ind./day, and mixture of Apocyclops and Artemia at 12.2–41.5 ind./day. Similarly, PL9–12 P. monodon larvae ingested Apocyclops at 12.6–51.7 ind./day, Artemia at 62.4–101.6 ind./day, and their mixture at 48.0–65.3 ind./day. This study indicated that P. monodon larvae, at PL3–6 and PL9–12, can ingest Apocyclops selectively better than Artemia at 1:1 ratio as shown by the improved body dry weight of the larvae.

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EFFECTS OF FORMALDEHYDE, SODIUM CHLORIDE, POTASSIUM PERMANGANATE AND HYDROGEN PEROXIDE ON HATCH RATE OF AFRICAN CATFISH CLARIAS GARIEPINUS EGGS

Joseph Rasowo, Oyoo Elijah Okoth, Charles Chege Ngugi-2007

Aquaculture 269(1-4): 271-277

Abstract:

A study evaluating the effects of formaldehyde, sodium chloride, potassium permanganate and hydrogen peroxide treatment on the hatching success of *C. gariepinus* eggs was carried out from April to July 2006. Eggs were artificially fertilized, 50 counted and subjected to a static bath dip treatment in given concentrations of the above chemicals for either 15, 30 or 60-minute durations before being incubated at 27 ± 1 °C for 24 h. Treatment efficacy was assessed by comparing the percent egg hatch in the treatment group to the untreated control group. Eggs treated with formaldehyde and sodium chloride at 250, 500 and 1000 ppm recorded greater mean percent hatch compared to the untreated controls. Likewise, percent hatch of eggs treated with hydrogen peroxide and potassium permanganate at concentrations ranging from 100–1000 ppm and 0.5–4.0 ppm respectively were greater relative to the untreated controls. The highest mean percent hatch recorded in the study was in eggs treated with 2 ppm potassium permanganate for 30 min (96.7%). Although formaldehyde and potassium permanganate gave the best performance, on the basis of safety concerns, ease of availability and cost, we recommend 1000 ppm sodium chloride treatment of catfish eggs for routine use by rural fish farmers to improve catfish egg hatchability.

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LIVE FEED AS SUPPLEMENT FROM THE ONSET OF EXTERNAL FEEDING OF JUVENILE SIGNAL CRAYFISH (*PACIFASTACUS LENIUSCULUS* DANA, ASTACIDAE) UNDER CONTROLLED CONDITIONS

M. Sáez-Royuela, J.M. Carral, J.D. Celada, J.R. Pérez, A. González-2007

Aquaculture 269(1-4): 321-327

Abstract:

Two 100-day experiments were carried out under controlled conditions in order to evaluate the effects of different combinations of a dry diet supplemented with live feed on survival and growth of juvenile *Pacifastacus leniusculus* Dana juveniles from the onset of external feeding. In the first experiment, juveniles were subjected to five feeding and density conditions: a dry diet for rainbow trout (D) with a density of 50 animals m⁻², the same dry diet supplemented with *Artemia nauplii* for 20, 60 or 100 days (50 m⁻²) and D supplemented with *Artemia nauplii* for 100 days at a density of 200 m⁻². When juvenile crayfish did not receive live feed supplement, mean survival rate (11.33%) and growth were significantly lower. The highest survival rates were obtained when nauplii were added for 100 days (57.83% and 57.33%). Survival rates in the two densities were similar but growth was significantly higher at the lowest one. When the period of supplementation was reduced to 20 or 60 days, survival rates decreased significantly. In experiment 2, amount and frequency of *Artemia* supply were increased and freshwater zooplankton (*Daphnia pulex*) was used as supplement of D. An increased frequency (three times a week) and amount of live food supply led to high survival rates (up to 82%) and growth (Carapace length: 11.79 mm, Weight: 360.16 mg). From these results it can be deduced that live feed can be the source of some nutritional factors needed for astacid juvenile crayfish from the onset of external feeding to guarantee the viability during the first months of life.

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PARENTAL AND STOCK EFFECTS ON LARVAL GROWTH AND SURVIVAL TO METAMORPHOSIS IN WINTER FLOUNDER (*PSEUDOPLEURONECTES AMERICANUS*)

Ian A.E. Butts, Matthew K. Litvak-2007

Aquaculture 269(1-4): 339-348

Abstract:

Geographically separated winter flounder (*Pseudopleuronectes americanus*) populations in the northwest Atlantic Ocean are both phenotypically and genetically distinct from one another. This has important implications for winter flounder aquaculture with respect to broodstock selection; however, few studies have investigated the effect of population on larval growth and survival in a hatchery setting. In this study, eggs from Passamaquoddy Bay females were fertilized with sperm from Georges Bank and Passamaquoddy Bay males. Larvae were reared in common environmental conditions to evaluate population and parental contributions to variations in growth, and survival during early life history. Mixed-model nested ANOVAs revealed that larvae sired by Georges Bank males were significantly larger with respect to standard length, eye diameter, head depth, and jaw length during certain stages in larval development. Maternal, paternal, and parental interactions all contributed to morphological variation in developing larvae. Survival was strongly influenced by the paternal variance component. These results have two major implications: 1) they provide further supporting evidence that Georges Bank winter flounder are genetically selected for faster growth than larvae from inshore stocks, and 2) they suggest that aquaculture operations should also account for paternal variation so that the best broodstock can be selected for production.

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EFFECTS OF CHANGES IN SALINITY AND TEMPERATURE ON SURVIVAL AND DEVELOPMENT OF LARVAE AND JUVENILES OF THE CRUCIFIX CRAB CHARYBDIS FERIATUS (CRUSTACEA:DECAPODA:PORTUNIDAE)

Juliana Baylon, Hiroshi Suzuki-2007

Aquaculture 269(1-4): 390-401

Abstract:

An experiment was carried out to determine the effects of changes in temperature and salinity on the survival and development of the larvae (zoea, megalopa) and crab instar 1 (C1) juveniles of the crucifix crab, *Charybdis feriatus*. Larvae and juveniles in each stage of development were reared at various salinity and temperature combinations: four salinities of 15, 25, 35 and 45‰ for each of the 5 zoea stages, five salinities of 5, 15, 25, 35, 45‰ for the megalopa and six salinities of 0, 5, 15, 25, 35, 45‰ for the C1 juveniles, at temperatures of 20, 26 and 32 °C. Results showed that both salinity and temperature significantly affected survival of larvae and juveniles and there was a significant interaction between salinity and temperature. There was generally high survival of zoea and megalopa at 25, 35‰ in 26, 32 °C and of C1 at 25‰ in 20, 26, 32 °C. Salinity and temperature also affected onset of development and duration of molt. There was rapid and synchronous development at 25 and 35‰ but delayed and extended at 45‰. With decreasing temperature, there was a delay in the start of development and duration of molt was prolonged. Larvae and juveniles did not survive in 15‰ even with 6 h of acclimation while larvae survived at 45‰ during abrupt and gradual transfer. The optimum salinity–temperature combination recommended for the larval and nursery rearing of *C. feriatus* is 25–35‰ at 26–32 °C.

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SURVIVAL, DEVELOPMENT AND GROWTH RESPONSE OF MUD CRAB, SCYLLA SERRATA, MEGALOPAE FED SEMI-PURIFIED DIETS CONTAINING VARIOUS FISH OIL:CORN OIL RATIOS

May-Helen Holme, Paul C. Southgate, Chaoshu Zeng-2007

Aquaculture 269(1-4): 427-435

Abstract:

This study was conducted to determine the optimum fish oil:corn oil ratio in semi-purified diets formulated for mud crab, *Scylla serrata*, megalopae. Six iso-energetic microbound diets (MBD) containing 6% total lipid were formulated to contain fish oil and corn oil either singly or in various ratios (0:1, 1:2, 2:1, 3:1, 1:0, 1:1), and each dietary treatment consisted of 20 individually reared megalopae. Survival, growth, development time to the first crab stage and signs of molting death syndrome (MDS) were recorded on a daily basis, and carapace width and dry weight of newly molted crabs were measured immediately after molt. Megalopae from all dietary treatments successfully molted into C1; however, best survival (70%) was achieved by megalopae fed MBD containing a fish oil:corn oil ratio of 1:1. Megalopae fed MBD containing fish oil:corn oil ratios of 3:1 and 1:0 showed survival of 65%, while survival of megalopae fed either live *Artemia* or MBD containing a fish oil:corn oil ratio of 2:1 was 60%. Lower survival (55% and 35%) was recorded for megalopae fed MBD with fish oil:corn oil ratios of 1:2 and 0:1, respectively. Significantly greater mean carapace width (3.51 ± 0.03 mm) and significantly higher mean dry weight (2.14 ± 0.14 mg) were recorded for crabs molting from megalopae fed live *Artemia* compared to those resulting from megalopae fed MBD. Megalopa fed *Artemia* also had the fastest mean development time (6.8 ± 0.5 days), but this was not significantly greater than development times for megalopae from any of the MBD treatments. Results from this study indicate that corn oil can be used to partially substitute fish oil in MBD formulated for mud crab megalopae, and that the optimal fish oil:corn oil ratio is around 1:1 when oil is supplied at a level of 6% of total diet dry weight. The study further showed that complete replacement of fish oil with corn oil in the formulated

diet resulted in a high occurrence of MDS-related mortality, indicating an essential dietary requirement for > C18 highly unsaturated fatty acids (HUFA), and a link between HUFA availability and the occurrence of MDS.

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GROWTH, SURVIVAL AND FATTY ACID COMPOSITION OF MACROBRACHIUM ROSENBERGII (DE MAN, 1879) POST LARVAE FED HUFA-ENRICHED MOINA MICRURA

S.K. Das, V.K. Tiwari, G. Venkateshwarlu, A.K. Reddy, J. Parhi, P. Sharma, J.K. Chettri-2007

Aquaculture 269(1-4): 464-475

Abstract:

A 60-day experiment was conducted to investigate the effects of enrichment on fatty acid composition of *Moina micrura* through lipid emulsions containing highly unsaturated fatty acids and to study the impact of HUFA-enriched *Moina* on growth, survival and fatty acid composition of post larvae of giant freshwater prawn *Macrobrachium rosenbergii*. Enrichment was done in three differently prepared emulsions containing sunflower oil, cod liver oil and MaxEPA capsules (commercially available) as sources of lipid. The feeding trial to post larvae was conducted using three replicates of four treatments which were fed with three different types of HUFA-enriched *Moina* and un-enriched *Moina* (control). The prepared emulsions were found efficient in enriching *Moina* by increasing the level of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) up to a maximum of $7.31 \pm 0.07\%$ and $2.17 \pm 0.03\%$, respectively. Growth rates of post larvae increased (maximum specific growth rate = 3.60 ± 0.02) with increased amount of eicosapentaenoic acid and docosahexaenoic acid (HUFA) in dietary *Moina*. Survival increased (maximum survival = 80.00 ± 1.65) as the amount of EPA and DHA increased in the respective dietary *Moina*. HUFA-enriched *Moina* showed good effect on the fatty acid composition of *M. rosenbergii* post larvae with respect to EPA and DHA. EPA percentage in post larvae ranged from $7.82 \pm 0.13\%$ (in control) to a maximum of $14.94 \pm 0.17\%$ (in MaxEPA group). DHA percentage showed similar trend ranging from $2.45 \pm 0.14\%$ (in control) to $7.63 \pm 0.19\%$ (in MaxEPA group). The present study indicates that, like in other live feeds, the nutritional quality of *Moina* in relation to fatty acids can also be increased by enrichment which can influence the growth, survival and fatty acid composition of post larvae of freshwater prawn.

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ENRICHMENT OF ARTEMIA NAUPLII IN VITAMIN A, VITAMIN C AND METHIONINE USING LIPOSOMES

Óscar Monroig, Juan Carlos Navarro, Francisco Amat, Francisco Hontoria-2007

Aquaculture 269(1-4): 504-513

Abstract:

Several types of liposomes were used to enrich *Artemia nauplii* in vitamin A, vitamin C and free methionine. In a first experiment, unilamellar liposomes formulated with krill phospholipid extract and retinyl palmitate demonstrated their capability to enhance the retinol content of *Artemia nauplii*. Furthermore, the increase in retinol was related to the amount of retinyl palmitate included in the liposomes as vitamin A source. These findings yield the possibility of using such vesicles to bioencapsulate simultaneously both vitamin A and essential fatty acids present in the krill phospholipid extract. A second enrichment was carried out with unilamellar liposomes composed of soybean phosphatidylcholine and loaded with sodium ascorbate as vitamin C source. Our results did not show that vitamin C content in the

nauplii could be increased using unilamellar liposomes. This was most likely due to the degradation of the vitamin C during enrichment as well as the ascorbate leakage. Finally, a third experiment assessed enrichment in free methionine using liposomes of different lamellarity (unilamellar or multilamellar) and composed of either soybean phosphatidylcholine or dipalmitoyl phosphatidylcholine, both combined with cholesterol as a membrane stabilizer. Results indicated that multilamellar liposomes represent a useful tool to deliver methionine to *Artemia nauplii*. Enhanced protection given by their multiple bilayers in comparison to unilamellar liposomes could account for the higher ability displayed by multilamellar vesicles for free methionine bioencapsulation.

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GROWTH OF THE HATCHERY-PRODUCED JUVENILES OF COMMERCIAL SEA CUCUMBER HOLOTHURIA (THEELOTHURIA) SPINIFERA THEEL

P. S. Asha, P. Muthiah-2007

Aquaculture Research 38 (10): 1082–1087.

Abstract:

The present study was conducted to develop the hatchery technology for seed production of the widely exploited commercial sea cucumber *Holothuria spinifera* Theel 1886, to facilitate an effective stock enhancement programme. Broodstock collected by skin divers were used for spawning trials. The embryonic and larval stages were similar to other aspidochirotetes. The larval survival rate was 43.5% on day 9, which decreased to 18.3% nearing metamorphosis on day 13, the growth rate was 48 $\mu\text{m day}^{-1}$ and the settlement rate was 3.5%. Algamac® used to induce settlement also served as the food source for the early settled juveniles, followed by *Sargassum* spp. extract (<40 μm) for the first month. *Sargassum* spp. powder along with fine sand (1:1) was given to juveniles >20 mm. Addition of *Spirulina* spp. along with *Sargassum* spp. powder and fine sand (0.5:1:2) enhanced the growth rate of the juveniles. In the hatchery, the juveniles attained an average size of 1, 30 and 48 on 20, 80 and 120 days respectively.

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MASS CULTURE OF FAIRY SHRIMP STREPTOCEPHALUS PROBOSCIDEUS (CRUSTACEA - ANOSTRACA) AND ITS USE IN LARVICULTURE OF THE PERSIAN STURGEON, ACIPENSER PERSICUS

Imanpour Namin, J. Uma Arshad, Zohreh Ramezanpoor-2007

Aquaculture Research 38 (10): 1088–1092

Abstract:

This study was conducted with cysts of *Streptocephalus proboscideus* obtained from the University of Gent-Belgium. The cysts were hatched in Environmental Protection Agency (EPA) medium. The nauplii were reared at the Sturgeon Research Institute using a pure culture of *Scenedesmus obliquus* alga supplied at a density of 5×10^3 cell mL⁻¹ that gradually increased to 1×10^4 , 5×10^4 and 1×10^5 cell mL⁻¹ with the growth of the nauplii. The nauplii attained sexual maturity and started producing cysts in 8 days and yielded a mean cyst number of 220 ± 40 female¹ brood¹ cysts. These cysts were used in the larviculture of Persian sturgeon, *Acipenser persicus* (Borodin). Forty-three larvae of Persian sturgeon (mean weight: 15.4 ± 1.1 mg; mean length: 27.1 ± 2.7 mm) with roughly absorbed yolk sacs were stocked in three aquaria and fed *S. proboscideus* nauplii at 8-h intervals. By the end of the experiment (day 5), the mean weight and length of Persian sturgeon larvae were 51.4 ± 13.3 mg and 20.7 ± 1.4 mm respectively.

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MIXIS IN ROTIFERS OF THE LINEAGE 'NEVADA', BELONGING TO THE BRACHIONUS PLICATILIS SPECIES COMPLEX, UNDER DIFFERENT FEEDING REGIMES

Venetia Kostopoulou, Helen Miliou, Yukiko Krontira, George Verriopoulos-2007
Aquaculture Research 38 (10): 1093–1105.

Abstract:

A strain of *Brachionus* 'Nevada', which belongs to the *Brachionus plicatilis* species complex, and is commonly found in European hatcheries, was investigated in terms of its mixis potential. Two feeding regimes used for mass culturing were employed. Rotifer populations were fed on phytoplankton (*Tetraselmis suecica*) and either baker's yeast, *Saccharomyces cerevisiae* (treatments A) or Culture Selco® (treatments B). In order to promote mixis, the salinity of the culture medium was reduced from 40 to 20 g L⁻¹. Indeed, the rotifer populations of lower salinity (A 20, B 20) showed a twofold increase in mixis rates compared with those of higher salinity (A 40, B 40). In addition, treatment A 20 showed significantly higher levels of mixis (22.59±2.07%) compared with B 20 (16.56±1.46%). The opposite trend was observed for the parthenogenetic growth rates (A 20: 0.46±0.01; B 20: 0.62±0.01). It is thus concluded that Culture Selco leads to a higher abundance of amictic ovigerous females, whereas yeast supports a higher abundance of males and mictic females carrying resting eggs. The two types of feeding regimes can be used for different purposes in a hatchery.

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ASSOCIATION BETWEEN BACTERIAL COMMUNITY STRUCTURES AND MORTALITY OF FISH LARVAE IN INTENSIVE REARING SYSTEMS

Gentoku Nakase, Yoshizumi Nakagawa, Shigeru Miyashita, Toshiro Nasu, Shigeharu Senoo, Hiroko Matsubara, Mitsuru Eguchi-2007
Fisheries Science 73(4): 784–791.

Abstract:

Bacterial community structures were analyzed in water used for rearing fish larvae by fluorescence in situ hybridization. In Experiment 1, red sea bream *Pagrus major* larvae were reared in two commercial seed production tanks. The survival rate in Tank 1 was higher than in Tank 2, even though phytoplankton, *Nannochloropsis* sp., was added to both tanks. In Tank 2, γ -proteobacteria became dominant (70% of total bacteria) on day 13, thereafter heavy larval mortalities occurred. In Tank 1, however, α -proteobacteria and the *Cytophaga*–*Flavobacterium* cluster were predominant from day –1 until day 13; no significant mortality was recorded. In Experiment 2, marble goby *Oxyeleotris marmoratus* larvae were cultured with or without *Nannochloropsis* sp. At the end of the experiment, larval survival rates in aquaria with *Nannochloropsis* sp. were significantly ($P < 0.05$) higher than those without. In rearing water without *Nannochloropsis* sp., γ -proteobacteria increased during rearing. In rearing water with *Nannochloropsis* sp., α -proteobacteria and the *Cytophaga*–*Flavobacterium* cluster were predominant at the beginning of the experiments and the relative abundance of γ -proteobacteria was maintained at a lower level throughout the experiments. The predominance of α -proteobacteria and the *Cytophaga*–*Flavobacterium* cluster appears to be a good indicator of successful larval production.

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PARENTAGE TESTING FOR HATCHERY-PRODUCED ABALONE HALIOTIS DISCUS HANNAI BASED ON MICROSATELLITE MARKERS: PRELIMINARY EVALUATION OF EARLY GROWTH OF SELECTED STRAINS IN MIXED FAMILY FARMING

Motoyuki Hara, Masashi Sekino-2007

Fisheries Science 73 (4): 831–836.

Abstract:

This study dealt with the detection of parentage in a mixed family tank of abalone *Haliotis discus hannai* using microsatellite DNA markers. As a preliminary investigation, the early growth rate between selected and non-selected abalone families, which were reared together in the mixed family tank from settlement stage to juvenile stage (7 months of age), was also compared. The selected families were derived from seven parents (three females and four males) selected for larger size in shell length at about 1-year-old, and the non-selected families originated from five wild captives (three females and two males). Parentage analysis based on eight microsatellite markers unambiguously allocated the 170 juveniles sampled from the single tank to the 17 parental pairs. The family size was highly heterogeneous among families, as two males in the selected families and one male in the non-selected families dominated the contribution to the offspring pool (>80%). The mean shell length of the selected families was approximately 23% larger than that of the non-selected families (Student's t-test, $P < 0.001$). This study demonstrated that the use of microsatellite markers is effective for parentage determination in the mixed family farming commonly used in abalone hatcheries, and selective operations for larger size could improve the growth of the next generation.

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EFFECT OF INTRODUCING WILD PATERNITY ON STOCK PERFORMANCE OF HATCHERY-REARED AYU

Kei'ichiro Iguchi, Minoru Mogi-2007

Fisheries Science 73 (4): 845–850.

Abstract:

The domestication of ayu *Plecoglossus altivelis*, in which breeding has been carried out for multiple generations without the introduction of exotic broodstock (purebred-styled cultivation), causes rapid loss of genetic variability, and is problematic for resource management programs. The introduction of wild paternity to enhance genetic variability was examined for its effects on the performance of the newly hybridized stock using the Gunma population (hatchery strain), which has been inbred for 29 generations since its origin. Principal component analysis showed that hybridization could modify the stock performance, moderately affecting behavior and morphometrics. Reinforcement of aggressiveness as well as transformation to a long-nosed shape in the hybrid population contributed revised performance that was acceptable to sports fishers as an artificial stock. To reduce genetic stress for native ayu populations, the introduction of wild paternity is proposed through sperm from wild caught specimens to hybridize with eggs from the pure-bred hatchery population.

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IMPROVEMENT OF LARVAL REARING TECHNIQUE FOR MASS SEED PRODUCTION OF SNOW CRAB *CHIONOECETES OPIILIO*

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Abstract:

Larval rearing experiments were conducted to examine the potential for mass seed production of the snow crab *Chionoecetes opilio* using a total of eight 20-kL tanks. Tanks were equipped with agitators, which move the water using a rectangular blade to prevent the zoeas sinking to the bottom of the tank. Larval rearing water was treated with sodium nifurstyrenate once a week to reduce the chance of larval infection by pathogenic bacteria. Zoeas were fed with rotifers and *Artemia* nauplii. A total of 122 830 megalops and 16 660 first-stage crabs were produced. Thus, the potential for mass seed production of snow crab was determined. Survival rates up to the megalopal stage were high in tanks with a feeding regime that fed rotifers to larvae through an entire zoeal stage. This study also describes the fatty acid composition of snow crab larvae. It revealed that the first zoeas had a high DHA content and DHA/EPA ratio, but these values significantly decreased in the second stage zoeas and megalops. Improving the DHA content and/or DHA/EPA ratio of larvae should be important in studies on mass seed production technology of the snow crab.

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