

LARVAL SETTLEMENT OF THE TROPICAL ABALONE, HALIOTIS ASININA LINNAEUS, USING NATURAL AND ARTIFICIAL CHEMICAL INDUCERS

Praphaporn Stewart, Nantawan Soonklang, Michael J. Stewart, Chaitip Wanichanon, Peter J. Hanna, Tanes Poomtong, Prasert Sobhon-2008

Aquaculture Research 39(11): 1181 – 1189

Abstract:

Many kinds of chemical and biological materials have been used as inducers of settlement of abalone larvae, as well as other species of marine gastropods, with responses being highly variable, even to the same chemical cue. The present study tested chemical inducers, γ -aminobutyric acid (GABA), δ -aminovaleric acid (5-AVA) and l-glutamic acid (GA) and the effects they have on larval settlement of *Haliotis asinina*. Additionally, a relatively inexpensive commercial substance, monosodium glutamate (MSG), was trialed. The datum provided shows all chemicals to be active inducers of settlement in this study, in order of effectiveness of 5-AVA, GABA, MSG to GA. Induction as adjudged from larval numbers settled was best at 6 h 62%, with 10–1 mM 5-AVA. At 24 h, induction was the highest at 78% when exposed to 10–2 mM 5-AVA. Larvae that were allowed to settle up to 72 h showed the highest numbers of settled larvae, and declined back to 60% when exposed to 10–2 5-AVA and 10–1 mM GABA respectively. Monosodium glutamate, although third in settlement standings would bypass the other chemicals, with regard to cost versus yield. The assessment of settlement surface, rough or smooth proved to be irrelevant, which had no significant impact on larval settlement.

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CHANGES IN LIPID CONTENT, FATTY ACID COMPOSITION AND LIPID CLASS COMPOSITION OF EGGS AND DEVELOPING LARVAE (0–40 DAYS OLD) OF CULTURED COMMON DENTEX (*DENTEX DENTEX LINNAEUS 1758*)

G. Giménez, A. Estévez, R.J. Henderson, J.G. Bell-2008

Aquaculture Nutrition 14 (4): 300 – 308

Abstract:

Total lipid content, fatty acid (FA) composition and lipid class composition of common dentex eggs spawned at different times and larvae reared under different culture conditions until 40 days posthatch (dph) were analysed to get a general pattern of lipid composition during larval development. Two groups of larvae were kept under starvation to compare their FA composition with that obtained from normally fed larvae. To compare FA use or accumulation during larval development, results were grouped according to the developmental stage of the larvae instead of age in days posthatch. Saturated and monounsaturated FAs decreased along larval development, while polyunsaturated fatty acid (PUFA) content increased. The ratio of docosahexaenoic acid (DHA)/eicosapentaenoic acid shifted from 4 to 5 in early developmental stages to lower than 1 after metamorphosis. Arachidonic acid levels remained constant along larval development. Larvae kept 6 days under starvation consumed most of their n-3 PUFA while conserving the DHA to values at day 0. The results presented here are useful for the design of nutritional experiments, because there were differences detected in terms of lipid and FA composition between developmental stages with higher differences mainly found in first-feeding larvae and early developmental stages.

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EVALUATION OF STREPTOCEPHALUS DICHOTOMUS NAUPLII AS A LARVAL DIET FOR FRESHWATER PRAWN MACROBRACHIUM ROSENBERGII

C.S. Velu, N. Munuswamy-2008

Aquaculture Nutrition 14 (4) : 331 – 340

Abstract:

This study was performed to assess the nutritional value of *Streptocephalus dichotomus* nauplii and compared with standard larval diet and parthenogenetic strain of *Artemia nauplii*. The effectiveness of live feed was determined by feeding freshwater prawn *Macrobrachium rosenbergii* postlarvae. Results on the growth rate, weight gain, survival, fatty acid and amino acid composition show a significant variation between the dietary treatments. Mean larval growth was significantly different ($P < 0.001$) between control diet (13.5 ± 0.5 mm) and live feeds (*Streptocephalus nauplii*; 18.4 ± 0.5 mm and *Artemia nauplii* 18.7 ± 0.2 mm). The weight of larvae-fed *Streptocephalus* (41.1 ± 1.44 mg) and *Artemia nauplii* (41.7 ± 0.2 mg) was not significantly different; however, treatment with live feeds was significantly higher than the control (16.3 ± 0.5 mg) ($P < 0.001$). Proximate composition on the fairy shrimp reveals that they are rich in protein, lipid, essential amino acids (EAA) and essential fatty acids (EFA). The polyenoic unsaturated fatty acid (18 : 2 n-6 and 18 : 3 n-3) and highly unsaturated fatty acid (20 : 4 n-3 and 20 : 5 n-3) show a dramatic increase in larval tissue relative to its proportional composition in the live diets. Amino acid composition in the live feeds, *Streptocephalus* and *Artemia nauplii*, perfectly reflects on the amino acid proportions in the larvae-fed diets which confirm its utilization.

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OVIPOSITIONAL BEHAVIOUR OF THE SWIMMING CRAB, *PORTUNUS TRITUBERCULATUS* (MIERS, 1876) (DECAPODA, PORTUNIDAE): IMPLICATIONS FOR BROODSTOCK MANAGEMENT IN A HATCHERY

Hamasaki, Katsuyuki, Fukunaga, Kyohei-2008

Crustaceana 81(7): 813-822

Abstract::

Ovipositional behaviour of the swimming crab, *Portunus trituberculatus*, was observed in the laboratory. Females were reared in tanks with sand on the floor. Prior to oviposition, females bent back their abdomen, both sides of which were covered with four pairs of erect exopods of the pleopods. This formed a cavity between the abdomen and the sand. Eggs were extruded onto the sand from two gonopores, similar to paste being squeezed from a tube. The extruded eggs sank into a depression in the sand under the abdomen and they then attached to the ovigerous setae of the endopods of the pleopods, which were moving back and forth. Some of the extruded eggs that spread under the body did not attach to the ovigerous setae of females that were dug out of the sand for observation, or of females that could not bury themselves sufficiently into the sand. Consequently, we conclude that a sandy substratum is vital for successful egg attachment in swimming crabs used for broodstock in a hatchery.

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FEEDING BEHAVIOUR, FEED SELECTIVITY AND GROWTH STUDIES OF MANGROVE KILLIFISH, *KRYPTOLEBIAS MARMORATUS*, LARVAE USING VARIOUS LIVE AND FORMULATED FEEDS

Bam Deo Pandey, Atsushi Hagiwara, Yoshitaka Sakakura-2008

Environmental Biology of Fishes 82(4): 365-375

Abstract:

Nine types of live foods viz. L, S and SS morphotypes of *Brachionus plicatilis* sp. complex, first instar *Artemia franciscana*, *Fabrea salina*, *Acartia tsuensis*, *Tigriopus japonicus*, *Diaphanosoma celebensis*, *Moina mongolica* and a formulated feed of two sizes (400 and 700 μ m) were used to observe feeding behaviour and growth of mangrove killifish, *Kryptolebias marmoratus*. Behavioural observations were made for one hour on days 0, 1, 5, and 10 after hatching. Focus, unsuccessful and successful attacks and vomit were noted. With rotifers L, S and SS types and newly hatched *Artemia nauplii* as food, all the larvae showed maximum feeding success throughout the experimental period. Larvae did not consume any of the 700 μ m artificial diet. Vomiting was noticed on capturing the ciliate *Fabrea* and 400 μ m artificial diets. Rotifers were ingested in greater numbers. SS-type rotifers were

consumed in largest number (209.2/h per individual) on day 10. Significantly greater growth was observed after 10 days rearing with L type rotifer, *Artemia nauplii*, *T. japonicus*, *A. tsuensis*, *M. mongolica*, *D. celebensis*, and a mixture of L type rotifer and *F. salina* (Tukey–Kramer post hoc test, $P < 0.05$). Feed selectivity experiments on days 0, 1, 5 and 10 revealed that killifish larvae feed preferentially on *Artemia nauplii* and rotifers from a mixture of *Artemia nauplii*, rotifers, *A. tsuensis*, *T. japonicus*, *D. celebensis* and *M. mongolica*. Techniques for culturing various zooplankton at small-scales are also described.

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TRANSCRIPT EXPRESSION PROFILES OF TAKIFUGU RUBRIPES SPERMATOOZOA AND EGGS BY EXPRESSED SEQUENCE TAG ANALYSIS

Xue-Yan Shen, Jian-Zhou Cui, Qing-Li Gong, Yong-Jian Liu, Yoshitaka Nagahama-2008

Fish Biology and Biochemistry 34(3): 235-243

Abstract:

Two cDNA libraries from Takifugu rubripes spermatozoa and eggs were constructed and a total of 620 expressed sequence tag (EST) clones were generated from the two libraries: 300 clones are from the spermatozoa library and 320 clones are from the eggs library. The most abundant cDNA clones in the two libraries were identified. A total of 207 ‘contigs’ (or single) EST clones were found to share significant sequence identity with known sequences in the GenBank database, representing at least 51 different genes. In order to understand the two types of germ cells further, the expression profiles of the identified clones in these cDNA libraries were analyzed. Furthermore, the presence of specific messenger RNAs in the spermatozoa and eggs has been demonstrated with BLAST analysis; the spermatozoa and egg library can supply unique and novel cDNA sequences in the Takifugu rubripes EST project. Another aim of this study is to identify cDNA clones that can be used as molecular markers for the analysis of the spermatogenesis and oogenesis in Takifugu rubripes. Six potential clones (S1-3 from spermatozoa and E1-3 from eggs) were selected to analyze their expression patterns by reverse transcription (RT)-PCR analyses. Half of these showed a specific expression in the expected tissue. Two of the clones were found by RT-PCR and in situ hybridization to be expressed specifically in the testis or ovary, and they maybe suitable molecular markers for the analysis of spermatogenesis and oogenesis.

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INHIBITORY EFFECT OF 2,4-DIBROMOPHENOL AND 2,4,6-TRIBROMOPHENOL ON LARVAL SURVIVAL AND METAMORPHOSIS OF THE SEA URCHIN STRONGYLOCENTROTUS NUDUS

Yukio Agatsuma, Hikaru Endo, Kazuya Taniguchi-2008

Fisheries Science 74(4): 837 – 841

Abstract:

As a possible factor leading to the low recruitment level of sea urchins in kelp forests, the inhibitory effect of 2,4-dibromophenol (DBP) and 2,4,6-tribromophenol (TBP) released from the large perennial brown algae *Ecklonia kurome* and *Eisenia bicyclis* on survival and metamorphosis of eight-armed larvae of the sea urchin *Strongylocentrotus nudus* was examined. The percentage of larvae that underwent metamorphosis in filtered sea water after 1 h exposure to one-half dilution of saturated dibromomethane solution (~60 ppm) as a chemical inducer reached approximately 100% after 1 h, while that in filtered sea water containing 1 ppm TBP was reduced to 73%. This was further reduced to less than 40% in the presence of 10 and 20 ppm TBP after 2 h. In filtered sea water containing 1 and 10 ppm DBP, the proportion of metamorphosed larvae was reduced markedly to 43 and 5% after 2 h, respectively. All larvae exposed to 50 ppm TBP and to 20 and 50 ppm DBP died after 1 h. These findings suggest that DBP is more toxic than TBP for sea urchin larvae, strongly inhibiting their metamorphosis.

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COMPARISON BETWEEN α -LNA AND DHA IN EARLY DEVELOPMENTAL STAGES OF TAKIFUGU OBSCURUS AND TAKIFUGU RUBRIPES

Soon Young Wang, Kyung Nam Han, Takao Yoshimatsu-2008

Fisheries Science 74(4): 853 – 859

Abstract:

Rearing experiments were conducted to investigate the essential fatty acid requirements in the early developmental stages of river puffer *Takifugu obscurus* and tiger puffer *T. rubripes* using two n-3 series unsaturated fatty acids, α -linolenic acid (18:3n-3, α -LNA) and docosahexaenoic acid (22:6n-3, DHA), under salinity of 30 and 18.5–20.3°C. River and tiger puffer larvae used in this study were 15 and 14 days old after hatching, and their average body weights were 30.1 and 20.8 mg, respectively. The results on fatty acid requirements of these two species were evaluated from fish growth, survival, fatty acid composition of the fish body and activity test results. The DHA groups of both river and tiger puffer exhibited better survival and weight gain. However, there was no difference in the mean final body weights of river puffer between two dietary groups. Also, the DHA group of tiger puffer showed better results in the recovery test from anesthetic condition than that obtained in the LNA group. In an examination of the fatty acid compositions of the whole body, the LNA group containing no dietary DHA resulted in 0.5% DHA in tiger puffer and 1.1% DHA in river puffer. These results suggest that α -LNA from *Artemia* converted to eicosapentaenoic acid (20:5n-3, EPA) and to DHA successively by their fatty acid metabolism. Symptoms following essential fatty acid deficiency were not observed in any experimental groups. As river puffer did not represent a significant difference in the dietary effects between α -LNA and DHA treatment groups, its essential fatty acid requirement was assumed to be somewhat closer to that of the freshwater fishes in comparison with that of marine fishes, including tiger puffer.

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EFFECT OF DIETARY TAURINE AND LIPID CONTENTS ON CONJUGATED BILE ACID COMPOSITION AND GROWTH PERFORMANCE OF JUVENILE JAPANESE FLOUNDER *PARALICHTHYS OLIVACEUS*

Shin-Kwon Kim, Hiroyuki Matsunari, Kazuharu Nomura, Hideki Tanaka, Masahito Yokoyama, Yuko Murata, Kenji Ishihara, Toshio Takeuchi-2008

Fisheries Science 74(4): 875 – 881

Abstract:

The effects of dietary taurine levels and lipid contents on the conjugated bile acid composition and growth performance of juvenile Japanese flounder *Paralichthys olivaceus* were investigated. Six types of diet (three different levels of taurine at two different levels of lipid) were fed to juveniles (average body weight, 0.04 g). Fishmeal that was washed with 70% ethanol to remove taurine was used as the sole protein source. Feeding experiments were carried out at 20°C for 6 weeks. At the end of the experiments, fish were weighed and analyzed for free amino acids in the body and the composition of the conjugated bile acids. The body weight and percent weight gain of the juveniles were improved by the dietary taurine supplementation. The taurine contents of the whole body and tissues increased with the increase of the dietary taurine contents. The conjugated bile acids in the gall bladder consisted of taurocholic acid and taurochenodeoxycholic acid, which increased with the increase of the dietary taurine level. Taurocholic acid accounted for more than 95% of the total conjugated bile acids. This indicates that taurine is the sole amino acid to conjugate bile acid in Japanese flounder.

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SHORT COMMUNICATION

ARTEMIA IS NOT A VECTOR FOR MONODON BACULOVIRUS (MBV) TRANSMISSION TO PENAEUS MONODON

M. Sarathi, G. Balasubramanian, V. K. Sivakumar, A. S. Sahul Hameed-2008

Journal of Fish Diseases 31(8): 631 – 636

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EVALUATION OF THE STOCKING EFFICIENCY OF GIANT CUTTLEFISH SEPIA LATIMANUS HATCHLINGS THROUGH MARKING EXPERIMENTS

Shigeki Dan, Katsuyuki Hamasaki, Takashi Yamashita, Masakazu Oka, Shuichi Kitada-2008

Nippon Suisan Gakkaishi 74 (4): 5-624

Abstract:

To evaluate the stocking effectiveness of giant cuttlefish hatchlings, 25-62 thousand individuals were annually marked on the cuttlebones with Alizarin red S and stocked into Urasoko and Kabira Bays of Ishigaki Island, Okinawa, southernmost Japan from 2001 to 2003. The giant cuttlefish caught by small set-nets in the bays and the cuttlebones collected from a fish market and five coastal beaches were examined to detect the marked cuttlebones and to measure the growth of released individuals. Released cuttlefish were caught in the bays where they were released from autumn in the release year to the spring two years later, and the proportion of released cuttlefish in catches ranged from 4.5 to 18.0%. The cuttlebones with marks were mainly collected on the beaches around the release sites. Based on these results, recapture rates and the yield per released individual were estimated at 0.02-0.08% and 0.24-1.28 g, respectively.

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TEMPERATURE EFFECTS OF ROTIFER BRACHIONUS PLICATILIS MASS CULTURE ON REARING EFFICIENCY OF LARVAL JAPANESE FLOUNDER PARALICHTHYS OLIVACEUS

Tsutoma Tomoda,* Masahiko Koiso, Yasuhiro Shima-2008

Nippon Suisan Gakkaishi 74 (4): 625-635

Abstract:

This study investigated the suitable temperature for mass culture of the rotifer, *Brachionus plicatilis*, in order to optimize the rearing of Japanese flounder, *Paralichthys olivaceus*, in terms of larval growth and vitality. Two-day batch cultures of rotifers were prepared daily at three graduated temperatures (18°C, 23°C, 28°C). Rotifers were harvested on day 2 from the start of cultivation, and then enriched at 18°C, the same temperature as larval rearing. Rotifers were supplied to the flounder larvae until 19 days post hatching (dph) at each temperature. Rotifers cultured at 23°C and 28°C had higher ratios of immature individuals, and their physiological state (e.g. egg ratio) after enrichment was poor. During 15-20 dph, larvae fed rotifers cultured at 18°C showed higher performance in growth and morphological development than those fed rotifers cultured at 23°C and at 28°C. All groups of larvae at 20 dph were evaluated according to starvation tolerance tests, when the larvae that had been fed 28°C rotifers had the lowest survival ($P < 0.05$). The thermal difference between rotifer mass culture and larval rearing had a large influence on the rearing efficiency of Japanese flounder larvae.

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EFFECTS OF PHOTOPERIOD ON SURVIVAL, GROWTH AND FEEDING OF SEVEN BAND GROUPER EPINEPHELUS SEPTEMFACIATUS LARVAE

Kazuhisa Teruya, Kenzo Yoseda, Masakazu Oka, Toyohiro Nishioka, Syoji Nakano, Koh-Ichiro Mori, Takuma Sugaya, Katsuyuki Hamasaki-2008

Nippon Suisan Gakkaishi 74 (4): 645-652

Abstract:

The larvae of the seven band grouper *Epinephelus septemfasciatus* were reared until eight days post hatching in 500 L tanks under four different photoperiods: 24L:0D, 12L:12D, 6L:6D:6L:6D, and 0L:24D. Further, mass-culture experiments of the seven band grouper larvae were conducted until ten days post hatching using 100 kL tanks under natural photoperiod and 24L:0D conditions. The number of rotifers in larval guts and total length of larvae were examined at six-hour intervals. The best survival and growth of larvae were observed in 500 L tanks with 24L:0D photoperiod. In addition, larval survival rate was better in the 100 kL tank under the constant light condition. The seven band grouper larvae were suggested to be a visual feeder and their gut contents were clearly observed in tanks with 24L:0D photoperiod even during dark phases in other tanks. Therefore, it is considered that improved survival and/or growth of larvae in tanks under the constant light condition are attributed to the prolonged feeding period for larvae.

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EFFECTS OF OZONIZED SEAWATER AND POVIDONE IODINE ON HATCHING RATE OF JAPANESE FLOUNDER *PARALICHTHYS OLIVACEUS* EGGS

Kengo Ohta, Masato Aritaki, Ken-Ichi Watanabe-2008

Nippon Suisan Gakkaishi 74 (4):653-659

Abstract:

Effects of ozone produced residual oxidants and povidone-iodine on hatching rates of Japanese flounder eggs were examined. The morula stage eggs collected both in May and June during the spawning period were exposed to ozonized seawater including oxidants (total residual oxidants: TROs) at concentrations ranging from 0.1 to 1.0 mg/L for a period from 1 to 15 min.

They were also exposed to seawater including povidone-iodine at concentrations ranging from 25 to 75 mg/L as available concentration of iodine (ACI) for the same period as the ozonized seawater. The hatching rate of eggs collected in May was nearly identical with that of the control eggs ($p < 0.05$) when tested eggs were exposed to oxidants of less than 1.0 mg/L for 2 min, or to iodine of less than 75 mg/L of ACI for 15 min. On the other hand, the hatching rate of eggs collected in June was lower than that of eggs collected in May under the same test conditions. These results suggest that safe hatching conditions are influenced by the spawning phase. Safe treatment conditions for Japanese flounder eggs are TROs of 0.5 mg/L for 5 min and ACI of 50 mg/L for 15 min.

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