

# Progress in fish larval nutrition

## Live-feed Enrichments and Broodstock Additives - 'Tailor-made' to Requirements

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A major problem in intensive larviculture of marine fish is inadequate food quality that leads to mortality, reduced growth and deformities. During the last decade, much attention has been paid to the roles of specific nutritional components such as essential fatty acids (EFA) especially HUFA's, phospholipids, vitamins C and E, carotenoids, immunostimulants and other dietary components in broodstock and larval nutrition.

Many hatcheries around the world are using fresh and/or frozen, high quality broodstock food such as squid, sardines, prawns and mussels. In many cases, this type of food may vary in quality due to seasonal factors, post-harvest handling and freezing period and methods. These quality fluctuations may affect the quality of the eggs and the larvae. Some hatcheries are using 'in-house' additives such as squid oil and vitamin mixtures to boost broodstock nutrition. However, there are no commercially available additives that can be customized to suit the nutrient requirements of a given fish species.

Live food enrichments play an important role in delivering nutrients to marine fish larvae. Today, there are many enrichment products with different levels and ratios of EFA, anti-bacterial agents and vitamins. Species-specific enrichments are, however, lacking. Sometimes, especially with new species, it is desirable to have a product with a targeted nutritional profile.

Research in our laboratory has resulted in commercial products that address the issues discussed above.

**Nutra-Brood<sup>®</sup>** is a tailor-made feed additive designed to enhance the nutrition of fish broodstock. The product comes as liquid-oil emulsion that contains essential fatty acids, vitamins, minerals and other essential nutrients. It can be injected into the fresh food and is digested and absorbed in the fish gut.



**Arti-Kol<sup>®</sup>** is a tailor-made enrichment product that can be designed to suit any nutritional and/or experimental requirements. For example, different levels and ratios of EFA, vitamins, therapeutics immune-stimulants, carotenoids and probiotics can be included. Specific nutrients and/or ingredients are incorporated into the oil/water matrix of the globules (liposomes) which is easily incorporated into live food.

Tailor-made Enrichments at Work ►►

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## Tailor-made Enrichments at Work

### **Novel dose-response design using enrichments help determine PUFA requirement of marine larval fish**

Bransden et al. aimed to determine the dietary requirement for 22:6n-3 of striped trumpeter larvae during early development. A novel dose-response design seldom used in larval marine fish studies was employed. Seven experimental emulsions were formulated with increasing concentrations of 20:5n-3 and 22:6n-3 and used to enrich rotifers. The rotifers were fed to striped trumpeter larvae from 5-18 days post hatch (dph). Larval tissue fatty acids were measured at 10, 14 and 18 dph. The data enabled calculation of the dietary requirement of 22:6n-3 to be 12.7-13.1 mg/g DM for striped trumpeter larvae during the rotifer feeding period.

Bransden MP, Dunstan GA, Battaglione SC, Cobcroft JM, Morehead DT, Kolkovski S & Nichols PD 2004. Influences of dietary n-3 long-chain PUFA on body concentrations of 20:5n-3, 22:5n-3, and 22:6n-3 in the larvae of a marine teleost fish from Australian waters, the striped trumpeter (*Latris lineata*). *Lipids* 39(3):215-22



### **Enrichments help assess the effect of 'mega' dose of vitamins C and E on yellowtail kingfish larvae.**

Several factors contribute to the development of skeletal, jaw and operculum deformities in marine fish species. These factors include genetic disposition, environmental conditions, both hydrodynamic and physical handling of eggs and larvae, and nutrition. Malnutrition particularly when related to amino acids and vitamins have already been reported a major contributor to the incidence of skeletal deformities. The use of a 'mega' dose of vitamins C (ascorbic acid) and E (mixed tocopherols) to reduce the incidence of deformities and increase stress resistance in yellowtail kingfish larvae was recently investigated. Two enrichments were manufactured: a base enrichments with standard levels of vitamins C and E and a 'mega' dose enrichment (4% each, on DM basis). Four feeding treatments were administered: (1) base enriched rotifers followed by base enriched *Artemia*; (2) base enriched rotifers followed by 'mega' dose enriched *Artemia*; (3) 'mega' dose enriched rotifers followed by base enriched *Artemia*; and 4. 'mega' dose enriched rotifers followed by 'mega' dose enriched *Artemia*. Early results show that 'mega' doses of vitamins C and E supplementation in the *Artemia* enrichments significantly reduced larval susceptibility to stress as well as specific forms of deformities.

Bruce M, Portneere C, Gara B & Kolkovski S (unpublished). Effect of 'mega' dose of vitamins C and E on stress resistance, survival and deformities in yellowtail kingfish *Seriola lalandi* larvae. ■



Dr Sagiv Kolkovski is the Lead Scientist of the Mariculture Research and Advisory Group, Department of Fisheries, Western Australia. The group is located in Fremantle, Western Australia. Dr Kolkovski's main focus is on marine fish larvae physiology and nutrition including live feeds enrichments, microdiets, feeding protocols and rearing systems. Dr Kolkovski also advises and designs broodstock feed additives and live food enrichments to meet specific nutritional requirements of marine fish larvae.

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Victam Asia is one of the largest livestock trade shows in Asia. Due to its location in Bangkok, it attracts a number of exhibitors who cater to the aqua feed industry. From 2006 onwards, the exhibition will have a dedicated area for Thai exhibitors. This special area will enable local exhibitors from the animal feed, petfood, aquafeed and rice and grain processing industries to present their products and services to both the Thai markets and to the many visitors that attend the show.

