

HATCHERY FEED GUIDE & YEAR BOOK 2016

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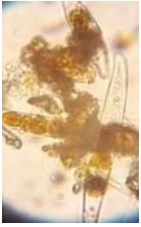


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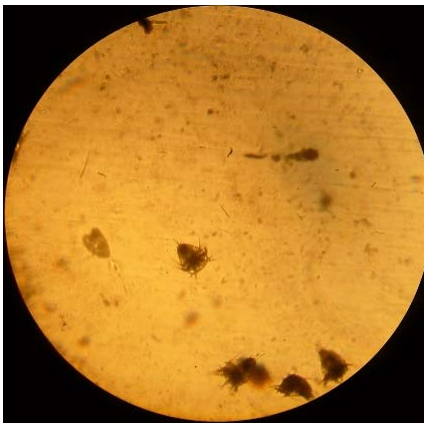
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Unconventional Live feeds: Opportunities and Constraints

R. Shibu Daniel and Ashutosh Srivastava take a look at the host of under-utilized organisms that are showing potential for use as live feeds for marine larviculture.



Biostimulated microfeed generation under controlled conditions

MAGNIFICENCE OF LIVE FOOD

When it comes to marine larviculture, even though inert diets have begun to rule the early larval stage hatchery world, when it comes to bioactivity and long-term residence *in situ* culture tank, live feeds are second to none to feed planktotrophic larvae and even lecithotrophic larvae after the onset of exogenous feeding. Perceptibility of live feeds make them easily notable and discernible due to their natural motility characteristics and ready availability

in the water column. Easy digestibility, high water content and feeble but assimilable nutrient components are all worthy of mention. Inert diets being prone to nutrient leaching and disintegration / deterioration of particles into the culture system is well-known. Early larval first forms do generally exhibit a primordial digestive system, with protein digestion at the hind-gut epithelial cells only.

LIVE FOOD ALTERNATIVES

Free amino acids (FAA) are the principal energy sources

during embryonic development of marine fish when the larval reserve treasury is empty. Free amino acids meet the metabolic and development needs of larval fish (Finn and Fyhn, 2010; Fyhn and Serigstad, 1987). Which specific FAA are required, and for how long, may vary between species. Fyhn, 1989 gave this novel finding to the science of early marine larviculture in order to evaluate the suitability of a given feed or prey organism for marine fish larvae at first feeding. When exogenous supply of

LIVE FEEDS

FAA becomes necessary, it rests upon the ingenuity of the hatchery farmer to choose and make available the right candidate at the right stage and at the right time.

There are a host of potential biological organisms that are under-utilized and now beginning to appear on the list for use as live feeds – pelagic larvae of brachyuran decapods, Copepod nauplii and Copepodite, Sea Urchin nauplii, Kingfish eggs, polychaete larvae, amphipods, Barnacle nauplii, microbially-colonized detrital particles (Pei-Yuan and Fu-Shiang, 1990), monogonont Rotifer *Proales similis* (Wullur et al., 2009) *cetera*.

“...There are a host of potential biological organisms that are under-utilized and now emergent on the listing for use as live feeds ...”

Oyster trochophores are gaining momentum in Asia (Liao et al., 2001). Marine pelagic fish eggs do generally possess a 50% or more of their total amino acid pool source as free amino acids alone (FAA).

Planktotrophic larvae of the boreal capitellid polychaete are very promising live feed

components.

Brachyuran larvae consume heterotrophic dinoflagellates very much (e.g. Perez and Sulkin, 2005; Schwamborn et al., 2006; Burnett and Sulkin, 2007). Copepod nauplii and or barnacle nauplii are excellent energy sources for first-feeding zoeae of king crabs (Paul et al., 1989). Photosynthetic sulfur bacteria (PSB) have now proved as diet in rotifer production (Palanichamy 2001).

Chlorogibba trochisciaeformis proved a good diet for *Brachionus* rotifers assuredly yielding 500 rotifers/ml density (Neelakantan et al., 1988). Grouper larvae reared in *Picochlorum* S1b green water blooms did per-

form really better than *N. oculata* (Tsong-Yuan et al., 2012). Brackish water calanoid copepod, though primarily herbivorous, *Pseudodiaptomus annandalei* cultured as live feed for grouper fish larvae

preys on the rotifer, *Brachionus rotundiformis* and its eggs (Dhanker et al., 2012). *P. annandalei* showed positive choice preference for neonate rotifers also (Hansen, 1994). *P. annandalei* has proven track record in enhancing larval survival and growth of high value tropical finfish species (Doi et al., 1997; Hagi-

wara et al., 2001; Jacobs, 1961). Mass production of copepod resting eggs also facilitates availability of copepod nauplii as a distinctly smaller live feed for aquaculture (Naes & Bergh 1994; Marcus 2005). Copepod nauplii are a richly source of Free Amino Acids with more than twice the amount of FAA per gram wet biomass than *Artemia* (Naess et al., 1995). Larval feeding trials conducted with other copepods, such as *Pseudodiaptomus annandalei*, *Apocyclops royi*, *Euterpina acutifrons*, and *Acartia tsuensis* have reported quite mixed results (Kraul et al., 1988; Doi et al., 1997a; Schipp et al., 1999; Toledo et al., 1999). Bacteria have been potentially conceived as potential bioactive food sources for marine invertebrates and fish (Zobell and Feltham, 1938; Seki, 1969; Wavre and Brinkhurst, 1971; Olafsen, 1984; Bitterlich and Schaber, 1986; MacDonald et al., 1986). Cultures of *P. lutheri*, *I. galbana*, *C. calcitrans*, *S. costatum*, *C. gracilis* and *Chaetoceros muelleri* harbored a broad spectrum of species belonging to the groups of α -Proteobacteria, β -Proteobacteria, γ -Proteobacteria, Cytophaga-Flavobacterium-Bacteroides (CFB) bacteria group, Actinobacteria and *Bacillus*

LIVE FEEDS

(Conceicao et al., 2010). Lactic acid bacteria delivery that is mediated through rotifer gut have enhanced growth of fish larvae (Gatesoupe, 1991). Diet and conditioned water control the profile and existence of gut microflora (Hansen and Olafsen 1999). Diatoms like *Thalassiosira weissflogii* and their de-watered media is a rich source of exopolysaccharides teeming with beneficial probiotics and a high source of Vitamin B₁₂ in early larval system. Laminarans being generally immunoactive, *T. weissflogii* has a maximum Chrysolaminaran content of 31.72 mgL⁻¹ and 411.95 pg Cell⁻¹ (Storseth et al., 2005). Extracellular Carbohydrates are released by the marine diatom *Cylindrotheca closterium*, *Thalassiosira pseudonana* and *Skeletonema costatum* (Urbani et al., 2005). These extracellular polysaccharides do provide answer to the hidden mortality factors in difficult-to-rear Brachyuran decapods.

Tabish et al., 2012 approved the adoption of differentially enriched rotifers as alternative first food in the early larviculture of indicus white shrimp. Kitto and Regunathan, 2012 deemed live feed rotifers as still an open option for shrimp hatcheries. The ciliate *Cristigera minuta* is

heavily grazed by the *Penaeus paulensis* larvae (Thompson et al., 1999). Marine thraustochytrid and heterotrophic chromist, Schizochytrium sp having high DHA oil content is an excellent larval live feed for clams (Thu et al., 2010)

Acartia clausi, a copious calanoid copepod in tropical wa-

ters (especially in India) is found to be nutritionally rich and could be immensely utilised as live prey for Asian seabass (Rajkumar and Kumaraguru vasagam, 2006). The culture methodology of the common soil nematode *Pangrellus redivivus* has been transferred from the aquarium industry to the penaeid



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shrimp industry. But hatcheries have not adopted this technology because they prefer to avoid the risk of investing in unconventional systems and learning curves (Phil Boeing, 2000).

EXPECTANT PROMISES

A present summation of alternate live feeds underline a few pointers to ponder that need to be adopted site-specifically on a trial and error approach and there exists much room for optimization of these lines with every alternative live food candidate species. It should always be remembered that any live food under consideration must be also able to improve water quality; pool in extra nutrients in the gut tracts; be able to stimulate inhibitory compounds and caring critical functions within the digestive space limits at first feeding; be an alert monitor of microbial management in the rearing system ; passively supply micronutrients and even render natural immuno stimulants too. In nutritional parlance, about alternative live feed starters, there are more and more recognised grey spaces as feeble informations exist relating to nutritional changes with alternate live food growth within larval rearing system.

However, successful aquaculture programs always rely on continuous hatchery production of high quality larvae. The food supply for larval stages of economically valuable fish and invertebrates is both a challenge and a major concern always for mariculture operations (Phil Boeing, 2000) especially during the early phases of first feeding larval forms.

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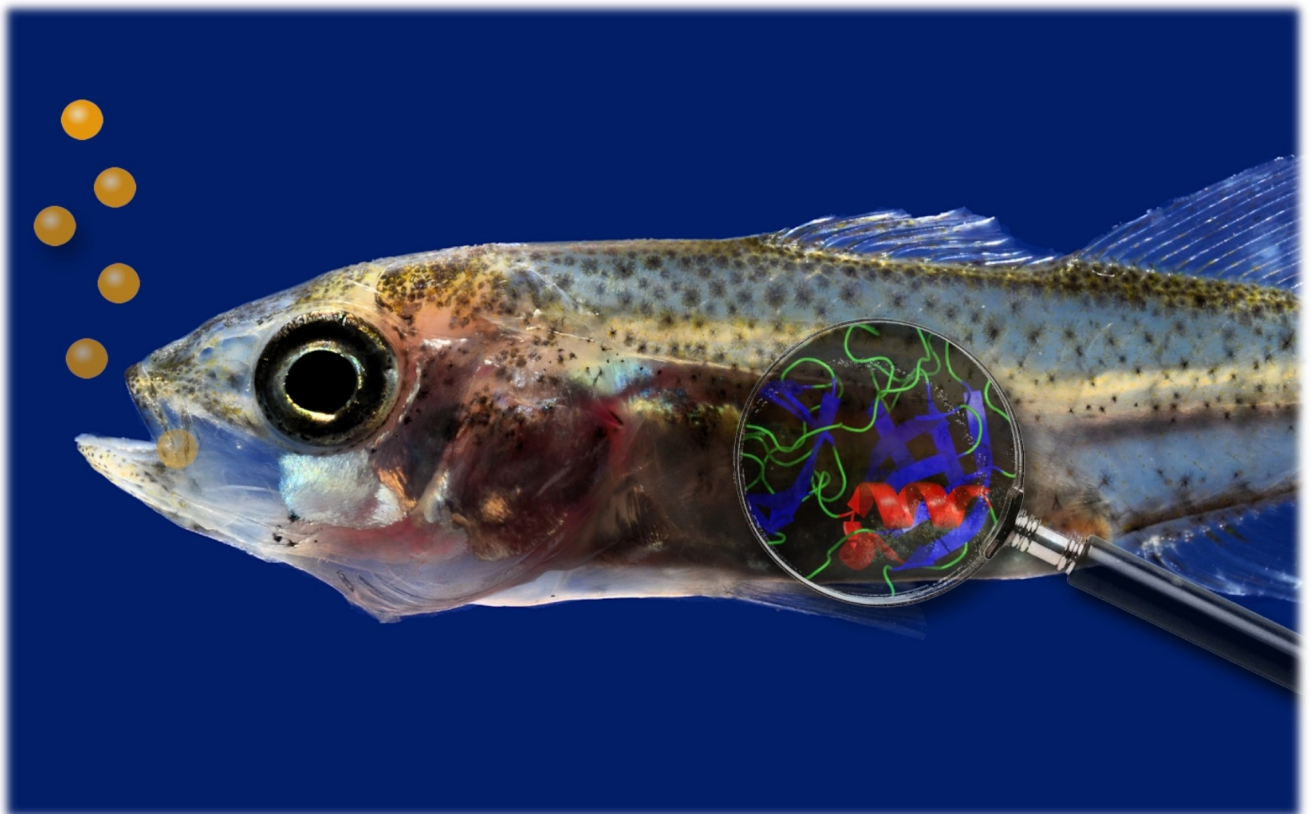
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Taste for Tots

Dr. Bernd Ueberschär provides a review of the challenges of feeding microparticulate diets (Microdiets) to larval fish: state of the art and gaps.



There is still much research effort required to complete our knowledge on the optimal nutritional profile for marine fish larvae.

The successful production of marketable fish always begins with a reliable availability of viable fry or juveniles. However, although the past few decades have seen many improvements, survival rates are still often low or highly variable and growth potential is, in most cases, not fully exploited. Although swimming in a soup of food, with optimal water quality and no

predators, the survival rates for the major commercially farmed species of marine fish varies usually between 10-30% beyond metamorphosis, indicating significant gaps in our knowledge of the optimal nutritional needs of growing fish larvae. Thus, larviculture is still considered a bottleneck to successful production of many preferred, high-quality marine species.

Reasons for today's high mortality rates in the larval stages of marine species are usually due to the natural deficiencies of the most common live food organisms which, due to the existence of standardized protocols for their mass production, are rotifers (*Brachionus sp.*) and brine shrimp (*Artemia sp.*). However, both rotifers and Artemia have nutritional deficiencies

MICRODIETS

as feed for marine species, particularly in essential n-3 highly unsaturated fatty acids and can be quite variable in their nutritional value. Enrichment with HUFA-rich lipid emulsions may lead to an excess dietary lipid and sub-optimal dietary protein content for fish larvae. In addition, rotifers and Artemia are likely to have sub-optimal dietary levels of some amino acids, vitamins and minerals. Moreover, live feed production is a labor-intensive process and is responsible for 50-80% of hatchery cost and as far as brine shrimp is concerned, the resource is limited. Looking at Artemia cysts harvested over the last 25 years, even in periods with favorable conditions, the natural production hovers at around 3,000 tonnes per

year. Most of these harvested cysts are consumed every year by today's aquaculture industry. However, according to the forecasts by FAO and other entities, the yield from marine fish production is expected to double during the next 15 to 20 years - and it is obvious that such growth can only be realized when more fry can be produced with fewer Artemia.

Copepod-nauplii have also been used as live feed, normally with considerably better results in terms of larval survival rates, growth and quality, when compared with rotifers and Artemia. But, technical difficulties and costs in mass-producing these organisms are still a major constraint to their routine use.

CHASING THE HOLY GRAIL

Microdiets that mimic the composition of the natural food organisms for marine fish larvae, such as the nauplii stages of calanoid or harpacticoid copepods may be a perfect replacement of the sub-optimal standard live diet and would omit the high effort necessary to produce copepods in hatcheries. The promise of an off-the-shelf, microparticulate diet for first-feeding larval fish is still one of the "holy grails" of the hatchery manager. Replacing the laborious live feed production facilities with high quality microdiets will greatly increase marine larval production, improve hatchery consistency and will help in cost reduction of fry production. Actually, part of the great success story of global



Typical shape of Microdiets (various brands)

MICRODIETS



38 days-old seabream larvae, the microdiet in its gut showing red from the astaxanthin content.

salmon production is the fact that salmon larvae are able to accept formulated feed as first diet, yielding survival rates of up to 90%.

The desire to replace live feeds in mariculture with microdiets is some decades old and has its roots in the aim to simplify hatchery feeding protocols, although the complete replacement of live feed with formulated feed for marine fish larvae was considered utopia at that time. Actually, complete substitution is still a challenge, at least for the first feeding stages; nevertheless the quality of commercially available microdiets allows for at least some species, such as seabass and seabream, the total replacement of live feeds or to skip the Artemia phase, as for example with seabream. The trade-off

when replacing live feed completely is still often reduced survival and sometimes reduced growth.

There are discussions why microdiets cannot, at this stage, replace live feed with similar performance. One reason is certainly that the nutritional profile for marine fish larvae is yet to be completely defined. Although lipids and fatty acid requirements are comparatively well known, very little work has been carried out to define specifically the optimal requirements for proteins, amino acids, minerals and vitamins. There are still arguments about the amount of hydrolyzed versus native proteins, free amino acids, total amount of protein content and about the role of exogenous enzymes from live prey. Live food organisms also con-

tain gut neuro-peptides and nutritional "growth" factors or bioactive micronutrients that may improve digestion efficiency. These bioactive micronutrients are frequently omitted in formulated diets, since there are no conclusions about their nature yet.

Other reasons are rather "technical". There is the need to find a balance between some desired leaching in order to contribute to palatability and attractability and to trigger ingestion specifically in first feeding larvae; on the other hand, due to high surface area-to-volume ratios of microdiets, low molecular weight, water-soluble nutrients tend to rapidly leach from particles before larvae have consumed them.

A significant issue with microdiets is their buoyancy. In order for a particle to be

MICRODIETS

available to larvae, it must be suspended in the water column. If the particle sinks too quickly, it becomes unavailable and will simply decompose on the bottom of the culture vessel and degrade water quality. Likewise, if the particle floats at the surface it is less available to larvae. Ideally, microdiets will be neutrally buoyant, or at least sink slowly to maximize availability to larvae.

An issue which is often underestimated when using microdiets is a proper feeding protocol and feeding techniques; inadequate feeding strategies can jeopardize the potential of the present microdiet quality. They need to be administered in small amounts per feeding event, but much more frequently compared with live feed. This can be realized only with auto feeders that are able to deliver pretty small amounts of feed per event. Overfeeding rapidly degrades water quality and requires a lot of effort for cleaning.

In summary, microdiets have evolved to high-tech products and the advances achieved in the quality in the past 10-15 years are exciting. The commercial products available at present allow principally complete replacement of live feed in some species when



Accurate feeding is essential and can only be achieved with specialized microfeeders.

properly administered, although some drawbacks such as reduced survival and growth rates apparently still hamper a wider application. In that context, it is important to look further into larval fish digestive physiology, where significant gaps still exist in knowledge specifically related to composition, the digestibility of microdiets and feeding efficiency. Co-feeding with microdiets and early weaning are, however, common practise now in some commercial hatcheries.

It can be expected, that the industry is close to realizing

major advances in microdiet quality, allowing the routine application in most of the commercially important marine species as live feed replacement. Commercial hatcheries are encouraged to introduce microdiets into their feeding plans and to report to the industry about their experience. This can in turn contribute substantially to further advances in microparticulate diets. Hopefully, we will see a major breakthrough within the next five years.

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Photos by courtesy of Dr. Bernd Ueberschär from the Association for Marine Aquaculture (GMA).



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The Year in Review

Send your hatchery related news to: editor@hatcheryfeed.com

A round-up of hatchery-related stories from around the world that made the news in the last year.

U.K./BELGIUM – In a reverse takeover, **INVE Aquaculture** was purchased by **Benchmark Holdings plc.** for \$342 million, making Benchmark a global leader in the aquaculture technology market overnight. Benchmark has a track record of integrating acquisitions, such as SalmoBreed and StofnFiskur. Philippe Léger, Chief Executive Officer of INVE, commented that Benchmark's toolbox of health and genetics solutions would complete INVE's current offering in advanced nutritional and health products.

FRANCE/ NIGERIA – **BernAqua's** French parent company **Invivo**, compared MeM from Bernaqua for the first three weeks of rearing with the use of a typical co-feeding protocol on commercial catfish (*Clarias gariepinus*) in a hatchery in Nigeria. It used two groups: one control group consisting of six tanks of 61,000 fry co-fed on live artemia and a commercial diet; and a test group of the same size fed exclusively on MeM (200-300µm before 10 DPH and 300-500µm from 10 DPH). The results revealed survival rates at the end of the trial of 44.2 percent in the control group and 96.6 percent in the MeM group; and similarly strong improvements in live weight of the fish, with the control group fish weighing in at an average 0.46 grams per fish, versus 1.25 grams in the MeM group. Combining the positive effect of MeM on survival and growth performances, the biomass of fish harvested after 3 weeks of feeding was of 11.8 (+/- 3.9) kg/tank in the control group and 71.7 (+/- 17.3) kg/tank in the group fed with MeM, thus obtaining an increase in productivity of 600 percent. Moreover, it was observed a reduction in deformities in the group fed with MeM. MeM is a

feed that is produced by an adapted extrusion process (marumerization) and coated, which aims to ensure full water stability of soluble and insoluble nutrients in the feed while avoiding the use of chemical binders. It is made from fish-meal, peas, fish oil, soybean lecithin and gelatin.

BELGIUM – Research at the **University of Ghent (Lab of Aquaculture & ARC)** has shown that germ-free sea bass larvae are an excellent tool for documenting the effects of feed and feed additives on their gastro-intestinal morphological development. A gnotobiotic feed chain model was developed for sea bass larvae using artemia. This model was used to study microscopically the effect of a germ-free controlled culture on the survival and gastrointestinal tract development of sea bass larvae during the first 14 Days After Hatching (DAH). Results showed that the germ-free sea bass larvae develop in the same way as their conventional counterparts. Consequently, the developed gnotobiotic feed chain model for sea bass larvae is a good model from morphological point of view to study the effect of micro-organisms on the development during the early days post hatching. Furthermore, expansion of this model in time should allow analyses of feed and feed additives on the development of sea bass larvae.

U.S.A. – **The University of Miami's Rosenstiel School of Marine and Atmospheric Science Experimental Fish Hatchery (UMEH)** made an international mark as the first educational and research institution in the world to obtain the GLOBALG.A.P. Integrated Farm Assurance for Aquaculture pro-

ducing Cobia eggs and fingerlings commercially. The GLOBALG.A.P. Aquaculture Standard applies to a diversity of fish, crustaceans and mollusks and extends to all hatchery-based farmed species, as well as the passive collection of seedlings in the planktonic phase. It covers the entire production chain, from broodstock, seedlings and feed suppliers to farming, harvesting and processing. As a supplier of cobia eggs to Open Blue Sea Farms in Panama, the GLOBALG.A.P. certification was a key element to have in place to support the growth of their business, Dr. Daniel Benetti, Professor and Director of Aquaculture with the Department of Ecosystems and Society with the Rosenstiel School of Marine and Atmospheric Science at the University of Miami said.

DENMARK – Mass produced copepods are on their way. **Acartia**, a partnership between **AKVA Group Denmark A/S, Agrotech, Roskilde University** and **Aqua Circle** is an integrated system of algae production and copepods on a commercial scale, with a planned production capacity of over 100 million copepod eggs daily.

Acartia is expected to revolutionize the production of marine fish in aquaculture. A large part of the future global aquaculture growth will be based on the farming of marine species. By feeding marine fish larvae with copepods early in the larvae's life, mortality is reduced by up to 80% and increase in growth can be improved by about 30%. Moreover, subsequent diseases can be avoided. Until now, it has not been possible to mass-produce copepods at a level, which can meet the global demand.

ISRAEL – An Israeli-developed method to enhance prawn yields without resorting to genetic modification has started to take hold in Asia, the researcher who has developed the technology said. Male prawns can grow up to 60 percent larger than females and a breakthrough by a team of researchers at **Ben Gurion University** is creating all-male prawn populations. The technology is using a cutting-edge scientific approach called temporal gene silencing through RNA interference and the idea is that by using this technology an all male population can be

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produced that will benefit the grower. Researchers said the advantage of this technology is that by using this technology chemicals and hormones do not need to be used and it is non-GMO. The method involves carefully injecting females of the giant freshwater prawn *Macrobrachium rosenbergii* with a molecule that silences a gene. This changes the sex of a female and ensures that all its eggs hatch as males. The sex change occurs only in the generation that has been injected and does not affect the offspring, Sagi explained.

TAIWAN – A research team led by Prof. Jiann-Ruey Hong from the **Institute of Biotechnology at National Cheng Kung University (NCKU)**, Tainan, Taiwan, has produced a fish feed additive that could double the survival rate of grouper fry. The feed additive raised the survival rate of the fry to more than 80 percent and is expected to help increase Taiwan's grouper output value 10-15 percent. Taiwan holds a 23 percent share of global grouper market, with Asia as its biggest export market and Hong Kong and mainland China having the highest demand.

DENMARK/N.IRELAND – A Danish research group working in association with the **Agri Food and Biosciences Institute (AFBI)** and the **Lough Neagh Fishermen's Co-operative (LNFCS)** in Northern Ireland, are to use Lough Neagh eels in breeding trials in an attempt to complete the full European eel life cycle in captivity for the first time. The Lough Neagh fishery based at Toomebridge is Europe's largest commercial wild eel fishery, producing 16% of Europe's wild eel catch. Following on from recent successes in the European "PRO-EEL" Project, the Danish National Institute of Aquatic Resources, Technical University of Denmark (DTU AQUA), has started a new "EEL-HATCH" project together with industry partners and has built new breeding and hatching facilities dedicated to eel. Lough Neagh is one of very few sites in Europe able to supply the contaminant free wild

male and female broodstock required to run their experiments.

AUSTRALIA – Researchers have embarked on a project they say will focus on developing the world's most advanced breeding program for the farmed black tiger shrimp (*Penaeus monodon*). The objective is to develop shrimp that grow faster, are more disease-tolerant and that will retain outstanding eating qualities. The aim of the Hub is to achieve the same high efficiency in farming the tiger shrimp as has been achieved for livestock such as pigs and chickens, researchers said. The research consortium, known as The Hub, hosted by **James Cook University**, involves industry and research partners the **CSIRO, University of Sydney, AGRF and Universiteit Gent** and was launched at **Seafarms**, Queensland, Australia's largest shrimp farming operation, which runs 52 ponds at the site.

USA – Genome mapping has been completed for Rainbow Trout. **NRGene**, in cooperation with scientists from the **U.S. Department of Agriculture's Agricultural Research Service** and the **University of Illinois**, has mapped the rainbow trout (*Oncorhynchus mykiss*) genome using its DeNovoMAGICTM big data genome assembly tool. It assembled short DNA reads delivered by the USDA and University of Illinois into a complete genome map of 2.17 G bp made of very long DNA scaffolds, within three weeks. The new genome scaffolds are being used to generate an improved reference genome before releasing it to the public.

INDIA – India's **Central Institute of Brackishwater Aquaculture (CIBA)** bred the milkfish (*Chanos chanos*) successfully in captivity for the first time in the country. The broodstock milkfish were reared in cement tanks for more than 10 years. They were bred by administering permitted hormone. The fertilized eggs were hatched

and reared to fingerling stage. Milkfish has the potential to be an important species in India.

SCOTLAND – Scientists say their research will help salmon breeders to select fish with greater resilience to Pancreas Disease (PD), one of the most problematic infectious diseases of farmed Atlantic salmon. PD, which is responsible for major economic losses to salmon farmers in the UK and Norway, is caused by a salmonid alphavirus. Scientists led by the University of Edinburgh’s **Roslin Institute** looked at commercial Atlantic salmon stocks that had survived an infection of salmonid alphavirus. They found that half of the observed variation in resistance to the disease could be explained by genetic factors that are passed from one generation to the next. One particular part of the salmon’s genetic make-up is responsible for almost a quarter of this variation. This genetic marker – called a QTL – is now being added to genetic tests that are used to help select the best fish for use in breeding programs.

CHINA – Aquarama, Asia’s most important ornamental fish, invertebrates, plants and accessories trade show is under new ownership and moving to China. The show has taken place in Singapore biennially since 1989. New owners, VNU Exhibitions Asia Ltd., is making it an annual event. Aquarama 2016, the 15th International Exhibition for Aquarium Supplies and Ornamental Fish, will take place at Guangzhou Import & Export Fair Pazhou Complex on September 22-25, 2016. With more than 300 exhibitors expected, the event will offer a much larger show floor than previous editions, top-level seminars, numerous on-site activities, farms and factories visits and of course fish, shrimp and aquascaping competitions. Along with a clear focus on ornamental fish and aquarium supplies trade, specific exhibit sections for upstream suppliers, public aquariums, quarantine and transport solutions will be combined with an ambitious hosted buyer program. Aquarama 2016 will be co-located with Aqua Fair Asia and Pet Fair South-China, two events introduced in



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2015 by VNU Exhibitions Asia Ltd. to support the development of Aquaria and Pet markets in South-China.

EUROPE – The European Food Safety Authority

(EFSA) Panel on Additives and Products or Substances used in Animal Feed published a scientific opinion, saying the feed additive **Calsporin®** is safe for inclusion in feed for ornamental fish. Calsporin® contains viable spores of a single strain of *Bacillus subtilis*. The minimum dose proposed for use in feed for ornamental fish is 1×10^{10} colony-forming units (CFU)/kg of complete feedingstuff. This application makes reference to a published study describing the effects of adding Calsporin® to the diet of juvenile koi carp (*Cyprinus carpio*). A significant increase in final body weight and improvement in feed to gain ratio was observed in fish given the additive compared with controls.

NORWAY/AUSTRALIA - Krill fishing company **Aker BioMarine** and **WWF-Australia** formed a partnership to set higher standards for sustainability in the Southern Ocean and to ensure better protection for fragile Antarctic ecosystems. In the area of the Southern Ocean where Aker BioMarine operates, the current krill catch represents less than half of one per cent of the total biomass of krill. However, given the importance of krill to the Southern Ocean food web, it is critical that krill harvesting is done in the most sustainable way. Aker BioMarine has achieved several conservation achievements. Through its previous partnership with WWF-Norway, it became the first krill fishing operation to be awarded Marine Stewardship Council certification. Together with the Antarctic and Southern Ocean Coalition and WWF-Norway, the company has also established a research fund for the Southern Ocean called the Antarctic Wildlife Research Fund.

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EVENTS 2016

Upcoming aquaculture events

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MARCH

13 - 15: **Middle East Aquaculture 2016**

DWTC - Dubai, UAE
Details

18 - 20: **2nd Guangzhou International Aquarium Show (GIAS2016)**

Guangzhou, Guangdong, China (map)
Details

29: **9th Aquafeed Horizons Asia**

Bangkok, Thailand
Details

29 - 31: **FIAAP/Victam/GRAPAS Asia**

Bangkok, Thailand
Details

APRIL

20 - 22: **4th International Symposium on Genomics in Aquaculture**

Athens, Greece
Details

26 - 29: **Asian-Pacific Aquaculture**

Surabaya, Indonesia
Details



MAY

9 - 11: **Aquafeed Extrusion Technology, Norway**

Centre for Feed Technology (FörTek) Ås, Norway
Details

25 - 26: **Aquaculture UK**

Aviemore, Scotland
Details



12 - 13: **Food & Feed Drying Technology short course**

Centre for Feed Technology (FörTek) Ås, Norway
Details

JUNE

2 - 4 **Middle East Aquaculture Forum**

Izmir Expo Center, Izmir, Turkey
Details



5 - 10: **17th International Symposium on Fish Nutrition and Feeding**

Sun Valley, Idaho, USA
Details

19 - 23: **40th Annual Larval Fish Conference**

University of Maryland Center for Environmental Science, Solomons, Maryland USA
Details

SEPTEMBER

6 - 8: **VIV China**

Beijing, China
Details

22 - 25: **Aquarama 2016**

Guangzhou, China
Details



20 - 23: **Aquaculture Europe**

Edinburgh, Scotland
Details

NOVEMBER

15 - 18: **Eurotier**

Hanover, Germany
Details

INCLUDE YOUR EVENT

Send your event details to:

editor@hatcheryfeed.com



Glossary of Hatchery Feed Terms

Terms you may encounter in this publication or elsewhere, relating to hatchery feed and nutrition

A

Additive — An ingredient or combination of ingredients added to the basic feed mix or parts thereof to fulfil a specific need.

Aflatoxins — A group of extremely heat-stable mycotoxins, produced by strains of *Aspergillus flavus* and *A. parasiticus*, which exhibit fluorescence on UV radiation. Aflatoxins are toxic to a wide range of eukaryotes.

Agglomeration — A process that produces a cluster of finely ground ingredients or microcapsules. For larval feed production, two methods are often used: (a) Microextrusion Marumerization (MEM): in this two-step process the ingredients are pressed through a die or screen with very small holes using either a cold extruder or a cooking extruder to produce long noodles; these are then broken into lengths approximately the same as the diameter

with a marumerizer (b) PARA - Particle-Assisted Rotational Agglomeration: a lower pressure method which uses a marumerizer but not an extruder. It is capable of producing shaped feed particles of less than 400 um in diameter.

Alevin — The larval stage of fish from hatching to the end of dependence on endogenous yolk as a source of nutrition. This term is often restricted to salmonids and related fish before they emerge from the spawning gravel or incubation substrate, to begin swimming freely.

Alga (plural: algae) — Primitive chlorophyll-containing mainly aquatic eukaryotic organisms lacking true stems and roots and leaves.

Alginates — Industrial product derived from brown algae (seaweeds).

Amphihaline — Aquatic species, which passes periodically at well defined stages of its life cycle, from salt water to freshwater and vice versa.

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Androgen — (a) A fish that has only a male parent; all genes in an androgen come from the father (b) Anabolic steroid hormone that stimulates activity of accessory sex organs and sexual characteristics in males. They are often termed male sex hormones.

Antioxidant — A substance that chemically protects other compounds against oxidating thus enhancing stability and prolonging shelf-life; for example, vitamin E prevents oxidation and rancidity of fats.

Artemia — A small crustacean. At certain periods of the year, it produces cysts, metabolically inactive as long as they are kept dry, that float at the water surface of saline waterbodies; upon immersion in seawater, these cysts hydrate and the embryo resumes its development. The cysts can be easily used as a source of live food for early stages of fish and crustaceans.

B

Berry — One of the eggs of a fish or a crustacean.

Binder — The adhesive component that holds together the non-adhesive components of a compound mixture such as aquafeed.

Bioencapsulation — A technique whereby various substances, for example nutritional elements and prophylactics, are administered into living organisms, which can then be administered as feed to another animal.

Blastoderm — The foundation from which the embryo will form on an egg. For practical purposes, the blastoderm is the same as the blastodisc or germinal disc of a fertilized egg.

Blastopore — As the blastoderm grows over the egg, it finally leaves a circular opening or blastopore.

Blastula — A hollow ball of cells, one of the early stages of embryonic development.

Breaking stage — Developmental stage of the brine shrimp cysts, when their shell (including the outer cuticular membrane) bursts and the embryo appears, surrounded by the hatching membrane.

Breeding color — Skin pigmentation developed during the spawning period.

Breeding cycle — A period between hatching and the first spawning of a given generation.

Brine shrimp — See Artemia

Brood — A group of young animals produced (spawned) at the same time.

Brood fish — Sexually mature fish, especially for propagation in fish farms.

Brooding — Care of the eggs during at least the early part of development. This can be undertaken either inside or outside the animal and can be undertaken by males in some animals.

Broodstock — Sexually mature specimens of both sexes kept for the purpose of controlled reproduction (independent of whether a first or subsequent generation is produced) as well as younger specimens destined to be used for the same purpose.

C

Carotenoids — Pigment molecules found in algal cells and crustaceans (exoskeleton) as well as in plant and animal fats. Fed to fish, salmonids in particular.

Copepod — A major group of minute crustaceans common to freshwater and saltwater. They have no carapace and have a single median eye. Some are free-swimming and belong to the zooplankton, while others are parasitic on the skin and gills of fish.

Copepodite — Developmental stage of copepods after the nauplius stage.

Crumbles — Granular processed fish feed made by crushing pellets between rollers moving at different speeds; the resulting pellet fragments are screened to produce several size ranges of particles.

Crustacean — Aquatic animal belonging to the phylum Arthropoda, a major group of invertebrate organisms characterized by their chitinous exoskeleton and jointed appendages, occurring in marine and freshwaters and on land, e.g. crabs, lobsters, crayfish, shrimps, prawns, etc. Microcrustaceans include cladocerans and copepods.

Cyst — (a) The resilient non-mobile, dehydrated, resistant, inactive, dormant stage of a free-living or parasitic organism, as a response to adverse environmental conditions. (b) A non-living membrane enclosing a cell or cells.

D

Decapsulation — A process whereby the capsules of brine shrimp cysts are removed before they are used further in cultivation. The cyst, often called an egg, is an arrested gastrula encapsulated within a hard lipoproteinaceous shell or capsule.

Die — In mechanics: a piece of metal with holes through it, used in extruding pellets.

Diet, purified — A feed made out of refined

ingredients with specified analyses; used for nutritional research only.

Diet, reference (RD) — In nutrition research: a diet with which one can compare response to experimental design and dietary treatments.

Diet, standard reference (SRD) — In nutrition research: a precisely defined and reproducible test diet satisfying the nutritional needs of fish for use in feeding studies to facilitate comparisons between various experiments, species, locations, researchers and other factors and conditions.

Diet, supplemental — A prepared diet formulated to provide additional nutrients to those obtained from natural food organisms grown in the culture environment (usually ponds). It may be undiluted as a supplement to other feeds, offered free choice with other parts of the diet separately available, or mixed with other feed ingredients to produce a complete feed.

Digestion coefficient, true (TDC) — Digestion efficiency expressed as the ratio of total weight of feed consumed minus weight of excreted faecal matter minus weight of metabolic faecal nutrient excreted over total weight of feed consumed.

E

Extruder, Extrusion Cooker — A continuous cooker employing a screw, that applies pressure, high temperature and mechanical shear to produce feeds. The process gelatinizes the starchy components, denatures proteins, stretches or restructures tactile components and causes exothermic expansion of the extrudate. When the feed leaves the die, it expands and the pellet that is formed will float.

F

Fatty acid — Organic acid composed of carbon, hydrogen and oxygen that combines with glycerol to form fats.

Fatty acid, essential- (FAE) — Fatty acid, which cannot be synthesized by an organism and must be supplied in the diet to avoid a dietary deficiency.

Fatty acid, highly unsaturated - (HUFA) — Fatty acid containing three or more double bonds between the carbon molecules.

Fatty acid, polyunsaturated - (PUFA) — Fatty acid containing two or more double bonds between

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the carbon molecules.

Feed coefficient — Feed consumption per unit weight increase.

Feed conversion (FC) — In aquaculture, a term usually used in relation to defining the performance of fish diets. It is used to express, in kilos, the dry weight of a specific feed required to produce one kilogram of fish flesh, e.g. FC = 2.8.

Feed conversion (efficiency), absolute — In semi-intensive aquaculture: an index obtained by dividing the dry weight of feed distributed by the extra growth believed to have been obtained

Feed conversion (efficiency), relative — In semi-intensive aquaculture: an index obtained by dividing the dry weight of feed distributed by total fish production, including that obtained from available natural food.

Feed conversion efficiency (FCE) — Live weight gain over a defined period expressed as a percentage of food intake during that same period; it is equal to: $(W/F) \times 100$, where W is the live weight gain and F the weight of the dry food fed over the period.

Feed conversion efficiency, specific - (FCEs) — Measurement of fish growth. Is equal (in percent) to $G/R \times 100$, where R is the food ration in percent weight of body weight per day and G is the specific growth rate.

Feed conversion ratio (FCR) — Ratio between the dry weight of feed fed and the weight of yield gain. Measure of the efficiency of conversion of feed to fish (e.g. FCR = 2.8 means that 2.8 kg of feed is needed to produce one kilogram of fish live weight).

Feed efficiency ratio (FER) — The inverse of the feed conversion ratio; the live weight gain per unit dry weight of feed; for example 0.35:1 if a gain of 0.35 kg live weight is produced by one kilogram of dry feed.

Feed formulation — Feed formulation is a calculation to decide how much of each raw ingredient to use to prepare a feed. The general objective of feed formulation is to mix ingredients of differing nutritional quality so as to obtain a balanced diet whose biologically available nutrient profile approximates to the dietary needs of the animal in question. Many manufacturers use the "least cost" method, where the ingredients of a feed may change regularly according to the availability and price

of different feedstuffs, but the final formulation of the feed (in terms of percentage and overall quality of protein, fats, etc.) will remain constant.

Feed rate — Quantity of feed given to animals on a daily basis, expressed as percent body weight per day or number of organisms consumed per hour.

Feed utilization — The weight increase per unit of utilized feed.

Feed, closed-formula — A diet for which the formula is known only to the manufacturer.

Feed, complete — A nutritionally adequate feed to be fed as the sole ration and capable of maintaining life and/or promoting.

Feed, compound — A feed composed of several ingredients of vegetable or animal origin in their natural state, fresh or preserved, or products derived from the industrial processing thereof, or organic or inorganic substances, whether or not containing additives, for oral feeding in the form of a complete feed.

Feed, expanded — Type of hard, relatively low-density pelleted feed with a slow sinking rate. Can be used to produce high-oil diets.

Feed, floating — Prepared feed pellets produced by the extrusion process under conditions that result in a density that will allow them to float at the water surface for extended periods.

Feed, microbound — feeds that are held together with binders from within the mix of ingredients. These can be either crumbles or on-size feeds.

Feed, microencapsulated — A microdiet consisting of ingredients that are encapsulated by a shell, or membrane.

Feed, moist — Feed which contains from 18 to 45 percent water.

Feeding value — A term referring to the nutritive value of different feeds, i.e. expressing the amount of nutrients furnished by each feed and the degree of their digestibility.

Fertilization — The addition of nutrients (fertilizers) for the purpose of artificial enrichment in order to stimulate primary production as the base of the food chain.

Fingerling — Related to any fish from advanced fry to the age of one year from date

of hatching regardless of size, usually applied to trout of about 10-70 g in weight, or 8-15 cm fork length. The term is, however, not rigidly defined.

First feeding — Term given to describe the period of transition between sac fry and fry, when the fish begin to look for food after having exhausted most of their yolk sac.

Flake — A feed ingredient rolled or cut into flat pieces with prior steam conditioning.

Floc — A coagulated mass of particles.

Food, live — Common, non-specific term used to describe the living microscopic organisms (e.g. rotifers, artemia) used to feed the larvae of certain finfish and shellfish before being weaned on artificial diets.

Fry — A term used to describe a fish at the post-larval stage. All stages from hatchling to fingerling stage can potentially be covered by "fry".

Fry, advanced — Any young fish from the start of exogenous feeding (after the yolk is absorbed). For salmon and migratory trout, see Parr.

Fry, swim-up — Term usually used in relation to salmonid culture referring to fish fry, which have just absorbed almost all of their yolk, becoming buoyant and ready to consume food. Swimbladder inflation occurs at this point.

G

Green water culture — The enhancement of natural food chains in ponds or tanks by nutrient enrichment, as a means of increasing food supply to an aquaculture species.

Growth rate, absolute — The actual increase in size of an individual or stock per unit time under known or specific conditions, expressed e.g. in g/day or kg/month.

Growth rate, instantaneous- (g) — A measure of the daily weight increase determined from a sample of fish over a short period of time and calculated by the following equation: $g = (\ln W_t - \ln W_0) / (t_1 - t_0)$ where W_t is the weight of the fish after t_1 days, W_0 is the initial weight and \ln is the natural logarithm.

Growth rate, relative (GRR) — The increase in size (length or weight) of an individual or stock per unit of time in proportion to its initial size; often expressed as equal to $[(S_t - S_0)/S_0]$

$\times 100$ where S_0 is the initial size and S_t the size at the end of the period.

Growth rate, specific (G) — An expression of daily increase in weight defined as $G = g \times 100$ where g is the instantaneous growth rate.

H

Hatchery — Place for artificial breeding, hatching and rearing through the early life stages of animals, finfish and shellfish in particular. Generally, in pisciculture, hatchery and nursery are closely associated.

Hatchery constant — A single value derived by combining the factors in the numerator of the feeding rate formula. Hatchery constant = $(3 \times \text{feed conversion} \times \text{daily length increase} \times 100) / \text{length of fish}$. This value may be used in fish hatcheries to estimate feeding rates (in percent body weight/day) when water temperature, feed conversion and growth rate remain constant.

Hatching stage — For brine shrimp: last developmental stage of the brine shrimp embryo, when the fully developed nauplius ruptures the hatching membrane and hatches, becoming a free-swimming larva.

J

Juvenile — Young stage of animals, usually up to the time they first become sexually mature. For fish usually between the postlarval stages up to the time they first become sexually mature. They are generally hardy at this stage.

L

Larva (Plural:Larvae) — An organism from the beginning of exogenous feeding to metamorphosis into juvenile. At the larval stage the animal differs greatly in appearance and behaviour from a juvenile or an adult.

Larva, (echino)pluteus — Planktonic larva of sea urchins (echinoderm Echinidae), which swims very actively to feed on planktonic organisms. After metamorphosis, settles on a substrate and becomes a juvenile sea urchin.

Larva, D — Developmental stage of mollusc, so called as the shell of the larva resembles a capital "D". Last stage of a planktonic mollusc larva prior to settlement on the sea bottom.

Larva, competent — Larva of mollusc that is ready to metamorphose and attach to a suitable surface.

Larva, eyed — Generally refers to a molluscan larva, which has developed a foot and is ready to settle out of the plankton and become benthic.

Larva, schizopod — Stage in development of decapod crustacean larva when it resembles an adult mysis in having an exopodite and endopodite to all thoracic limbs.

Larviculture— The culture of larvae, usually in hatcheries.

M

Marumerizer — a sizing and shaping device that breaks extruded strands into small individual agglomerations and shapes them into spherical particles.

Microencapsulation — Liquids and particulate dietary components are enclosed within a coating, which helps prevent dissolving and leaching, but will release under specific environmental conditions.

Microextrusion Marumerization (MEM) — see Agglomeration

Microalgae — see Phytoplankton

Micro-ingredients — Vitamins, minerals, antibiotics, drugs, and other materials normally required in small amounts and measured in milligrams, micrograms or parts per million (ppm)

Mycotoxins — Toxins naturally produced by molds and fungi

Mysis — Pelagic larval stage of a crustacean intermediate between the protozoa (zoea) and postlarva stages.

N

Nauplius (pl. nauplii) — Earliest larval stage of a crustacean.

P

Particle-Assisted Rotational Agglomeration (PARA) — see Agglomeration

Pellet — Agglomerated feed formed by compacting and forcing it through die openings by a mechanical extrusion process.

Phytoplankton — Minute plants suspended in water with little or no capability of controlling their position in the water mass. The plant component of plankton. Frequently referred to as microalgae.

Plankton — Passively drifting or weakly swimming organisms, including many microscopic plants and animals.

Postlarva (pl. postlarvae) — Stage occurring after the larval stage, resembling the juvenile but still lacking certain characteristics. For crustaceans: the stage following metamorphosis from larva (zoea) to juvenile. In penaeid shrimp, this is commonly counted in days after appearance of postlarval features, e.g. PL12 indicates a postlarva that has lived 12 days since its metamorphosis from the zoea stage of development.

Prebiotics — Non-digestible food ingredients that stimulate the growth and/or activity of bacteria in the digestive system that have favorable effects on the intestinal flora.

Probiotics — Live micro-organisms added to feed, which confer health benefits.

Protein efficiency ratio (PER) — Ratio of live weight gain (in grams) over protein consumed (in grams). Production per unit of protein fed.

Protein utilization, (apparent) net (NPU) — The amount of nitrogen retained by the animals over the total nitrogen consumed.

Protein, biological value of (BV) — Percent digested protein retained by the animal, expressed as the percentage of food nitrogen utilized for growth and body maintenance; this involves digestion, absorption, utilization and excretion of nitrogen-bearing compounds, especially proteins.

Protein, crude — The nitrogen content in a feed or animal or plant tissue, multiplied by a factor, which is generally 6.25.

Proteins, single-cell- (SCP) — type of natural food used in hatcheries made of individual cells (unicellular organisms), such as yeasts and microalgae fed to brine shrimp nauplii.

Protozoan (pl. protozoans) — A member of the phylum Protozoa, composed of mostly microscopic animals made up of a single cell or a group of more or less identical cells, reproducing by fission and living chiefly in water; includes many parasitic forms.

Protozoa (pl. protozoae) — Larval stages between the nauplius and mysis in crustaceans; usually have seven pairs of appendages.

Proximate analysis — (Analysis of) moisture, lipid, protein, fibre, ash and (by difference) carbohydrate content of any animal or plant product or mixed substance such as a feed.

R

Rotifers — Group of microscopic, primarily aquatic, animals belonging to a distinct class of the *phylum Aschelminthes*. They are characterized by a corona at the anterior end, which bears tufts of cilia used for feeding and locomotion. Rotifers are important live-food organisms in the rearing of marine fish larvae in hatcheries.

S

Satiation — Used to describe animals, which have been fed to the limit i.e. they will not eat any more.

Scissiparity — Asexual type of reproduction, which consists in the division of the organism into two parts.

Settlement — For molluscs this is the process by which molluscan larvae undergo a cessation of their mobile stage and begin a sedentary life stage by attachment to a suitable support.

T

Tank, spawning — Rectangular or circular hatchery tank containing a relatively large volume of water (10-30 m³) in which brood fish are introduced to spawn.

Tetraploid — An organism or cell where each chromosome occurs in sets of four.

Trace elements — Nutrient elements essential for the life and growth of an organism, but needed in only very small quantities or amounts.

Triploid (3n) — An organism or cell where each chromosome occurs in sets of three.

U

Umbrella stage — Developmental stage of the brine shrimp embryo, when it hangs underneath the empty cyst shell after the breaking stage and completes its development into a nauplius.

V

Vitamin — An organic compound occurring in minute amounts in foods and essential for nu-

merous metabolic reactions.

Vitamin premix — A mixture of crystalline vitamins or concentrates used to fortify a formulated feed.

Viviparity — Giving birth to living young, which have already reached an advanced stage of development.

Viviparous — Bringing forth living young; the mother contributes food toward the development of the embryos.

W

Weaning — Process in which an animal's dependence on its mother, directly or indirectly (e.g. yolk sac) for food or protection comes to an end. In aquaculture, also used to refer to the transition from live food to processed feed for small larval fish.

Y

Yolk — Cells and structures that are concerned with or associated to the egg yolk and its production and development.

Z

Zoea (pl. zoeae) — Larval stage of crustaceans following metamorphosis from the nauplius larva. It may be referred to as protozoa where differentiation between the nauplius and mysis (or postlarva stage of development) is difficult.

Zooplankton — The animal component of plankton.

Zoospore — Motile, flagellated and asexual spore.

Zygote — a fertilized egg.

ΩHF

Sources: We have drawn from numerous sources and especially the [FAO Glossary of Aquaculture](#).

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larviculture feeds are used by over 500 hatcheries, universities, and marine ornamental operations in more than 90 countries around the world. We also produce and distribute clean, hatchery-scale rotifer and copepods starter cultures, Otohime and TDO weaning and juvenile feeds, and related supplies.

(See our product listings in this guide.)



Ensuring Stable and Productive Cultures: Reed Mariculture feeds and enrichments are produced using bio-secure, proprietary processes. Our long shelf life products provide fish, bivalve and shrimp hatcheries with clean, convenient and nutritious feeds that can replace in-house microalgae. The result: clean, efficient and stable production.



Who We Serve: Hatcheries/commercial aquaculture, public aquariums, public and private researchers, breeders and aquarium retailers and hobbyists.

Extraordinary Customer Service: We are known for outstanding customer service and technical support, and expertise in world-wide shipping logistics. Give us a call and let us know what we can do for you.

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MANUFACTURED FEEDS

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|------------|--------------------------|----------|--------------------|-----------------------|--|------------------|
| Aller Aqua | Aller Parvo EX | Fish | Larvae Fry Nursery | Crumbles | ALLER PARVO EX is a complete starter feed for tilapia, catfish and carp. The feed meets the demands of fry and serves as a good support for fast growth and robust fish. | DATASHEET |
| Aller Aqua | Aller Futura EX | Fish | Larvae Fry Nursery | Crumbles Mini pellets | ALLER FUTURA EX is rich in easily digestible proteins and contains a high amount of natural micronutrients, attractants, minerals and vitamins. The formulation includes raw materials of the highest quality and ingredients especially suited for fry. | DATASHEET |
| Aller Aqua | Aller Futura MP EX | Fish | Larvae Fry Nursery | Micro pellets | ALLER FUTURA MP EX is an alternative or a supplement to the existing crumbles. The feed is produced by a low-temperature, agglomeration technique, which is gentler to the raw materials than traditional extrusion technology. The physical properties of the ALLER FUTURA MP EX are defined by homogenous, easy-to-handle, dust-free pellets. | DATASHEET |
| Aller Aqua | Aller Performa | Fish | Larvae Fry Nursery | Crumbles Mini pellets | ALLER PERFORMA is first of all good value for money and provides excellent growth rates as well as FCR. The product is suitable for a wide variety of conditions and a broad range of species. | DATASHEET |
| Aller Aqua | Aller PerformaOrganic EX | Fish | Larvae Fry Nursery | Mini pellets | ALLER PERFORMA ORGANIC EX provides good value for money with excellent growth rates and high feed efficiency. The feed intake and wellbeing of juvenile fish is optimized by inclusion of raw materials of the highest quality, with excellent taste characteristics. | DATASHEET |
| Aller Aqua | Aller Rep EX | Fish | Broodstock | Pellets | ALLER REP EX is a thoroughly tested feed, which has proved its stability by ensuring the production of robust and fertile eggs. ALLER REP EX is generally used all year round. | DATASHEET |
| Aller Aqua | Aller Sturgeon REP EX | Sturgeon | Broodstock | Pellets | ALLER STURGEON REP EX is developed for broodstock sturgeon, and the first choice for many fish farmers in established sturgeon-producing countries. The feed ensures a high yield of strong and fertile eggs and is the right choice whether the goal is roe for breeding or caviar of the highest quality. | DATASHEET |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|-----------------------|--------------|---------|------------------------------|--|---|------------------|
| BernAqua – InVivo NSA | Caviar | Fish | Larvae Juveniles | Agglomerated Micro-capsules | Caviar is an agglomerated product, classified in different sizes to match the different stage of the fish larval development. Each capsule is filled with small peptides and low MW soluble proteins, nucleotides, EFA based phospholipids, a balanced profile of chelated trace minerals, etc. | DATASHEET |
| BernAqua – InVivo NSA | Nori | Fish | Larvae Juveniles | Agglomerated Micro-capsules | Nori is an agglomerated feed high in protein and moderated in fat content, which preserves hepatic conditions and promotes fast growth. The essential fatty acids of the feed are only originating from the protein fraction. Nori is perfectly water stable. It has an excellent buoyancy and water stability. | DATASHEET |
| BernAqua – InVivo NSA | MeM | Fish | Juveniles | Cold Extruded | MeM is a nursery feed for fish cultured in intensive conditions. MeM is produced following a new technology, which involves cold Micro-extrusion and Marumerization. This innovative technology ensures a full water stability of soluble and insoluble nutrients in the feed while avoiding the use of chemical binders. | DATASHEET |
| BernAqua – InVivo NSA | Royal Caviar | Shrimp | Larvae Post larvae | Agglomerated Micro-capsules | Royal Caviar is formulated and produced to mimic the basic features of live food. Royal Caviar increases profitability and performance of shrimp hatcheries. Royal Caviar is produced following a unique technology, which involves the agglomeration of microcapsules. The new key ingredient is giving Royal Caviar a better palatability so increased performance. | DATASHEET |
| BernAqua – InVivo NSA | BioSpheres | Shrimp | Larvae Post larvae | Agglomerated Micro-capsules, Extruded & Crumbled | The BioSpheres range comprises four different feeds, each one exclusively and independently formulated for the shrimp stage it is targeted to. Each of the feeds is easily identified by their color and physical properties which are following the evolution of the needs of the shrimp throughout its cycle. | DATASHEET |
| BernAqua – InVivo NSA | Vitellus | Shrimp | Larvae Post larvae Juveniles | Extracted Artemia | Vitellus is exclusively composed of first quality Artemia cysts. The cysts have been opened and their content extracted. Vitellus is processed with the most modern techniques which guarantee the total preservation of the unique nutritional qualities of the Artemia cyst. | DATASHEET |

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| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|-----------------------|-------------------------|--------------|--------------------|-------------------|---|------------------|
| BernAqua – InVivo NSA | Royal Oyster | Shrimp | Broodstock | Cold Extrusion | Royal Oyster is a high quality supplementary shrimp maturation feed. Royal Oyster speeds up the recovery of breeders after each spawn. Royal Oyster improves nauplii quality and pigmentation. Royal Oyster is produced by Cold-extrusion and marumerization. This process avoids the use of artificial binders and nutrient-loss in water. | DATASHEET |
| Biomar | LARVIVA Multigain | Shrimp | Larvae | Powdered | Complete dry formula high quality feed with all nutrients required to boost disease and stress resistance of shrimp larvae. LARVIVA Multigain can be used as a supplementary diet, fed directly to the shrimp tanks. | DATASHEET |
| BioMar | LARVIVA Shrimp-ProStart | Shrimp | From Z1-Z2 onwards | | Agglomerated, high protein larval feed with the right amino acid balance, for first feeding and replacement of live feed. Available in appropriate size range. Complete nutritional profile. Of constant quality always off-the-shelf available. Includes Bactocell®, a probiotic that is documented to have positive effect on shrimp survival and growth performance. | DATASHEET |
| BioMar | LARVIVA Shrimp-PL | Shrimp | From PL1 onwards | | An extruded and granulated feed with high digestibility, based on the best raw materials of marine origin. Great importance has been ascribed to palatability, which together with high protein content ensures maximum growth and survival during the early life stages. Contains immune stimulants, and high levels of vitamins and minerals. | DATASHEET |
| BioMar | LARVIVA ProStart | Fish | Larvae | | Agglomerated, high protein larval feed with the right amino acid balance, for co-feeding with live feed and for early weaning. Includes Bactocell®, a probiotic that is documented to reduce vertebral deformities in marine larvae as well as in salmonids.. | DATASHEET |
| BioMar | LARVIVA ProWean | Fish | Larvae | | Weaning and nursery feed for fish larvae. Extruded granulates of highest quality to use in standard weaning procedures. Includes Bactocell®, a probiotic that is documented to reduce vertebral deformities in marine larvae as well as in salmonids. | DATASHEET |
| Bio-Oregon | BioVita Starter | Salmon Trout | First feeding fry | Extruded Crumbles | BioVita Starter is a premium fish feed with high levels of fish meal and fish oil. For use in first feeding, it contains an enhanced vitamin pack and pigment to promote healthy fish and natural coloration. Natural palatability enhancers ensure an active first feeding response. | DATASHEET |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|------------|--------------------|--------------|-------------------|-------------------|--|------------------|
| Bio-Oregon | BioClark's Starter | Salmon Trout | First feeding fry | Extruded Crumbles | BioClark's Starter combines traditional dietary values with an increased level of alternative ingredients to reduce cost and to promote sustainability. For use in first feeding, it contains an enhanced vitamin pack and pigments to promote healthy fish and natural coloration. Natural palatability enhancers ensure an active first feeding response. | DATASHEET |
| Bio-Oregon | BioVita Fry | Salmon Trout | Parr | Extruded Pellets | BioVita Fry is a premium fish feed with high levels of fish meal and fish oil. It contains an enhanced vitamin pack and pigments to promote healthy fish and natural coloration. Natural palatability enhancers ensure an active feeding response. | DATASHEET |
| Bio-Oregon | Bio-Olympic Fry | Salmon Trout | Parr | Extruded Pellets | Bio-Olympic Fry is our most advanced fry diet and provides maximum growth rates and shortened production times. Bio Olympic Fry has demonstrated growth improvements of up to 20% in controlled trials. | DATASHEET |
| Bio-Oregon | BioClark's Fry | Salmon Trout | Parr | Extruded Pellets | BioClark's Fry is a mid-level energy fish feed for moderate or controlled growth. It includes an increased level of alternative ingredients to reduce cost and to promote sustainability. It contains an enhanced vitamin pack and pigments to promote healthy fish and natural coloration. | DATASHEET |
| Bio-Oregon | BioBrood | Salmon Trout | Parr | Extruded Pellets | BioBrood is designed to meet the needs of developing and maturing eggs and sperm. It contains premium fish meal and fish oil and extra vitamins and minerals for improved fecundity, sperm mobility, brood health, egg quality, and fry survival. BioBrood should be fed for 6-12 months prior to spawning. | DATASHEET |
| Bio-Oregon | BioPro 2 | Salmon Trout | Parr | Extruded Pellets | BioPro 2 is a health promoting diet specifically formulated for freshwater salmon and trout. BioPro is designed to be fed leading up to stressful situations, including periods of high disease risk or adverse environmental conditions such as elevated summer water temperatures, intense sunlight or low dissolved oxygen. | DATASHEET |
| Bio-Oregon | BioSupreme | Salmon Trout | Parr | Extruded Pellets | BioSupreme is specifically formulated to prepare salmon for the transition from fresh to saltwater. Like BioTransfer, BioSupreme contains elevated levels of dietary salt and now includes newly identified ingredients that are essential for increasing feed intake and growth following transfer. BioSupreme should be fed for 6 weeks prior to release or transfer to saltwater. | DATASHEET |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|------------|--------------------------------|-----------------|------------------------------------|-------------------------------|---|------------------|
| Bio-Oregon | BioDry 1000LP | Salmon Trout | Parr | Extruded Pellets | BioDry 1000LP (Low Phosphorus) is an extruded, low-pollution fish feed which is formulated to reduce the amount of phosphorous discharged into the environment. This diet contains less than 1% dietary phosphorus. | DATASHEET |
| Cargill | LiquaLife Z-M | Shrimp | Larvae | Pre-stabilized nutrient beads | LiquaLife® products are liquid feeds for larval and post-larval shrimp produced through a patented technology. Each drop contains pre-stabilized nutrient beads and direct-fed microbials to deliver optimum nutrition for better survival rates and growth. LiquaLife® feeds are designed to complement live feeds, such as algae and Artemia, and completely replace conventional dry feeds. In addition, the probiotic bacteria in LiquaLife® feeds help prevent the accumulation of toxic ammonia. | WEBSITE |
| Cargill | LiquaLife M-PL | Shrimp | Larvae PL | Pre-stabilized nutrient beads | | |
| Cargill | LiquaLife PL | Shrimp | PL | Pre-stabilized nutrient beads | | |
| Cargill | LiquaLife PL* | Shrimp | PL | Pre-stabilized nutrient beads | LiquaLife® PL is designed for PL transport and ideally replaces Artemia in the transportation of your PL's from the hatchery to the farms, making sure your PL's are active and stress free while reducing your costs and hazards. LiquaLife® PL improves water conditions during travel, due to the probiotic bacteria in its micro capsules. Reduces water contamination risks and mortality caused by stress. Prevents the contact of personnel with caustic and toxic products used in Artemia decapsulation. Reduces personnel and production costs by not having to hatch or produce Artemia. | WEBSITE |
| Cargill | Aquaxcel | Shrimp/ Fish | Larvae PL fry Fingerlings | Micro-extruded | Combining superior nutrition and modern micro-extrusion technology, AQUAXCEL® gives young animals all they need to thrive. Our feeds are designed to give you the best cost-benefit ratio to take to your bottom line. | WEBSITE |
| Cargill | Aquaxcel 0.3 mm, 0.6 mm, 0.8mm | Shrimp | Larvae PL | Micro-extruded | Complete feeding program designed for shrimp hatcheries, maternities and raceways that is composed of advanced starters, maximizing performance, nutrient stability, and cost-benefit to farmers. | WEBSITE |
| Cargill | Aquaxcel 0.8mm, 1.5mm, 2.0mm | Shrimp | PL | Micro-extruded | Advanced starter feeds designed to provide enhanced performance of PL's in nursery, transfer ponds and direct stocking of growout ponds. | WEBSITE |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|----------|---------------------------|---------|------------|----------------|--|------------------|
| Cargill | AquaXcel Warm Water | Fish | | Micro-Extruded | Combining superior nutrition and modern micro-extrusion technology, AQUAXCEL® gives young animals all they need to thrive. Our feeds are designed to give you the best cost-benefit ratio to take to your bottom line. | WEBSITE |
| Cargill | AquaXcel Cold Water | Fish | | Micro-Extruded | Combining superior nutrition and modern micro-extrusion technology, AQUAXCEL® gives young animals all they need to thrive. Our feeds are designed to give you the best cost-benefit ratio to take to your bottom line. | WEBSITE |
| Cargill | AquaXcel Marine | Fish | | Micro-Extruded | Combining superior nutrition and modern micro-extrusion technology, AQUAXCEL® gives young animals all they need to thrive. Our feeds are designed to give you the best cost-benefit ratio to take to your bottom line. | WEBSITE |
| CreveTec | L100, L200 | Shrimp | Larvae | Crumbles | Extremely attractive diet due to inclusion of highly digestible ingredients. All feeds contain micro-algae and hydrolyzed proteins. | WEBSITE |
| CreveTec | PL300, PL500 | Shrimp | PL | Crumbles | Extremely attractive diet due to inclusion of highly digestible ingredients. All feeds contain micro-algae and hydrolyzed proteins. | WEBSITE |
| CreveTec | PL800, PL1000 | Shrimp | Nursery | Crumbles | Extremely attractive diet due to inclusion of highly digestible ingredients. All feeds contain micro-algae and hydrolyzed proteins. Growth of PL12 to 1,2 g in 4 weeks in intensive nursery systems. | WEBSITE |
| CreveTec | Broodstock growing pellet | Shrimp | Broodstock | Pelleted | Pellet with 54 % proteins. Contains krill and squid. | WEBSITE |
| CreveTec | Maturation pellet | Shrimp | Broodstock | Semi-moist | Semi-moist pellets with 10 % fresh polychaetes. | WEBSITE |

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| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|--|---|-------------------------------|----------------------------------|---|---|--------------------|
| EWOS/Cargill Aqua Nutrition Canada/Norway/Scotland | EWOS start (015P, 040P, 1P) | Salmonids | Hatchery Fry | Extruded Pellets | EWOS start uses the best fishmeal & fish oil to produce a clean, slow sinking and homogenous pellet. Using EWOS start has been shown to improve water quality, optimise SGR and FCR and will give a more even fish size distribution. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Canada | Micro (#0, #1, #2) | Salmonids | Hatchery Fry | Crumbles | A premium all fishmeal/oil freshwater diet. Results in excellent raceway hygiene and cost effective growth. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Canada | Micro 1.2mm | Salmonids | Fingerlings | Extruded Pellets | A premium all fishmeal/oil freshwater diet. Results in excellent raceway hygiene and cost effective growth. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Canada | Transfer (1.5, 2.0 and 3.0mm) | Salmonids | Fingerlings, Smolts | Extruded Pellets | Premium smolt feed used to prepare fish for transfer to salt water OR when combating stressors. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Canada | Pacific (1.2, 1.5 and 2-9mm) | Salmon, Trout, Coho | Fry Fingerlings Grower | Extruded Pellets | High protein and moderate fat diets. Blend of premium fish meals and select alternative proteins. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Canada | Vita (1.5, 2-9mm) | Salmon, Trout, Bass, Sturgeon | Fry Fingerlings Grower | Extruded Pellets | Moderate protein and low fat with fishmeal and highly digestible alternative ingredients. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Canada | Calform (2-9mm) | Salmon Trout Bass | Fingerlings Grower | Extruded Pellets | Floating/slow sinking feed. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Canada | Natura (#0, #1, #2) | Pink & Chum Salmon | Hatchery Fry | Crumbles | High quality fish oil, low tem fish meals and select alternative ingredients. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Canada | Brood (5,7,9 and 10.5mm) | Salmon Trout | Feed 10 months prior to egg take | Extruded pellets | Nutritionally optimized fatty acids, fishmeal based diet. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Chile | EWOS micro (018, 075, 2) | Salmonids | Hatchery Fry | Sphere-izer Agglomeration System feed (SAS) | A comprehensive and complete range of hatchery diets from first feeding to fry. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Chile | EWOS Transfer (5,15,50,100,200) | Salmonids | Fry Smolt | Extruded Pellet | A comprehensive and complete range of hatchery diets from fry to pre-transfer. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Norway | EWOS fry (5P, 15P) EWOS smolt (30P, 50P) | Salmonids | Hatchery Fry Smolt | Extruded Pellets | A comprehensive and complete range of hatchery diets from first –feeding to pre-transfer. | WEBSITE CONTACT |
| EWOS/Cargill Aqua Nutrition Scotland | EWOS micro (5P, 15P, 30P, 50P) | Salmonids | Hatchery Fry Smolt | Extruded Pellets | A comprehensive and complete range of hatchery diets from first –feeding to pre-transfer. | WEBSITE CONTACT |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|-------------------------------------|--|---------------------|--------------------------------------|----------------------------|--|------------------|
| Frozen Ocean FROZEN OCEAN | Frozen Marine Polychaetes | Shrimp, Marine fish | Broodstock | Whole, frozen | Frozen Ocean marine polychaetes (sea worms) have been sterilized and certified as free of virus. They are blast frozen to ensure the highest retention of nutrients. Their high concentration of Omega-6 and Omega-3 fatty acids provides an excellent source of nutrients. They also have significant amounts of proteins, lipids, DHA, EPA, and vitamins E and C. | WEBSITE |
| Frozen Ocean FROZEN OCEAN | Frozen Copepods | Shrimp, Marine fish | Larvae, PL., Fry Nursery, Broodstock | Whole, frozen | Frozen Ocean copepods have been sterilized, analyzed, and certified as free of virus, and they have a low content of water. Copepods are a proven substitute for up to 50 % of the consumption of Artemia cysts. | WEBSITE |
| Frozen Ocean FROZEN OCEAN | Frozen Artemia Biomass | Shrimp, Marine fish | Larvae, PL., Fry Nursery, Broodstock | Whole, frozen | Artemia biomass has been sterilized and certified as free of virus. It has a low content of water and is uniform in size. | WEBSITE |
| Gold Coin Biotechnologies SDN BHD | ENCAP® (Zoeal, Mysis, Early Post Larvae, Late Post Larvae) | Shrimp | Larvae Feed | Micro-encapsulated | ENCAP® products are microencapsulated with ingredients of the highest quality and digestibility. With our process being carried out at low temperature where minimum heat is involved, there is minimal nutrient loss. When used in hatcheries, the product also display the following advantages: simplicity to use, minimum water pollution, minimal feed wastage, controlled buoyancy, high attractability and faster growth to larvae. | WEBSITE |
| Gold Coin Biotechnologies SDN BHD | MPF (Early Post Larvae) (Late Post Larvae) | Shrimp | Larvae Feed | Micro-particulated | Microparticulated feed is formulated based on the highly specialized feeding habits of the post larvae. Highly digestible marine proteins are used to allow the young post-larvae's alimentary canal assimilate these important nutrients. | WEBSITE |
| Gold Coin Biotechnologies SDN BHD | HiPro (Early Post Larvae) (Late Post Larvae) | Shrimp | Larvae Feed | Powder | Minimal feed wastage promotes strong attractant for consumption and prolonged feed uptake by larvae. This product is simple to use; just add straight into the rearing tanks . | WEBSITE |
| Gold Coin Biotechnologies SDN BHD | GCMAT-SH1 Broodstock and Maturation Feed | Shrimp | Broodstock | Maturation diet powder mix | Mix the maturation powder mix with water at hatchery level to prepare semi-moist feed to reduce usage of live and fresh foods and lowers the bio-security risks associated with those. This feed contains high level of marine proteins, vitamins, omega-3 PUFAs and highly digestible ingredients for fast growth. | WEBSITE |
| Gold Coin Biotechnologies SDN BHD | VT Gold | Shrimp | Broodstock | Semi-Moist Pellet | VT Gold is a ready-to-use shrimp maturation feed supplemented with immune stimulants to improve shrimp resistance to disease and reduce biosecurity risks. It contains premium quality and high level of marine proteins, vitamins, omega-3 PUFAs and other nutritional and digestible ingredients that promotes fast growth and good ovary maturation. | WEBSITE |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|---|------------------|---------|------------------------|--------------------|--|--------------------|
|  Inve Aquaculture | O.range | Fish | Larvae up to juveniles | Crumbled dry feed | The ultimate marine fish dry diet range. Consists of 4 diets that perfectly fit the fish's nutritional needs throughout the different hatchery stages. Optimal HUFA and DHA/EPA profiles. Excellent stability and floatability. Formulated using only top quality raw ingredients. | WEBSITE CONTACT |
|  Inve Aquaculture | Fish Breed-M | Fish | Broodstock | Powdered | A consistent, high quality powdered concentrate for moist broodstock feeds. Decreases or eliminates the use of fresh fish feed, thus reducing risk of infection. Optimizes productivity while offering consistent spawning and fertilization rates. | WEBSITE CONTACT |
|  Inve Aquaculture | Lansy Breed | Fish | Broodstock | Pellets | Soft pellets that enhance the nutritional quality of the offspring and provide a more predictable output. Allows for better and increased egg production. Available in 8, 12 or 24 mm pellets. | WEBSITE CONTACT |
|  Inve Aquaculture | NRD | Fish | Larvae up to juveniles | Crumbled dry feed | Top performance dry diet range for marine fish. One diet line for the co-feeding, weaning, post-weaning, nursery and pre-ongrowing stages. | WEBSITE CONTACT |
|  Inve Aquaculture | BREED-S FRESH | Shrimp | Broodstock | Semi-moist pellets | Pioneering, soft shrimp maturation diet with fresh marine ingredients. Replaces up to 70% of the fresh feed. Offers full-biosecurity, a consistent nutritional quality and superior egg quality while boosting the spawning performance. | WEBSITE CONTACT |
|  Inve Aquaculture | EPAC | Shrimp | PL | Crumbled pellets | Post-larval shrimp feed range for low cost applications. NEW formula that includes more marine proteins and lipids, offers better water stability and increased palatability and attractiveness to the PLs. Maintains a clean and healthy rearing environment while allowing a reliable output of robust PLs. | WEBSITE CONTACT |
|  Inve Aquaculture | FRIPPAK FRESH | Shrimp | Larvae | Micro-encapsulated | A range of advanced larval shrimp feeds. Minimizes <i>Artemia</i> consumption, offering the best balance between live food and formulated diets. Contains high levels of fresh and natural ingredients. Offers higher survival rates and shorter production cycles. Now with NEW formulas for #2 CD and #3 CD. | WEBSITE CONTACT |
|  Inve Aquaculture | FRIPPAK PL FEEDS | Shrimp | PL | Crumbled | High quality diet range for post-larval shrimp. Complementary with our FRIPPAK FRESH range for the larval stages. Minimizes <i>Artemia</i> consumption and produces the best quality PLs. Increases survival rates. | WEBSITE CONTACT |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|--|----------------------------|---------|------------------------------|---|---|--------------------|
| Inve Aquaculture  | LANSY-Shrimp | Shrimp | Larvae PL | Micro-encapsulated, crumbled and flaked | A range of high quality dry diets covering all hatchery stages. Replaces at least 40% of the <i>Artemia</i> needs. Manufactured according to the highest sanitary standards, ensuring consistent survival and uniform growth. Excellent buoyancy and water stability. | WEBSITE CONTACT |
| Inve Aquaculture  | VANNA (China only) | Shrimp | Larvae PL | Micro-encapsulated, crumbled and flaked | A performing diet range for economic <i>vannamei</i> larviculture. Highly nutritional, well balanced formulation. Largely reduces the use of live algae and Artemia. Produces strong, healthy PLs. Non-GMO. | WEBSITE CONTACT |
| Lucky Star | Initial | Fish | Larvae | Micro-encapsulated | Nutritionally balanced to satisfy the requirements of marine fish species. Slow sinking to maximize feed availability and avoid feed loss. High levels of digestible protein, utilizable lipids, cholesterol and vitamins. Effective co-feed with rotifer, artemia and micro algae. | WEBSITE |
| Lucky Star | MP Enhance | Fish | Larvae | Formulated particle | Extrusion micro-particulate granule which offers an economical choice. Effective co-feed with rotifer, microalgae and <i>artemia</i> . | WEBSITE |
| Lucky Star | Micro Elite | Shrimp | Larvae | Encapsulated | Micro Elite shrimp larval feed is processed by the most advanced encapsulated technology with the following characteristics: Excellent feed buoyancy in water column to maximize feed availability. Encapsulated granules extending water stability and minimize nutrition leaching. Balanced fatty acid profile. | WEBSITE |
| Lucky Star | Brine shrimp flake | Shrimp | Larvae | Flake | Lucky Star brine shrimp flake is delicately formulated to satisfy the nutritional requirements of quality shrimp larvae. | WEBSITE |
| Epicore/ MEGASUPPLY  | Epilite Z, M, PL | Shrimp | Larvae Post larvae | Liquid | EPIILITE is a unique range of advance technology liquid larval hatchery feeds that provide superior hatchery nutrition and cause fewer pollution problems than traditional dry feeds. | DATASHEET |
| Epicore/ MEGASUPPLY  | Epifeed LHF 1, 2, 3 | Shrimp | Larvae Post larvae | Liquid | EPIFEED LHF is a unique range of advance technology high concentration liquid larval hatchery feeds that provide superior hatchery nutrition and cause fewer pollution problems than traditional dry feeds. | DATASHEET |
| Epicore/ MEGASUPPLY  | Epibal 300, 500, 700, 1200 | Shrimp | Post larvae Nursery Raceways | Granular | EPIBAL is a range of high energy granular hatchery feeds for post larval shrimp. | DATASHEET |
| Epicore/ MEGASUPPLY  | EpifeedMBF | Shrimp | Broodstock | Pellet | EPIFEED-MBF is a specially formulated dry diet that provides excellent nutrition for maintaining prolific spawners and for improving reproductive performance. It represents an enormous step towards a bio-secure system in all production areas by replacing fresh natural feed. | DATASHEET |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|--|--|---------------------|-----------------------|---|---|------------------------|
| Epicore/ MEGASUPPLY  | Epifeed Black Artemia Flake | Shrimp | Larvae Post larvae | Flake | EPIFEED ARTEMIA BLACK FLAKE is a high quality flaked hatchery feed for post larval shrimp. Its high-energy nutritional profile enhances animal health and growth. | DATASHEET |
| Epicore/ MEGASUPPLY  | EPIFEED DRY 150 | Shrimp | Larvae Post larvae | granular | EPIFEED DRY 150 is a high energy granular hatchery feeds for Zoea to early post larval shrimp. | DATASHEET |
| Pacific Trading Aquaculture | Otohime | Fish | Larvae | Granulate | Otohime is made from highly selected raw materials with easily digested protein and high quality lipids to promote the vitality of fish larvae, sizes 75mu to 1400mu. Amazing cleanliness, excellent dispersibility on water surface and ideal sinking speed, this is considered the premium Japanese larval diet around the world. | DATA SHEET |
| ProChaete Innovations Ltd | Larvae Feeds 1 – 5 Sizes are from < 100 micron up to 1000 micron. | Shrimp | Larvae | | The core protein source is polychaetes, but other marine raw materials are also present in the product. The feed is produced in an extrusion and spherizing process. It provides an excellent route to reducing the use of Artemia in the first feeding process. | DATASHEET |
| ProChaete Innovations Ltd | Complete Maturation Feed | Shrimp | Broodstock | Extruded | ProChaete CMF pellets can be used in addition to fresh / frozen products, or as a complete diet, meaning that the farmer would not need to hold stocks of other types of feed. | DATASHEET |
| ProChaete Innovations Ltd | Semi-Moist Maturation feed | Shrimp | Broodstock | Extruded | ProChaete has developed a unique product which has Semi Moist properties and is soft in texture, giving a feed which is highly nutritious and palatable. It's designed to be fed to shrimp along with squid, either at the same time, or as an additional meal during the day. | DATASHEET |
| ProChaete Innovations Ltd | Frozen worms | Shrimp | Broodstock | | | |
| ProChaete Innovations Ltd | Grow-out Feed | Shrimp | PL | Extruded | Our in-house research has led to the development of three targeted grow-out diets: SGO 35% 1mm & 1.8mm, plus SGO 30% 2.4mm. | DATASHEET |
| Reed Mariculture  | Instant Algae TP 1800 | Shrimp, Bivalves | All life stages | Single-species Microalgae, 8% dry-weight;. Refrigerated liquid concentrate; no blending required. | Always available. TP 1800 can be used to replace live algae production, augment existing production during peak season, or to have available in case of a culture crash. <i>Thalassiosira pseudonana</i> is high in DHA and EPA and works fabulously for shrimp and bivalves at all stages. | WEBSITE CONTACT |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|--|-------------------------------------|--|--------------------------------------|---|---|--|
| Reed Mariculture  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> Distributor to the Americas | Otohime Larval Weaning Diets | Finfish Larval Weaning Diet | High quality dry larval weaning diet | Pellets: Granular, Marumerized and Extruded | Otohime Larval Weaning Diets from Japan provide superior nutrition for juvenile and adult fish. They are amazingly clean with excellent particle integrity in water, provide optimal nutrition and stimulate a strong feeding response for improved growth and survival rates. A balanced diet suited for virtually all finfish. | WEBSITE (Otohime) WEBSITE CONTACT |
| Reed Mariculture  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | APBreed TDO | Finfish Pelletized Feed/ Weaning Diet | High quality dry diet | Pellets: Granular and Extruded | TDO is the top-selling hatchery larval finfish diet "top dressed" with <i>Haematococcus</i> (astaxanthin source), natural feed stimulants, a natural immune-stimulant, and more! Prime source of easily digested proteins and high quality lipids with an excellent HUFA and phospholipid profile. High in the carotenoid astaxanthin for color enhancement. | WEBSITE (AP Breed) WEBSITE CONTACT |
| Skretting USA | Starter Crumble | Trout and Steelhead | First feeding Fry | Extruded crumbles | Starter Crumble is a nutrient rich, crumbled starter feed suitable for Trout, Steelhead and a range of other cold and warm water species. Starter Crumble is produced from a highly digestible, extruded pellet | MORE INFORMATION CONTACT |
| Skretting USA | Protec Crumble | | | Extruded crumbles | Protec Crumble, our most advanced feed formulation, is a diet that promotes fish health and should be fed prior to and during stressful periods for your fish. Protec Crumble contains beta-glucans, nucleotides elevated levels of vitamins and minerals. | MORE INFORMATION CONTACT |
| Skretting USA | Classic Fry | Trout and Steelhead | Parr | Extruded pellets | Classic Fry, previously called Extruded Steelhead, is a medium-energy, extruded sinking or floating fry diet. Classic Fry is specifically formulated to achieve good growth and healthy fry. | MORE INFORMATION CONTACT |
| Skretting USA | Oncor Fry | Trout and Steelhead | Parr | Extruded pellets | Oncor Fry is Skretting USA's best diet for Trout and Steelhead fry, formulated to ensure good water stability, excellent growth and low FCR. Oncor Fry has a higher level of digestible protein and higher energy content than Classic Fry to ensure that your fish get off to the best | MORE INFORMATION CONTACT |
| SPAROS Lda  sparos <small>I&D nutrition in aquaculture</small> | WIN Flat ^{plus} | Premium weaning microdiet for Flatfish | Larvae, Nursery | Micro-encapsulated, Extruded | WIN Flat ^{plus} is produced using advanced technologies of microencapsulation and low-shear extrusion. This combination allows creating microparticles with a high digestibility and stability in water. SPAROS larval feeds contain a large fraction of soluble proteins, n-3 HUFA's and marine phospholipids, vital nutrients for an enhanced performance of first-feeding larvae. | Contact Sparos to get a product sheet WEBSITE |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|---|--|-----------------------------|----------------|---------------------------------------|---|--|
| SPAROS Lda  | BROODFeed BROODFeed ^{Lean} | Marine fish | Broodstock | Dry Extruded | HATCHERY FEEDS by Sparos™ broodstock products meet nutritional requirements at specific stages of sexual maturation resulting in optimal fecundity and egg quality, while maintaining fish health. Feeds contain highly digestible marine protein sources, enhanced levels of arachidonic acid and other HUFAs, marine phospholipids, vitamins, minerals, nucleotides and natural antioxidants including carotenoids. | Contact Sparos to get a product sheet WEBSITE |
| SPAROS Lda  | WIN Fast | Fast growing marine fish | Larvae | Cold-extrusion and microencapsulation | A premium weaning microdiet for fast growing marine fish larvae, WIN Fast is produced by cold-extrusion and microencapsulation technologies to preserve nutrients and guarantee high water stability. It is nutritionally balanced for maximum growth and improved stress/disease resistance. A knowledge-based microdiet developed through a 3-year research project. | Contact Sparos to get a product sheet WEBSITE |
| Tromso Fiskeindustri  | Aglonorse | Fresh water and marine fish | Larvae and fry | Agglomerated | Agglomerated larval diet, formulated with marine ingredients with high digestibility. Designed and formulated to, minimize the use of artemia. An excellent early weaning diet for marine, fresh and ornamental fish larvae. | WEBSITE CONTACT |
| Tromso Fiskeindustri  | Aglonorse | Fresh water and marine fish | Larvae and fry | Agglomerated | Agglomerated larval diet, formulated with marine ingredients with high digestibility. Designed for co-feeding with artemia. An excellent weaning diet for marine, fresh and ornamental fish larvae. | WEBSITE CONTACT |
| Zeigler | EZ Artemia | Shrimp | Larvae, PL | Micro-capsule | 100% Artemia Replacement formulated as a complete balanced diet to mimic the color, taste, texture, and nutritional value of Artemia nauplii. | DATA SHEET |
| Zeigler | EZ Larva | Shrimp | Larvae, PL | Micro-capsule | Premium Liquid Larval Diet designed to produce high quality PLs and maintain excellent water quality. Contains algae, pigments, and high HUFA content. | DATA SHEET |
| Zeigler | Larva Z Plus | Shrimp | Larvae, PL | Micro-particle | Premium Dry Larval Diet scientifically and commercially proven to produce the highest quality PLs. Contains algae, pigments, and high HUFA content. | DATA SHEET |
| Zeigler | Larva Esencial | Shrimp | Larvae, PL | Micro-particle | Dry Larval Diet designed to promote fast growth while maintaining water quality in larval rearing systems. Contains pigments and HUFAs from marine sources. | DATA SHEET |
| Zeigler | Larva AP-100 | Shrimp, Fish | Larvae, PL | Micro-particle | Dry Larval Diet nutritionally balanced for marine larvae. Contains pigments and HUFA's from marine sources. | DATA SHEET |

| SUPPLIER | PRODUCT NAME | SPECIES | LIFE STAGE | FORM | DESCRIPTION | MORE INFORMATION |
|----------|----------------------------|---------|------------|----------------------|---|------------------|
| Zeigler | Shrimp Starter | Shrimp | PL | Crumble | A complete nutrition alternative for feeding post larvae. A high protein, nutrient dense diet fortified with vitamin packs and pigments to enhance survival and growth. | DATA SHEET |
| Zeigler | PL Raceway Plus | Shrimp | PL | Crumble | Complete, premium diet for Nursery and Raceway systems that is proven to yield larger, more robust and healthier animals for stocking in ponds. Contains pigments and high levels of HUFAs from marine sources. | DATA SHEET |
| Zeigler | Brine Shrimp Flake – Red | Shrimp | PL | Flake | Highly digestible flake diet formulated for <i>P. monodon</i> with special pigments added for preferred coloration of the larval rearing tank. Contains high quality brine shrimp. | DATA SHEET |
| Zeigler | Brine Shrimp Flake - Black | Shrimp | PL | Flake | Highly digestible flake diet for coloration of the digestive track in <i>L. vannamei</i> . Contains high quality brine shrimp and algae for a nutritionally balanced formula. | DATA SHEET |
| Zeigler | EZ Black | Shrimp | PL | Micro-particle Flake | Micro-particle flake diet for coloration of the digestive track in <i>L. vannamei</i> . Contains high quality brine shrimp. | DATA SHEET |

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The best

BALANCE

New FRIPPAK® FRESH *Gold*

Maximize your profits with the proven best balance between live feed and dry diets.*



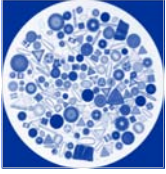
Available diets:

- #1 CAR
- #2 CD
- #3 CD

* as shown in lab-scale experiments large commercial culture runs (> 2 billion fry per year) in Mexico, Nicaragua and Vietnam.

For more information, contact your local INVE Aquaculture representative.







ENRICHMENTS & SUPPLEMENTS

| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|------------------------------|--------------|---|--|---|---|------------------|
| Algal Scientific Corporation | Algamune AM | Finfish, shrimp | Algae meal supplement naturally containing beta 1,3 glucan | Dried and milled micro-algae meal in bags | Algamune AM is a dried, milled microalgae meal produced from pure culture. It contains 50% beta 1,3 glucan as well other essential nutrients. Algamune can be included in all types of larval feeds or added directly to tank water for suspension feeders. | DATASHEET |
| Algal Scientific Corporation | Algamune AP | Shrimp, shellfish, rotifers, <i>Artemia</i> , filter-feeding fish | Algae paste with beta 1,3 glucan | Refrigerated or frozen bags (nominally over 20% solids) | Algamune AP is a wet microalgae paste harvested from pure algal culture. It contains 50% beta 1,3 glucan as well other essential nutrients. Algamune can be added directly to culture water for enrichment of live food organisms or fed directly to target species. | DATASHEET |
| Aller Aqua | ALLER ARTEX | Fish | Larvae Fry Nursery | Crumbles | ALLER ARTEX is the best solution for full or partial substitution of live <i>Artemia</i> to young fry in the early stages after hatching. A natural feeding solution for fry, the feed has high palatability which is immediately ingested and consequently not polluting the water. | WEBSITE |
| BernAqua – <i>InVivo NSA</i> | Red Pepper | Fish | Enrichment | Stable Emulsion | Red Pepper is a complete enrichment product for rotifers and <i>Artemia</i> . Red Pepper contains, besides essential fatty acids, the most important nutrients. The level of Vitamin C included is unique on the market. Red Pepper is also containing chelated trace minerals and immuno-stimulants. Red Pepper disperses easily. All nutrients are well protected so as not to leach. | WEBSITE |
| BernAqua – <i>InVivo NSA</i> | Oliow3 | Fish | Enrichment | Stable Emulsion | Oliow3 is a stable emulsion based on refined fish oils, stabilized with carefully selected emulsifiers. Oliow3 is also enriched with Vitamins E and C that are acting as anti-oxidants in the body of the fish larvae. Oliow3 is readily forming a uniform and stable emulsion of lipid droplets, filtered efficiently by rotifers or <i>Artemia</i> . | WEBSITE |
| BernAqua – <i>InVivo NSA</i> | ω3Algae | Fish | Micro-algae | Powder | ω3Algae is only composed of a selected blend of <i>Chlorella</i> Algae. The processing ensures the preservation of all nutritional characteristics and the total elimination of all bacteria and viruses. ω3Algae is easy to use, reaching complete cell separation in just a few minutes of blending. The suspension remains remarkably stable in water. | WEBSITE |

| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|---|----------------------|--------------------------|------------------------------------|------------|---|--------------------|
| BernAqua – <i>InVivo NSA</i> | ω3Yeast60 | Fish | Rotifer Feed | Powder | ω3Yeast60 is a selected yeast-strain, not genetically modified. ω3Yeast60 is presenting the highest levels of protein associated with EFA and vitamin C levels comparable to the highest levels found in live micro algae. No oils are mixed or top coated on the yeast. ω3Yeast60 can support fast growth at high densities for long period of time, without presenting the risk of rotifer degeneration or culture crashes. | WEBSITE |
| BernAqua – <i>InVivo NSA</i> | Royal Pepper Protein | Shrimp | Booster / Micro-bial | Suspension | Royal Pepper Protein is a high quality shrimp supplementary liquid feed aimed at improving health and stress resistance. Royal Pepper Protein is used throughout the larval cycle, and fences off Zoea syndrome and Post Larvae stress. | WEBSITE |
| BioMar | LARVIVA Multigain | Rotifers Artemia | Enrichment | | Complete dry formula to enrich live feed with all nutrients required by marine larvae or other first feeding species. | DATASHEET |
| Industrial Plankton | PBR 1000L | Marine Fish Shellfish | On site algae production equipment | Live Algae | Fully automated equipment produces live algae on site for hatchery feed. 1000L tank, self cleaning and sterilizing, automated harvesting, UV sterilization, user friendly touch screen controls. Requires 4'X4'X7' space. | DATASHEET |
| Inve Aquaculture  | S.presso | Fish | Live food enrichment | Liquid | Complete liquid enrichment for <i>Artemia</i> and rotifers. Innovative suspension/emulsion technology that performs in different conditions and densities. | WEBSITE CONTACT |
| Inve Aquaculture  | S.tream | Fish | Rotifer diet | | Semi-continuous rotifer culture diet with superior performance. Easy to adapt to any previous equipment, it is clean, easy and quick to use. Cost-effective, can be used from 2000 up to 8000 rotifers per ml. | WEBSITE CONTACT |
| Inve Aquaculture  | S.parkle | Fish | Rotifer diet | Liquid | Sparkling clean batch diet for a consistent, performing rotifer culture. Allows re- inoculation up to 50 consecutive generations. Cost-effective and easy to use as it is designed to reduce the workload providing short and highly productive runs. | WEBSITE CONTACT |
| Inve Aquaculture  | EASY SELCO | Fish | <i>Artemia</i> enrichment | Liquid | The original, easy to use liquid enrichment for <i>Artemia</i> . Easy preparation: no mixing needed. Easy application: 1 single dose is possible. Easy storage: enhanced temperature stability. | WEBSITE CONTACT |
| Inve Aquaculture  | A1 DHA SELCO | Fish | <i>Artemia</i> enrichment | Liquid | All-in-one liquid <i>Artemia</i> enrichment. Enriches up to 500 nauplii per ml. Optimal DHA inclusion and increased levels of natural marine phospholipids. Bacterial control during the enrichment cycle while ensuring increased survival rate of the fish larvae. | WEBSITE CONTACT |

| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|--|-------------------|----------------|---|--------|---|--------------------|
|  Inve Aquaculture | DHA PROTEIN SELCO | Fish | Rotifer enrichment | Liquid | All-in-one powdered enrichment for rotifers with an optimal DHA/EPA ratio. Ensures a high nutritional value and allows continued rotifer growth during the enrichment process. Makes for increased survival rates of the fish larvae while reducing the number of deformities. | WEBSITE CONTACT |
|  Inve Aquaculture | Sanocare SURE | Fish | | Liquid | Water conditioner for improved rotifer quality. Improves survival rate of the fish larvae, increases the coloration of the rotifers and thus also the attractability for the fish. | WEBSITE CONTACT |
|  Inve Aquaculture | Sanocare ACE | Fish | | Liquid | Water conditioner for improved <i>Artemia</i> quality. Increases the quality and vitality of hatched, concentrated and stored <i>Artemia</i> nauplii. Stabilizes pH levels and avoids foaming off during hatching, enrichment or storage. | WEBSITE CONTACT |
|  Inve Aquaculture | Sanolife MIC-F | Fish | | | Microbial mixture for disease control, gut microflora colonization and water quality improvement in fish hatcheries. Inhibits a number of pathogenic bacteria. Produces enzymes and degrades waste. Colonizes the digestive tract and improves growth and survival rates. | WEBSITE CONTACT |
|  Inve Aquaculture | Sanolife GWS | Fish | | | Green water conditioner for larval fish rearing. Replaces up to 100% of the live algae while maintaining the rotifer quality inside the tank. Improves water quality and microbial flora. Diffuses light inside the tank, reducing the stress levels of the fish. | WEBSITE CONTACT |
|  Inve Aquaculture | Sanoguard S-PAK | Shrimp | | | Health booster for shrimp, for improved resistance to stress and diseases. Strengthens the immune system and health. Facilitates recovery after a period of stress. Improves survival and growth rates. | WEBSITE CONTACT |
|  Inve Aquaculture | Sanolife MIC | Shrimp | | | Microbial mixture for disease control and improved water quality in shrimp hatcheries. Inhibits <i>Vibrio</i> and other pathogenic bacteria. Produces enzymes and degrades waste. Colonizes the digestive tract. Produces strong PLs while improving survival and growth rates. | WEBSITE CONTACT |
| Lucky Star | Nutri - HUFA | Fish Shrimp | <i>Artemia</i> / Rotifer enrichment | Fluid | Lucky Star Nutri – HUFA is an <i>Artemia</i> /Rotifer enrichment product which consists of essential unsaturated fatty acids that are desirable by marine fish and shrimp larvae. | WEBSITE |





| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|--|--------------------|-------------------------------------|------------------------------|--------|---|------------------|
| Epicore/ Megasupply  | EPICIN G2 Hatchery | Shrimp / marine and freshwater fish | Probiotic for hatchery water | Powder | EPICIN-G2 is a natural microbial ecosystem with added stabilizers and growth stimulants for detoxifying aquaculture hatchery water. It eliminates water-fouling waste products such as ammonia, nitrites and hydrogen sulfide, thereby lowering stress and providing a healthier environment for aquatic animal growth. It also improves animal health and disease resistance by creating a probiotic environment. | DATASHEET |
| Epicore/ Megasupply  | EPICIN G2 DFM | Shrimp / marine and freshwater fish | Direct Fed probiotic | Powder | EPICIN-G2 DFM is a natural microbial ecosystem with added stabilizers and growth stimulants. It eliminates water-fouling waste products such as ammonia, nitrites and hydrogen sulfide, thereby lowering stress and providing a healthier environment for aquatic animal growth. It also improves animal health and disease resistance by creating a probiotic environment. When applied to feed at the feed mill, EPICIN-G2 DFM is especially effective in improving FCR and reducing secondary pathogen mortality in viral weakened shrimp. | DATASHEET |
| Epicore/ Megasupply  | EPICIN HOD | Shrimp / marine and freshwater fish | Probiotic | Powder | EPICIN-HOD Hatchery Organics Digester is a natural microbial ecosystem for detoxifying the tank environment in aquaculture hatcheries by mineralizing and bio remediate solid organic waste and detritus, which usually settles on the tank bottom. The biologic catalysts of EPICIN-HOD Hatchery Organics Digester immediately start the process of digesting accumulated organic matter; these microorganisms have been specially selected due their ability to produce a wide variety of powerful enzymes to decompose the different organic wastes produced in the larviculture tanks. It also improves animal health and disease resistance by creating a probiotic environment; EPICIN-HOD Hatchery Organics Digester is fortified with unique accelerators to increase the microbial action. | DATASHEET |

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| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|--|--------------------------------|---|--|--|---|------------------|
| Epicore/ Megasupply  | Epicin Ponds | Shrimp Marine and freshwater fish | powder | Biological Aquaculture Pond Water Treatment | EPICIN-Ponds is a natural microbial ecosystem with added stabilizers and growth stimulants for detoxifying aquaculture grow-out ponds. It eliminates water-fouling waste products such as ammonia, nitrites and hydrogen sulfide, thereby lowering stress and providing a healthier environment for aquatic animal growth. It also improves animal health and disease resistance by creating a probiotic environment. | DATASHEET |
| Epicore/ Megasupply  | EpicinPST | Shrimp Marine and freshwater fish | powder | Biological Aquaculture Pond Soil Treatment | EPICIN-PST pond soil treatment is a specially formulated biological and biochemical system designed to accelerate the biological decomposition of highly fouled aquaculture pond soil. It is a natural microbial ecosystem to inoculate the soil wastes and start the bioremediation process. It also is fortified with unique accelerants to speed the microbial action. | DATASHEET |
| Epicore/ Megasupply  | Epizym AGP- Complete | Marine and freshwater microalgae | liquid | Algae Growth Media for Pure and Indoor cul- tures | EPIZYM-AGP-C is a complete concentrated medium for producing high levels of nutritious marine algae and other phytoplankton used for feeding shrimp and other marine animals. It is a one-pack, liquid version of the Guillard's f/2 medium with added cellular growth stimulants. | DATASHEET |
| Epicore/ Megasupply  | Epizym AGP (M) | Marine and freshwater microalgae | liquid | Algae Growth Media For Large and Outside Culture Tanks | EPIZYM-AGP-M is a concentrated medium for producing high levels of nutritious marine algae and other phytoplankton used for feeding shrimp and other marine animals. It is a one-pack, liquid version of the trace elements, micro-nutrients, vitamins and minerals of the Guillard's f/2 medium with added cellular growth stimulants. | DATASHEET |
| Pacific Trading Aquaculture | Super Fresh Chlorella SV-12 | Fish Rotifers | Rotifer diet green-water technique | Fresh live chilled liquid | Super Fresh Chlorella SV12 has been developed in Japan especially for Rotifer cultivation. Each cell contains DHA, EPA and Vitamin B-12 ensuring optimal enrichment. Delivered live and fresh within 5 days of order and is considered a vital cornerstone of RELIABLE stable high and low density rotifer cultivation. | DATASHEET |
| Pacific Trading Aquaculture | Emerald | Rotifers | Rotifer diet | Powdered | <ul style="list-style-type: none"> • Spray dried fine Chlorella powder • Axenic culture production (Patented process) • Economical • Designed for high and low density rotifer cultivation • Long shelf life • Stable production | DATASHEET |

| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|---|--|--|---|--|---|--------------------|
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae Isochrysis 1800 | Finfish Zooplankton and Artemia enrichment, Bivalve Shellfish Shrimp | Single-species Microalgae, 8% dry weight | Refrigerated liquid concentrate; no blending required | Always available. Isochrysis 1800 can be used to replace live algae production, augment existing production during peak season, or to have available in case of a culture crash. Isochrysis is high in DHA and often used to enrich zooplankton such as rotifers or Artemia. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae Nanno 3600 | Finfish as a rotifer feed or for greenwater | Single-species Microalgae, 18% dry weight | Frozen or Refrigerated liquid concentrate; no blending required | Nanno 3600 is our original high-yield rotifer feed. It is a single-species product (<i>Nannochloropsis</i>) and produces phospholipid-rich rotifers. It also provides a high Feed Conversion Rate with minimal organic waste, and gives an EPA and ARA pre-enrichment boost for use with high-DHA enrichment protocols. Store frozen for 2 years. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae Pavlova 1800 | Finfish Zooplankton enrichment; Bivalve Shellfish; Shrimp | Single-species microalgae, 8% dry weight | Refrigerated liquid concentrate; no blending required | Pavlova is a small golden/brown flagellate whose nutritional profile is very similar to Isochrysis . It is excellent for enriching rotifers and other zooplankton. Its sophisticated sterol composition makes it particularly popular in cold water fish hatcheries. Pavlova is very difficult to grow so it is not produced by many hatcheries. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae Tetraselmis 3600 | Finfish feed stimulant effect for zoo- plankton and Brine Shrimp; Bivalve Shellfish; Shrimp | Single-species microalgae, 18% dry weight | Frozen liquid concentrate; no blending required | Tetraselmis is a large green flagellate with a very high lipid level. It contains natural amino acids that stimulate feeding in marine animals. Tetraselmis increases fecundity in zooplankton, is a standard feed for many Bivalves, and is excellent for increasing growth rates and fighting "Zoea Syndrome" in larval Shrimp. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae TW 1200 | Finfish Zooplankton; Bivalve Shellfish; Shrimp | Single-species microalgae; 6% dry weight | Refrigerated liquid concentrate; no blending required | Thalassiosira weissflogii is a large diatom used in Shrimp and Bivalve Shellfish larviculture. Considered by many to be the single best algae for larval Shrimp, the large cell size (5 – 15 micron) extends the algae feeding period until the end of the PL stage. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae Shellfish Diet 1800 | Bivalve Shellfish; Ascidians/ Tunicates; Sea Urchins; Soft Corals; Brine Shrimp; and Copepods | Microalgal blend; 8% dry weight | Refrigerated liquid concen- trate; no blending required | Shellfish Diet 1800® is a mix of six marine microalgae that have all demonstrated success with a variety of Shellfish including Oysters, Clams, Mussels, and Scallops. Shellfish Diet can be used with pre-set larvae all the way up through broodstock as a complete live algae replacement . | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae RotiGrow <i>OneStep</i> | Finfish Zooplankton feed | Microalgal blend; >14.8% dry weight | Frozen liquid concentrate; no blending required | RotiGrow OneStep is a clean, high-yield, microalgal blend rotifer feed that maximizes balanced pre-enrichment levels of DHA, EPA and ARA. RotiGrow <i>OneStep</i> eliminates the secondary enrichment step for those fish with a higher DHA requirement at the larval stage. | WEBSITE CONTACT |

| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|--|--|--------------------------------|---|---|---|--------------------|
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae RotiGrow <i>Plus</i> | Finfish Zooplankton feed | Microalgal blend; >14.8% dry weight | Frozen liquid concentrate; no blending required | RotiGrow <i>Plus</i> is a clean, high yield rotifer feed that maximizes pre-enrichment levels of DHA, EPA and ARA. The essential first step in the RotiGrow System . Depending on the nutritional requirements of the fish larvae, it can be used as a stand-alone feed. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae RotiGrow <i>Nanno</i> | Finfish Zooplankton feed | Microalgal blend; >16.4% dry weight | Frozen liquid concentrate; no blending required | RotiGrow <i>Nanno</i> is a clean, high yield single species rotifer feed that produces phospholipids-rich rotifers. Our highest yielding feed, it provides the highest biomass conversion rate of our products, with the least organic waste in the tank. Gives a high EPA and ARA pre-enrichment boost for use with high DHA-enrichment protocols. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Chlorella Ltd. Chlorella V12 | Finfish Zooplankton feed | Live microalgae concentrate; 14% dry weight | Refrigerated algal concentrate – delivered fresh and alive | This Chlorella , grown in Japan, is a super fresh grow-out feed enriched with DHA using a patented methodology. It provides a moderate DHA, EPA and ARA enrichment (25mg/g HUFA pre-enrichment). It is naturally high in vitamin B-12, a nutrient necessary for larval health. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae RotiGreen <i>Omega</i> | Finfish Greenwater | Microalgal blend; 8% dry weight | Frozen liquid concentrate; no blending required | RotiGreen <i>Omega</i> is effective Greenwater with Optimum DHA, EPA & ARA nutrition for fish larvae as well as enrichment maintenance for rotifers in the larval tank. Marine microalgae concentrates stay extremely clean with excellent suspension in the tank. *RotiGreen <i>Omega</i> may require special care for larva with an inflating air bladder. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae RotiGreen <i>Nanno</i> | Finfish Greenwater | Microalgal blend; 8% dry weight | Frozen liquid concentrate; no blending required | RotiGreen <i>Nanno</i> balances DHA/EPA with ARA to optimally nourish fish and maintain the health of rotifers. Extremely clean, it offers excellent suspension in the water column. RotiGreen <i>Nanno</i> is as effective as live <i>Nannochloropsis</i> , and is replacing our Nanno 3600 for greenwater applications. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Algae RotiGreen <i>Iso</i> | Finfish Greenwater | Microalgal blend; 8% dry weight | Refrigerated liquid concentrate; no blending required | RotiGreen <i>Iso</i> is a pure algae formulation that is as effective as live. A highly nutritious greenwater when swallowed or gill fed by larvae, it can maintain or further increase the DHA/EPA ratio in your rotifers and larval fish to meet their nutritional requirements. Naturally high in the carotenoids necessary for larval health. | WEBSITE CONTACT |
|  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Zooplankton "Mini L 160" Live Rotifers | Finfish Live Larval Feed | Live zooplankton | A dense culture of live zooplankton packaged in 1 – 1.5 liters of salt water in breathable bags. | Reed Mariculture supplies pure cultures of a strain of <i>Brachionus plicatilis</i> (L-type) with a typical lorica length of about 160 µm. This species is euryhaline, capable of thriving in salinities of 5-40 ppt. It is available in quantities from 1 million to 1.5 billion, concentrated and packaged into "breathable" bags. | WEBSITE CONTACT |

| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|---|---|--------------------------------|--|--|---|---|
| Reed Mariculture  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | Instant Zooplankton <i>Parvocalanus crassirostris</i> Copepods | Finfish Live Larval Feed | Live Zooplankton | A dense culture of Live Zooplankton packaged in 1 – 1.5 liters of salt water in breathable bags. | Copepods are the feed of choice for wild marine finfish. <i>Parvocalanus crassirostris</i> is a small, pelagic calanoid copepod. The nauplii (newly hatched larvae) are small measuring in the 40-100 µm range, making them a suitable feed for small-gape fish larvae. Adults are in the 200 to 400 µm range. | WEBSITE CONTACT |
| Reed Mariculture  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | APBreed RGcomplete | Finfish Zooplankton Feed | Microalgal blend; 4.4% dry weight | Very stable refrigerated liquid concentrate; includes ammonia control; no blending required | RGcomplete is a super-concentrated microalgal-based premium quality feed for filter-feeding invertebrates. It has been sized especially for Breeders, Aquarists, and Propagators and includes both a pH buffer and ClorAmX® (ammonia neutralizer). It has a long refrigerated shelf life of at least six months. Suitable for a wide range of zooplankton with a balanced Omega profile. | WEBSITE (AP Breed) WEBSITE CONTACT |
| Reed Mariculture  Reed Mariculture <small>ENSURING HATCHERY SUCCESS</small> | APBreed SDAquarist | Shellfish, Corals | Microalgal blend; 4.4% dry weight | Very stable refrigerated liquid concentrate; includes ammonia control; no blending required | A mixed diet of four marine microalgae (<i>Isochrysis</i> , <i>Pavlova</i> , <i>Tetraselmis</i> and <i>Thalassiosira pseudonana</i>) that provides superior nutrition for all types of shellfish, crustaceans and other filter feeding invertebrates, increasing both growth rate and survival. Complete with ammonia control and buffered for a long refrigerated shelf life. | WEBSITE (AP Breed) WEBSITE CONTACT |
| Salem Microbes | Four Fish Slime & Sludge Buster | Fish | Water conditioner, Microbial enrichment | FREEZE DRIED | A super soluble blend as biofilter additive of non-pathogenic consortium of Bacillus Spp.to remove Slime and Bottom sludge. Keeps water devoid of suspended and settled wastes. Rapidly builds up favorable bacteria after chemical/drug treatments. High production of enzymes Amylase, Protease, Lipase, Cellulase, Xylanase, Gelatinase, Lignosulfonase removes all kinds of wastes. | DETAILS |
| Salem Microbes | Four Fish Ammonia Control | Fish | Water conditioner | LIQUID | Liquid blend of nitrifying bacteria designed to control ammonia and nitrite in breeding and display tanks, to seed biofilter for quick nitrification cycle. | DETAILS |
| Salem Microbes | Four Fish Oxygen Support Tablet | Fish | Oxygen support | Effervescent Tablets | Designed for improving the dissolved Oxygen levels in tanks, overcoming the sudden drop due to climate change or mechanical breakdown and during transport. | DETAILS |
| Salem Microbes | Seedone | Shrimp Hatchery | Microbial culture | Fully Soluble Powder | Instantly soluble, super-concentrated, probiotic blend for use in aquaculture hatcheries with high livability, adapts faster to a wide range of salinity and acts instantly. For use in Broodstock, Nauplii, Zoea, Mysis and Post Larvae stages. | DETAILS |

| SUPPLIER | PRODUCT NAME | SPECIES | PRODUCT TYPE | FORM | DESCRIPTION | MORE INFORMATION |
|--|-----------------------|----------------------|-------------------------|----------------|---|--------------------|
| Salem Microbes | Stressbeat | Shrimp Hatchery | Microbial Feed Additive | Powder | Isolates of "Bacillus" species and its cellular components. Promotes phagocytosis, improves hepatopancreas health and improves digestion in times of stress. | DETAILS |
| Salem Microbes | Encon | Shrimp Hatchery | Microbial enrichment | Liquid | Liquid blend capable of reducing ammonia and sulphide gas, minimizes the need for frequent water exchanges and ensures better bio security. | DETAILS |
| Tromso Fiskeindustri <small>TROMSO FISKEINDUSTRI A company in the Odd Berg Group</small> | Phosphonorse | Rotifers and artemia | Enrichment | Oil | A blend of phospholipids, marine oils, vitamins and carotenoids. Designed to boost the DHA content of rotifers and artemia, and give an excellent nutritional composition of the live prey. | WEBSITE CONTACT |
| Zeigler | EZ Bio | Shrimp | Larvae, PL | Powder | A multi-functional biologic treatment for use in shrimp and fish hatcheries . Used to lower risk from pathogenic bacteria and improve water quality. | DATA SHEET |
| Zeigler | EZ Mate | Shrimp | Maturation | Form into Worm | Partial replacement for fresh maturation foods to promote increased nauplii production and brood stock health. Completely biosecure and contains high levels of pigments, HUFA's, vitamins, and minerals. | DATA SHEET |
| Zeigler | Maturation Supplement | Shrimp | Maturation | Pellet | Promotes rapid ovarian development and increased mating in maturation systems. | DATA SHEET |
| Zeigler | Shrimp Broodstock | Shrimp | Broodstock | Pellet | Power-packed with special ingredients for stronger, healthier brood stock and improved reproductive performance. | DATA SHEET |

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R&D Services

| SUPPLIER | SERVICE | SPECIES | LIFE STAGE | FEED TYPE | DESCRIPTION | MORE INFORMATION |
|-------------------|---|---|---|--------------------|---|------------------|
| AquaBioTech Group | Aquatic nutrition R&D and aquaculture consultancy services | Barramundi, Catfish, Pike Perch, Salmon, Sea Bream, Sea Bass, Sturgeon, Shrimp, Tilapia, Trout etc. | Larvae, PL., Fry, Nursery, Broodstock | All kinds of feeds | The AquaBioTech Group is an international consulting company located in the centre of the Mediterranean on the island of Malta, although operating globally with clients and projects in over fifty-five countries. The AquaBioTech Group undertakes a variety of aquaculture, fisheries, marine surveying, aquarium and aquatic environmental projects throughout the world. | MORE INFORMATION |
| ABT Innovia | Aquatic nutrition & nutraceutical R&D. Novel protein testing; efficacy of dietary health and growth promoting supplements | Barramundi, Catfish, Pike Perch, Salmon, Sea Bream, Sea Bass, Sturgeon, Shrimp, Tilapia, Trout etc. | Larvae, PL., Fry, Nursery, Broodstock | All kinds of feeds | ABT Innovia offers research services to support the development of feed additives (pre- and pro-biotics, growth and health promoting feed additives) and alternative protein sources, among other activities, with a wide range of commercially important species under any combination of culture conditions in our fully licensed and bio-secure R&D facilities. | MORE INFORMATION |
| | Aquatic nutrition & nutraceutical R&D feed testing. Efficacy of dietary supplements. Efficacy of health products. | | | All types. | ABT Innovia offers research services to support the development of live feed enrichments, water treatment processes and products, algal products and production processes, among other activities, with a wide range of commercially important species under any combination of culture conditions in our fully licensed and bio-secure R&D facilities. | |
| Aqua UGent | Extensive R&D and consultancy services based on proprietary model systems in: <ul style="list-style-type: none"> • Nutritional research • Hatchery management • Microbial management • Morphological development • Aquatic veterinary medicine • Life cycle analysis • Genomics and breeding • Environmental monitoring | Rotifers (<i>Rotifera</i>), Brine shrimp (<i>Artemia</i>), White shrimp, Freshwater prawn, Bivalves, Tilapia, Pike perch and jade perch | Larvae, Post-larvae (shrimps), Fry, Adults (bivalves) | All kinds of feeds | We provide multidisciplinary expertise and innovations to facilitate your development and testing of live and compound feeds, raw materials, additives, probiotics ... | MORE INFORMATION |

| SUPPLIER | SERVICE | SPECIES | LIFE STAGE | FEED TYPE | DESCRIPTION | MORE INFORMATION |
|--|---|--|--|---|---|--|
| Cerulean Aquaculture Consulting | Feed and feeding strategy R & D, consultancy services | Finfish | All | All | Whether you are just starting or are looking to take the next step with your business, CERULEAN AQUACULTURE CONSULTING, LLC can help. Services range from industry assessment and on-farm problem solving to research design and grant-writing. | MORE INFORMATION |
| Nofima AS | Aquatic nutrition, R&D and aquaculture consultancy services | Mainly salmonids | Larvae, Fry Smoltification, Grow-out, Broodstock | All kinds of feeds for experimental use | Nofima offer the best solutions to develop and test new ingredients and feeds. We have extensive knowledge in technology and raw materials, and highly skilled scientists. Nofima provide research along the whole value chain, from feed ingredient to food for human consumption and market analyses. | MORE INFORMATION: NOFIMA NOFIMA Feed Technology Centre |
| SPAROS Lda  | Customized feeding trials. Expertise in: Nutrition, digestive physiology and metabolism Nutritional modulation of immune response Aquaculture farming systems Aquafeed processing technologies | Nile tilapia, Common carp, Rainbow trout, Gilthead seabream, European seabass, Meagre, Turbot, Senegalese sole | Larvae, PL., Fry Nursery, Broodstock | All kinds of feeds | SPAROS is a technology-driven SME dedicated to test and develop your products. We offer our experience to: • Evaluate the efficacy of your new products (ingredients, additives, feeds) on: growth performance; feed efficiency; digestibility; metabolism; immune and health status Dose response and tolerance trials with novel feed additives for registration dossiers. | MORE INFORMATION |
| SPAROS Lda  | Technology tests in aquafeeds Our technology platform comprises: • Twin-screw extruder • Low shear and temperature controlled extruder • Vacuum coater • Micropulverizer • Lab scale encapsulation • All other auxiliary manufacturing equipment | Nile tilapia, Common carp, Rainbow trout, Gilthead seabream, European seabass, Meagre, Turbot, Senegalese sole | Larvae, PL., Fry Nursery, Broodstock | All kinds of feeds | SPAROS' pilot-scale feed mill, can offer • Tailored feed formulation scenarios and the manufacture of experimental feed batches • Extrusion tests to assess the stability of your products to industrial processing conditions • Characterization of the effect of test products on the physical pellet properties (e.g., hardness, water stability, fat absorption, sinking speed). | MORE INFORMATION |

Help us make this Guide more comprehensive!

Do you use a hatchery feed R&D service that isn't listed? Please tell us so we can include it next time.

If you are a feed supplier and have not been listed, please contact us for inclusion in the next issue.

Email: editor@hatcheryfeed.com



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ABT Innovia

- see AquaBioTech Group

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Bio-Oregon

- see Skretting USA

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Epicore/Megasupply—See Megasupply

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