



# RESEARCH IN PROGRESS

# 1. PRIORITIES FOR LIVE FEED PRODUCTION AND RESEARCH IN TASMANIA

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The Tasmanian Aquaculture and Fisheries Institute (TAFI) conducts primary research into live feed production and mass produces feeds for a range of marine larvae. The research is undertaken at the School of Aquaculture in Launceston and the Marine Research Laboratories (MRL) in Hobart. Around 9 research scientists, 6 technicians and 16 post-graduate students study various aspects of live feed production or use live food in their research programs. Five groups of cultured live feeds are studied: microalgae, rotifers, brine shrimp, copepods and amphipods.

Live prey are used to cultivate a range of marine fish, crustaceans and molluscs including striped trumpeter (*Latris lineata*), sea horse (*Hippocampus abdominalis*), greenback flounder (*Rhombosolea tapirina*), damselfish (*Acanthochromis polyacanthus*), Tasmanian whitebait (*Lovettia sealii*), galaxids (*Galaxias maculatus*), blenny (*Parablennius tasmanianus*), black bream (*Acanthopagrus butcheri*), southern rock lobster (*Jasus edwardsii*), spotted handfish (*Brachionychthys hirsutus*) and Pacific oyster (*Crassostrea gigas*). Research has been conducted on optimal feed species, culture systems, densities and prey-selection at experimental and pilot-scale mass production levels.

Microalgae batch culture production is based on traditional algae species like *Chaetoceros muelleri*, *Isochrysis galbana*, *Pavlova pinguis*, *Tetraselmis suecia*, and *Nanochloropsis oculata*. Autoclaved 20-L carboys provide high quality axenic cultures and microfiltration (0.2  $\mu$ m) is used in batch culture in tanks up to 1000 L, using metal halide lamps, CO<sub>2</sub> and aeration injection. Microalgae are used as a primary food source for oysters and other live feeds and in green-water culture of marine fish. Commercial oyster hatcheries also use continuous pasteurisation systems.

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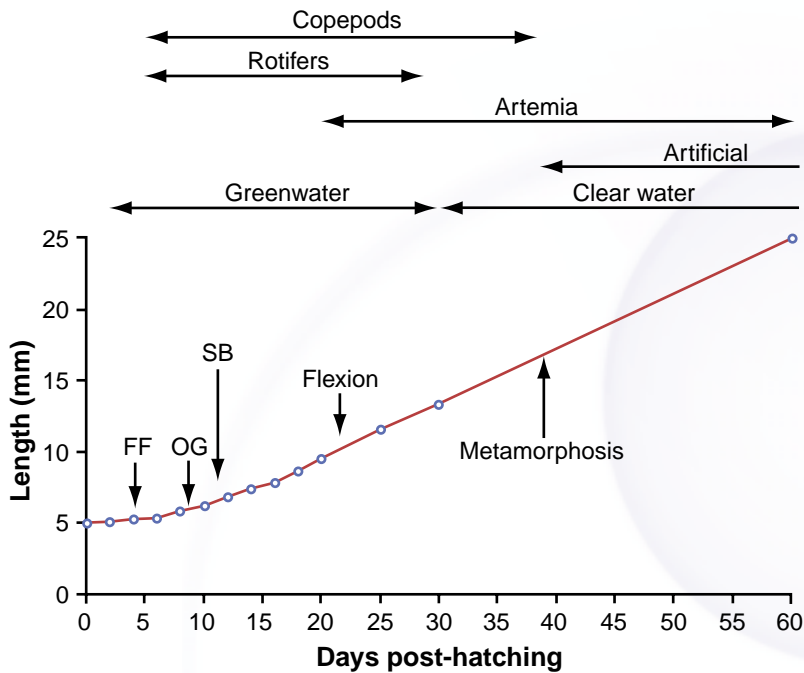
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(See details in appendix.)

The large-strain rotifer *Brachionus plicatilis* is most commonly used to feed marine fish in Tasmania, although the easier-to-culture small strain *B. rotundiformis* has been trialled. Rotifers are batch-cultured at densities of 100 to 300 per millilitre on a diet of microalgae and bakers yeast, *Saccharomyces cerevisiae*. Experimental batches have also been cultured at densities 300 to 700 per millilitre using commercially available diets including Culture Selco and Rotimac. Rotifers are enriched with vitamins, algae and commercial products like DHA Selco, Protein Selco, and Algamac, depending on the nutritional needs of the target species. Research in collaboration with the CSIRO has been conducted on developing new methods for enrichment using vitamin C, bacteria and fungi. Rotifers are fed primarily to marine fish and are mass-cultured at the MRL for feeding to striped trumpeter in six 2000-L tanks. Striped trumpeter are fed rotifers twice a day at 5 per millilitre from first feeding for one month.

Brine shrimp are an important component of most larval diets, and especially for striped trumpeter, seahorses and southern rock lobster. The newly hatched *Artemia* nauplii are reared from decapsulated cysts and enriched using methods similar to those described for rotifers. Care is taken in selecting brands of *Artemia* with good nutritional profiles and in matching the appropriate sized *Artemia* to each developmental stage. There is a need for large-scale on-growing of *Artemia* to around 12 mm in total length for feeding to southern rock lobster phyllosoma larvae and sea horses. It is believed that changing the tissue composition of the *Artemia* to a favourable biochemical profile probably requires an extended feeding regime of at least several days. Studies are being undertaken to better understand feeding regimes using on-grown *Artemia* and how to produce them cost-effectively. Problems with *Artemia* include protozoan diseases associated with the cysts, their high cost and a projected worldwide shortfall in supply.

Copepods are increasingly seen as a supplementary feed to rotifers and *Artemia* in the culture of 'difficult' marine fish. However, mass-culture of cold water copepods has been problematic. In Tasmania, copepod culture has been investigated through a research program within the Aquaculture CRC, although much of the field testing has been conducted using tropical species in Darwin. Three genera have been investigated experimentally: the harpacticoid *Tisbe*, cyclopoid *Apocyclops*, and calanoid *Acartia*. Most effort

has been expended on examining the life cycles, demographics, productivity, and environmental and dietary requirements of each species. *Tisbe* has been cultured in Launceston using batch, semi-continuous and recirculation systems on diets of microalgae, fortified yeast, pelleted feeds, vegetables, macroalgae and associated microflora. Much of the information is currently subject to confidentiality agreements. Striped trumpeter have been reared successfully using predominately harpacticoid copepods as a supplementary feed (Figure 1.1). They are collected from raceways at night using submersible pumps and floating net cages.



**Figure 1.1.** Feeding regime and development of striped trumpeter larvae (*Latris lineata*) reared in green-water tanks using *Tetraselmis suecica*.

Amphipods have been used to feed seahorses and the endangered handfish *Brachionychthys hirsutus*. The techniques for mass-culture of amphipods are still being developed through the work of post-graduate students and in collaboration with aquaculturists in the seahorse industry.

### **PRIORITIES FOR LIVE FEEDS RESEARCH AND DEVELOPMENT**

Priorities for live feeds research and development in Tasmania fall into three categories:

1. Improvements are needed in the production and reliability of microalgae, rotifers and *Artemia* cultures. There is scope for adopting new, improved methods to increase the reliability and reduce the cost of these feeds. For example, microalgae could be cultured using continuous pasteurisation systems, and rotifers on commercially available algae pastes and dried products.
2. There needs to be development of live feeds that more closely match the nutritional profiles of the eggs and larvae of the target culture species. In the first instance this might involve better assessment of enrichment procedures and testing of enrichment diets. The longer-term aim should also be to develop cost-effective culture systems for selected alternative species like copepods and amphipods. The use of these species should also be linked to gaining a better understanding of green-water culture systems in order to optimise larvae survival and growth of cultured marine fish.
3. There needs to be a greater adoption and testing of early weaning practices using artificial feeds developed within Australia and overseas.

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