

3. POLYUNSATURATED FATTY ACID AND ASCORBIC ACID ENRICHMENT OF ZOOPLANKTON

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As part of Australia's Fisheries Research and Development Corporation project "The Development of Rock Lobster Propagation Techniques for Aquaculture in Australia", we assessed the biochemical composition of *Artemia* sp. fed different enrichment diets, including a comparison of different sized *Artemia*. The *Artemia* were then tested in feeding trials with lobster *Jasus edwardsii* phyllosoma. Here, we report on the content of polyunsaturated fatty acids (PUFA) and ascorbic acid (AsA) in the *Artemia*.

Experiment 1: Different enrichment diets. *Artemia* (1.5 mm) were enriched using a 6 h enrichment³. Products used for enrichment included Protein Selco, Super Selco, DHA Selco (all products from INVE), AlgaMac 2000 (Aquamarine Biofauna), *Isochrysis* sp. (T.ISO) and a "YM-20-like" manufactured diet. With respect to the PUFA docosahexaenoic acid (DHA), AlgaMac 2000 provided the best enrichment (18% of total fatty acids), followed by DHA Selco (10%) and the remaining products, 2 to 5%. AlgaMac 2000 also produced the highest DHA:EPA ratio in the *Artemia* of 4. Highest enrichment of AsA was provided by Protein Selco (2.2 mg AsA g⁻¹ dry weight), and *Isochrysis* sp. (T.ISO) (1.2 mg g⁻¹) with other products producing 0.1 to 0.3 mg g⁻¹. When fed to lobster phyllosoma, there were some differences between the performance of the diets. In particular, the

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(See details in appendix.)

³ A 6 h enrichment is being used routinely for *Artemia* enrichment by TAFI.

Producers of the commercial enrichment products advocate longer enrichment periods of 24 to 48 h. Therefore, what is being reported here is not necessarily implied as providing optimum *Artemia* enrichment, rather demonstrating the result of short-term enrichment, as adopted by TAFI.

“YM-20-like”-fed *Artemia*- which contained the least DHA and AsA - was the least effective for the phyllosoma.

Experiment 2: Different sized Artemia. *Artemia* of 3 different sizes (average: 0.8, 1.5 and 3.0 mm) were enriched with either DHA Selco, or *Isochrysis* sp. (T.ISO) using a 6 h enrichment. The fatty acid data from this experiment are still being finalised, but some initial trends were observed. The PUFA content was similar across *Artemia* size classes with DHA-Selco whereas with *Isochrysis* sp. (T.ISO) it was approximately twice as high in the smaller size *Artemia* compared to the 3.0 mm size. For AsA, the concentration in the *Artemia* increased with decreasing size of the *Artemia* and was higher with *Isochrysis* sp. (T.ISO) than with DHA-Selco (Fig. 3.1).

Lobster phyllosoma fed 0.8 mm *Artemia* had lower survival and growth than the 1.5 mm and 3.0 mm *Artemia*. This result was difficult to reconcile from the analytical data, and may be a function of differences in the ingestion and/or digestibility of the different sized *Artemia*.

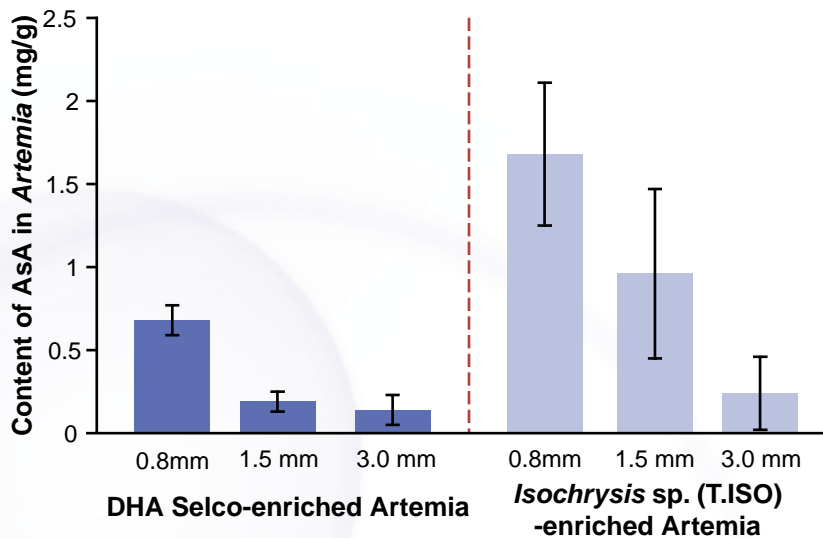


Figure 3.1. Ascorbic acid in different sized *Artemia*, enriched with either DHA Selco or *Isochrysis* sp. (T.ISO)

SUMMARY AND AVENUES FOR FUTURE RESEARCH

Most data on the enrichment of *Artemia* are based on 24 or 48 h enrichment. We found that a 6 h enrichment was also effective, though our data (like other studies) did not discriminate between assimilated nutrients or bioencapsulated nutrients (i.e. contained in partly digested particles within the *Artemia* gut). Also, information on the ingestion and digestibility of *Artemia* fed different enrichments and of different sizes is required to provide a more complete assessment of nutritional value.

Nevertheless, the study provided useful information on the potential nutritional value of *Artemia* based on biochemical composition. The enrichment of different sized *Artemia* showed very interesting results for the transfer of AsA. It would be interesting to assess whether other vitamins or key nutrients are transferred at different rates according to the *Artemia* size, and also to examine retention rates after non-feeding periods.