A Suitable Food Ration for Aquaculture of *Homarus americanus* Larvae

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(MS in prep. for *Aquaculture*)

Aquaculture of *Homarus americanus* larval stages commonly involves the use of live or frozen adult *Artemia* as the standard food. Our previous studies demonstrated that live *Artemia* are taken more readily by *Homarus* larvae than the frozen product, and that maintenance and feeding problems are reduced through its use. During 1972-1973, we conducted important, related studies to determine the optimum daily ration of live, adult *Artemia* required by larval stages of *Homarus*. This was done by offering a series of standard rations to individually held larvae and observing the influence of these on growth and survival.

Two independent trials were conducted at ambient temperatures ($\bar{x}$=15°C) and a third was conducted in a recirculated, semi-enclosed system at an elevated temperature (19°C). In each trial one hundred newly hatched first stage larval siblings were placed in a pen matrix. This was fabricated from two inch lengths of two inch diameter PVC plastic pipe fitted with a Fiberglas screen bottom. The unit was floated in a semi-closed circulating seawater bath. While this method of holding and censusing was time consuming, it proved best for easy maintenance and quantitative feeding of large numbers of individually-held larvae. The 10 by 10 matrices were divided into five groups of twenty compartments, which received daily food rations of either 1, 2, 4, 8, or 16 live adult *Artemia*. Each day the number of brine shrimp consumed and the moult stage of the larvae were recorded. All remaining food was removed and new food added in the appropriate dosage. Following the last larval moult, the carapace length of each surviving stage IV larva was measured.

The best survival (averaging 33% to stage IV) was achieved by larvae supplied with four or more brine shrimp per day, with little difference in mortality occurring at the ambient or elevated temperatures. However, the survival was depressed at the higher food dosages, presumably due to the high B.O.D. caused by fouling and waste food accumulation. Many of the deaths involved larvae undergoing a moult or those previously observed to possess symptoms of nutritional deficiency.

The frequency of moulting was enhanced under conditions of abundant food and retarded when insufficient amounts of food were available. Larvae fed four or more *Artemia* per day moulted to stage IV two to three days earlier than those receiving two or less. These differences were further accentuated at 19°C, although no significant difference in the time to stage III was observed. Siblings that were cultured concurrently in a Hughes larval culturing system began moulting to stage IV two days earlier than the most rapidly moulting ones held in individual cups. These differences are largely attributed to the better water circulation provided by the Hughes system.

The most efficient consumption of the available food was obtained at the lower food dosages (83 - 95% for the 1, 2 and 4 brine shrimp per day rations). The ration of eight brine shrimp per day yielded the most efficient utilization of food at a level above minimal requirements. As was expected, larval feeding was more efficient at the elevated temperature because of the substantially higher energy requirements demanded by an accelerated metabolism.

The mean carapace length at stage IV was slightly larger (0.5mm) when the larvae were provided with ample food. As early as the first week of larval development, stage III larvae were noticeably larger in cups that were provided with progressively

higher food dosages. The higher temperature produced an accelerated moulting frequency, with about the same survival and size results as observed in the ambient trials, yet the warmer water reduced the duration of larval development and resulted in higher efficiency of feeding.

The results of these experiments show that individual larvae fed fewer than eight brine shrimp per day grew slower and were smaller, yet those receiving larger doses suffered greater mortality, presumably due to fouling caused by the decay of uneaten food. The best results were achieved at a level of eight brine shrimp per day, in which larvae attained the largest size, in the shortest time, with the greatest survival, and with the most efficient utilization of food.