Food Preferences In Tropical Marine Fish Larvae

By Forrest A. Young

It is well known that the typical marine larval fish feeds upon a variety of small life forms that comprise the plankton. In the laboratory,cultured varieties of live plankton are the most common foods. The marine rotifer, *Brachionus plicatilis* is probably the most commonly used first food for marine fish larval rearing and the use of *Brachionus* has become almost universal.

While *Brachionus* is an acceptable first food for many species of marine fish larvae, there are many other species that simply will not consume the rotifer in any form. This has been demonstrated in *Pomacentrus*, *Abudefduf*, *Apogon*, *Holocanthus*, *Pomacanthus*, *Chromis*, *Microspathodon*, *Balistes*, and many others.

While the exact mechanism that precludes rotifer feeding in the above mentioned species has not been described, it is the author's and Moe's (pers. comm.) hypothesis that the slow and relatively lazy, circular swimming pattern of the rotifer does not elicit a feeding response in many species of marine fish larvae. This behavioral inhibition of feeding has made laboratory rearing of affected species quite difficult.

Observations of marine fish larvae have led to the description of three basic stages in the typical hunting/feeding pattern. The first event is the visual aquisition of the prey item. This lasts for a few seconds and during this time the larva begins to "track" the prey item prior to identification. The second stage is typified by the larva swimming quite close behind the intended prey. This period may be as long as ten or fifteen seconds and during this time the prey is closely observed for motions that are typical of marine zooplankton. If the item that is being followed is not alive, such as a bit of detritus, and does not display the "proper" swimming motions, it will be rejected as a food item. The final stage that follows a positive identification of a prey item is the strike. Here the larva curls its body into an "S" shape curve, and the quick explosive release of the body from the "S" curve pushes the larva forward and during this plunge, the

larva opens its mouth and engulfs the prey.

Observations by the author and Moe (pers. comm.) have led to the hypothesis that the quick and jerky motion that is typical to copepod nauplii during the larvae's stage two observation will elicit feeding responses in species that refuse to feed upon rotifers.

It has been the observation of the author that the strike will typically occur immediately following one of the quick erratic swimming motions of the copepod nauplii. The larva will follow the nauplii from one "swimming pulse" to the next and usually will strike at the end, or rest period, between the third to fifth swimming pulse during the acquisition/tracking period.

Copepodites, adult copepods and newly hatched Artemia nauplii also exhibit this same type of quick erratic movement and are fed upon in the same manner by larger, later stage larvae. When given a choice between rotifers and copepods, all marine fish larvae that have been researched, greatly prefer to feed on copepods. This has been determined by observation of feeding behavior, by stomach sampling of larvae, and subsequent comparison of the relative abundance of the preferred food organism in the larval tank. Even where rotifers outnumber copepods by a significant margin, often a factor of two or more, the larvae will have more copepods in the gut as a result of this preference.

Another phenomena that has been observed is that there are quite a few species, such as *Holocanthus*, *Scarus*, *Balistes*, *Sparisoma*, from the author's and Moe's (pers. comm.) research and *Synchiropus* from Achterkamp's 1986 research paper, will eat neither rotifers or copepod nauplii. Other planktonic organisms, primarily motile ciliates such as *Euplotes* are suggested as an acceptable food (Lange pers. comm.). In the sea, these species probably feed upon a wide variety of ciliated protozoans, motile algaes (Dinoflagellates), and larvae of coral reef fauna. This group of relatively small (10 to 50 microns) planktonic organisms undoubtedly contributes greatly to the food requirements of tropical marine fish larvae. It is the author's hypothesis that these species of larvae that feed upon the smaller nannoplankton will eventually feed upon copepod nauplii, copepodites and finally copepods as they grow. This has been observed also by Achterkamp (1986). From the present information and the state of the art, it seems that the preference for smaller, non-copepod prey items is primarily size related and doesn't involve the behavioral aspect that is present with the discrimination between equally sized copepod nauplii and rotifers.

The greatest significance of these food preferences of tropical marine fish larvae is that it makes those varieties that will not eat rotifers totally reliant upon the provision of copepods, ciliated protozoans, and motile algaes. It has been the author's experience that cultured varieties of copepods do not provide the proper nutrition for the development of fish larvae. This is probably a fault of the culture regime, but this aspect has not been researched since adequate amounts of copepods can be quickly obtained from wild plankton harvest. While the collection of wild plankton is a tedious and time consuming chore, it eliminates the variable of a perhaps

deficient cultured food, and the facilities that would be required to produce it. The culture of other micro-plankton has not been undertaken seriously due to lack of time and funding. From preliminary experimentation, it is the author's subjective opinion that nutritional deficiencies will be a serious problem with the feeding of cultured micro-plankton to marine fish larvae. Attempts to surmount potential nutritional deficiencies of cultured microplankton by collection of wild microplankton was not successful. In no instance, was good survival of the non-copepod/non-rotifer feeding larvae achieved with wild microplankton , that was harvested with a 20 micron plankton net. *Balistes* and *Holocanthus* ate none of the foods presented and died within 7 days which is the time it takes for larvae to starve.

As a researcher, this aspect is particularly frustrating and this obstacle will prevent large scale rearing of these commercially valuable ornamental fishes until sufficient research surmounts it.

In summation, three types of feeding regimes exist for tropical marine fish larvae. One is a generalized, non-specific feeding that is easily provided for by the feeding of cultured rotifers, but has a definite predilection for copepod forms. The second is more specific and entails the selective feeding upon the copepod fraction of the plankton. The final type feeds initially upon the much smaller fractions of the plankton, in the 10 to 40 micron range and will then feed upon larger forms such as copepods as the larvae grow.

This paper is presented in the hopes that other researchers have noted these and other phenomena in the feeding of cultured marine fishes. The author will be happy to correspond with these parties to try and gain a more complete understanding of the processes that affect the laboratory rearing of tropical marine fish larvae.

Literature Cited

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