CULTURE OF BRACKISH-FRESHWATER SHRIMP, *MACROBRACHIUM ACANTHURUS*, *M. CARCINUS*, AND *M. OHIONE*

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ABSTRACT

Macrobrachium larvae were reared in gradually increasing salinities and in constant salinities of 14, 16, 18, and 20 °/₀₀. Best survival (36%) was achieved not only in an increasing salinity but also in the constant salinity of 16 °/₀₀. In a controlled spawning experiment, temperature was lowered from 27.5° C to 24.0° C for 2 weeks. It was then returned to 27.5° C and an average of 52.9% of the females tested spawned within one week.

[Key words: Mariculture, salinity tolerance, controlled spawning, larval rearing.]

INTRODUCTION

Species of *Macrobrachium* are being cultured in several areas of the world. The Marine Research Laboratory, Florida Department of Natural Resources, is investigating three native Florida species to determine their potential as commercially marketable products. These are *M. carcinus*, the largest of the three (250-300 mm rostrum to telson), *M. acanthurus* (100-140 mm), and *M. ohione* (50-70 mm). *Macrobrachium* have many characteristics warranting culture. Adults are easy to maintain in captivity and mate readily, even under adverse conditions, and controlled spawning has been successfully attempted. Juveniles can be reared in shallow freshwater grow-out ponds, these problems and techniques having already been worked out by aquaculture industries. The shrimp are omnivorous, eating mostly detritus, allowing for low cost feeding. Diseases are rare. Finally, these shrimp have the high market value essential for an economically feasible commercial venture.

Since salinity requirements vary during larval development (Choudhury, 1970; 1971), our investigations were carried out to develop an optimal regime of salinities conducive to maximal growth and survival of larval stages.

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In 20 °/$_{oo}$ relatively high mortality again occurred at stage 2 and in stage 10. Fifty-six percent survived to stage 10, but only 28% metamorphosed with juveniles appearing from 22 to 52 days after hatching. Generally, difficulty appeared at stages 2 or 3, stage 8, and during metamorphosis.

In the first group maintained in increasing salinity, losses were gradual until stage 8. Seventy-six percent survived to stage 8, 44% survived molting to stage 9, and 36% metamorphosed with juveniles appearing from 35 to 56 days after hatching. This group had little trouble at stage 2 and in metamorphosis.

The second group was maintained at 15 °/$_{oo}$ for one week and then increased to 20°/$_{oo}$ over a period of 5 days with high mortalities occurring from stages 3 to 5 and again at stage 10. Forty-eight percent reached stage 10 but only 12% achieved metamorphosis. Growth was slower in this group and the larvae were stunted. The first juveniles did not appear until the 46th day after hatching. Two stage 10 larvae lived 72 days without metamorphosing and finally died.

DISCUSSION

In controlled spawning, relatively high percentages were noted for *Macrobrachium acanthurus* and *M. carcinus*, but results were low for *M. ohione* (Table 1). The latter ranges into the northern colder regions of the country. Consequently, it may require a lower temperature than *M. carcinus* or *M. acanthurus* to affect spawning. A lower temperature may increase success with all these species as could lengthening the period of lowered temperature.

Gradually increasing salinity undoubtedly occurs in the natural environment as the larvae are carried downstream toward the sea, and thus this increase might accelerate larval development. However, larvae reared in a constant 16 °/$_{oo}$ and those reared in a gradually increasing salinity from 0 to 20 °/$_{oo}$ had almost identical survival rates (36%) and growth curves. Increasing salinity did not generally increase survival rate nor growth rate, but one larva in 20 °/$_{oo}$ underwent metamorphosis in stage 8 after only 22 days, producing a juvenile with some 9th stage larval characteristics.

The second group maintained in increasing salinity merely emphasized that the initially euryhaline larvae become more stenohaline as the larval period progresses. Following metamorphosis, however, juveniles again become euryhaline. Increasing salinity at a rate of 1 °/$_{oo}$ per day stunted growth and many larvae in stage 10 did not undergo metamorphosis. Although salinity is important, it is not a rigid requirement within the ranges tested, as juveniles were obtained from all groups.

The only major disease thus far noted in the adults is a fungus we refer to as "black spot". It causes a black deterioration of the exoskeleton eventually resulting in death. However, treatment in a 10 minute sea water bath destroys the freshwater fungus.

TABLE 1. Controlled spawning experiment

10-14-71: Temperature lowered to 24° C from 27.5° C

10-28-71: Temperature raised to 27.5° C

11- 3-71: Results

Species	# females	# spawned	% spawned
M. acanthurus	18	12	66.6
M. carcinus	9	5	55.5
M. ohione	7	1	14.3
Total	34	18	52.9

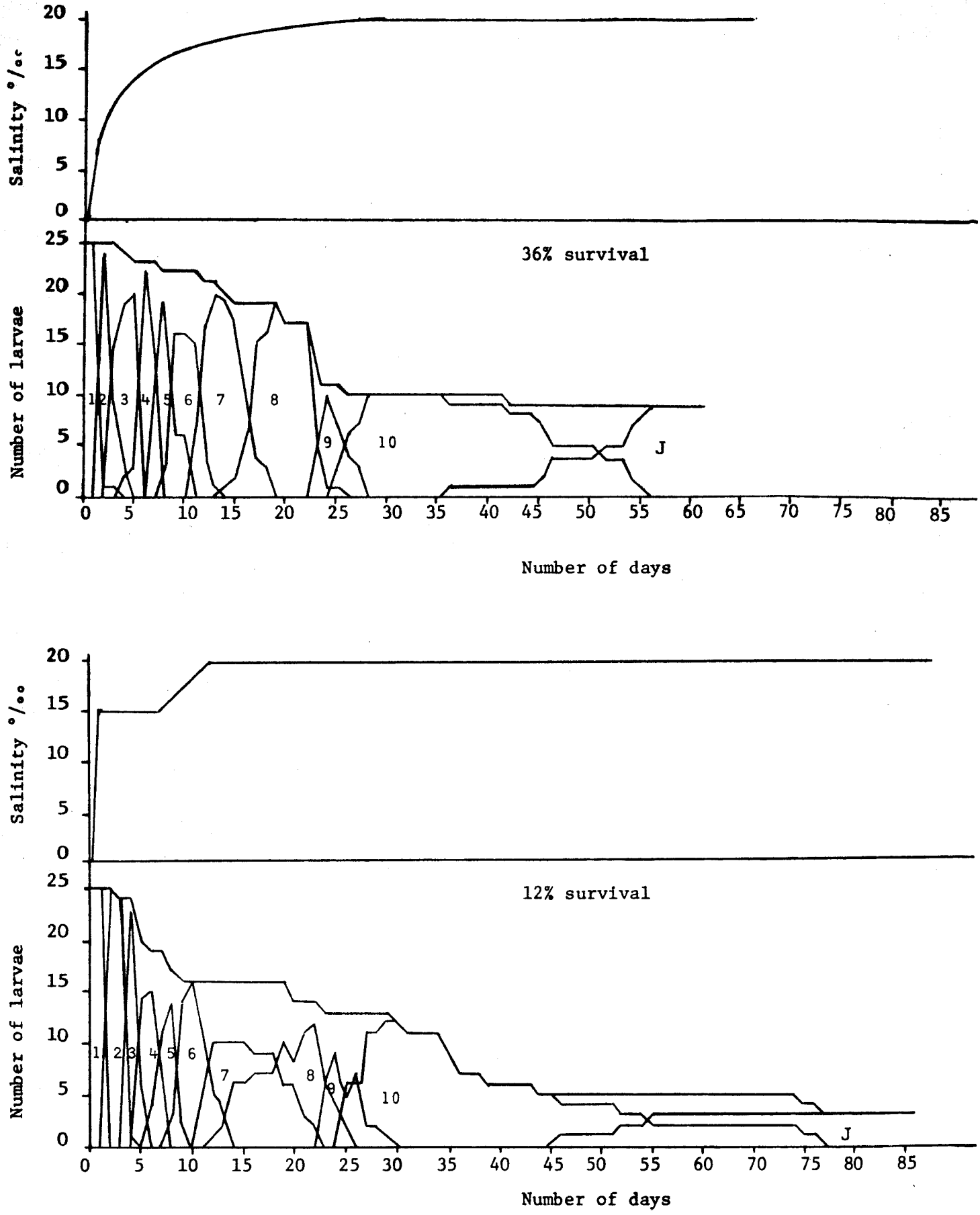

Figure 2. Larval survival and stage length of M. acanthurus reared in increasing salinities