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Health & Welfare
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Live diets for pacu larvae tested in Peru

Responsible Seafood Advocate logo

1 December 2005 William N. Camargo Christopher C. Kohler Susan T. Kohler Melyna Silva P. Fernando Alcántara B. Cesar Sias A. Palmira P. Padilla

Moina, known as the water flea, performs better than artemia

The fast growth and high-quality flesh of black pacu make them a good candidate for further aquaculture in the Amazon region

Commercial fisheries in the Amazon region have increased drastically in the last decade, and signs of overfishing of the most prominent fish species are apparent. Through concerted efforts by several Amazon institutions, particularly in Brazil and Peru, and foreign organizations, small- and large-scale fish culture now supplies part of the demand for most of these commercial species and helps preserve the fisheries.

Colossoma macropomum, commonly called black pacu in English, gamitana in Peru, and tambaqui in Brazil; and *Piaractus brachypomus*, red pacu in English, paco in Peru, and pirapitinga in Brazil, have excellent flesh quality, fast growth, and low protein requirements that make them suitable for aquaculture. As a consequence, fingerling demand for the fish has increased. Fingerling production in the Amazon must address the limited knowledge of alternative local food sources for larval and postlarval fish stages.

Larval feeding experiment

Live food production facility used to produce plankton for the fish larvae.

In a joint effort between Instituto de Investigaciones de la Amazonia Peruana and the Aquaculture Collaborative Research Support Program, the authors recently carried out a study to evaluate the growth performance of *C. macropomum* and *P. brachypomus* larvae fed artemia and *Moina*, a Cladoceran commonly known as the water flea. The study was funded in part by a U.S. Agency of International Development grant and conducted with support from the Pond Dynamics/Aquaculture Collaborative Research Support Program.

The study was conducted in a flow-through system consisting of 70-l aerated aquariums with three aquariums for each of three dietary treatments for the two species. Water quality was monitored throughout the larval-rearing process, with temperatures of 26 to 28 degrees-C, dissolved-oxygen concentrations of 5-6 milligrams per liter, and 6 to 7 pH.

Two days after yolk resorption, larvae were randomly distributed at 500 larvae per aquarium and conditioned for 10 days using plankton as feed. Thereafter, larvae were fed freshly hatched artemia nauplii, decapsulated artemia cysts, or *Moina* for four weeks at a ration below 8 percent body weight. Five larval samples were taken every week from each tank and fixed in buffered formalin for biometric measurements.

Survival

Mean survival for the *C. macropomum* larvae did not show significant differences between the diets, while *P. brachypomus* larvae showed greater survival with *Moina*, although all animals in one tank were lost to a *Vibrio* outbreak. In contrast, significant differences among *C. macropomum* and *P. brachypomus* larvae were determined for the final individual body weights.

Growth

Weight gains for the *C. macropomum* larvae were not significantly different among treatments, while growth for *P. brachypomus* larvae fed decapsulated artemia cysts or *Moina* was significantly higher ($P = 0.078$) than those fed artemia nauplii. The specific growth rates for *C. macropomum* and *P. brachypomus* larvae were not significantly different. Similarly, the condition factor was not significant for *C. macropomum* larvae, but higher for *P. brachypomus* larvae fed artemia cysts (Table 1).

Camargo, Performance of *C. macropomum* and *P. brachypomus* larvae fed varied experimental diets, Table 1

Colossoma macropomum	***Colossoma macropomum***	***Colossoma macropomum***	***Colossoma macropomum***	***Colossoma macropomum***	***Piaractus brachypomus***	***Piaractus brachypomus***	***Piaractus brachypomus***	***Piaractus brachypomus***
Artemia Cysts	2.16 ± 0.76^{a}	177.85 ± 0.15^{a}	75.8 ± 13.8^{a}	33.8 ± 7.0^{a}	3.97 ± 0.47^{a}	770.00 ± 0.22^{a}	79.5 ± 7.9^{a}	36.5 ± 2.9^{a}
Artemia Naupli	2.17 ± 0.37^{a}	117.79 ± 0.11^{b}	71.7 ± 4.7^{a}	38.5 ± 1.8^{a}	3.00 ± 0.31^{b}	373.33 ± 0.13^{b}	64.1 ± 5.1^{b}	39.6 ± 2.3^{b}
Moina	2.40 ± 0.35^{a}	170.58 ± 0.11^{a}	73.7 ± 10.7^{a}	45.6 ± 6.6^{a}	3.58 ± 0.33^{b}	706.67 ± 0.23^{a}	76.2 ± 8.0^{a}	44.3 ± 2.8^{b}

Table 1. Performance of *C. macropomum* and *P. brachypomus* larvae fed varied experimental diets. Values in columns with the same letter superscript are not significantly different ($P = 0.05$).

Mouth opening

Initial mean mouth opening for 10-day-old *C. macropomum* larvae was 0.119 ± 0.02 cm, which represented 19.2 percent in relation to total body length, while initial mean mouth opening for 12-day-old *P. brachypomus* larvae was 0.173 ± 0.04 cm, or 21.8 percent in relation to total length. The mouth openings of *C. macropomum* and *P. brachypomus* larvae were large enough to consume *Moina* and both artemia live diets.

Overall results

On the whole, artemia cysts seemed to be a better feed than nauplii for *P. brachypomus* larvae. The reason could be the relative energy content of the nauplii. Energy content is higher in cysts, since no energy is invested in hatching, compared to 30 to 40 percent of energy invested in hatching artemia nauplii.

On the other hand, *Moina* and decapsulated artemia cysts are less evasive than artemia nauplii, thus increasing the chances for fish larvae to capture them with less energy. In general, *Moina* are a better live food source than artemia decapsulated cysts and nauplii. *Moina* is one of the most valuable food sources available because of its excellent high-protein nutritional profile, which is slightly higher than that of artemia.

(Editor's Note: This article was originally published in the December 2005 print edition of the Global Aquaculture Advocate.*)*

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