Weaning of the Asian Catfish, *Clarias macrocephalus* Gunther, Larvae to Formulated Dry Diet

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Abstract

Two feeding trials lasting 10 days each were conducted to determine the weaning time in the Asian catfish, *Clarias macrocephalus,* larvae to dry diet feeding. Three-day-old catfish larvae were fed newly-hatched Artemia nauplii for 2,4, and 6 days after which *ad libitum* feeding with a commercial feed (trial 1) or a formulated diet (trial 2) was started. Fish fed exclusively dry diet (0-day *Artemia* feeding) or those fed only *Artemia* for 10 days served as the controls. In trial 1, fish fed Artemia at different durations had significantly higher growth and survival than those reared exclusively on dry diet. In trial 2, percent survival was not significantly different among fish with or without *Artemia* pre-feeding. However, fish had significantly higher final body weight and SGR when reared initially on *Artemia* prior to dry diet than those fed exclusively dry diet. Based on the results, catfish larvae can be successfully weaned to dry diet after feeding Artemia for a maximum period of four days (ave. BW=12.25 mg).

Introduction

Weaning is the change in feeding of fish larvae from live food to dry artificial diet. However, the absence of a functional stomach during their larval stage makes it difficult for fish to adapt to dry diets (Dabrowski 1984; van Damme *et al* 1990). In C. m*acrocephalus,* success in larval rearing necessitates initial feeding of live zooplankton although feeding with a combination of artificial diet and live *Artemia* and/or *Moina* can improve growth and survival (Fermin and Bolivar 1991). In the African catfish (C. *gariepinus)* larvae, the earliest weaning time for optimum growth rate was about 4 days. This corresponded to a body weight of 18.2 mg from an initial weight of 2.4 mg (Verreth and Tongeren 1989). The present study was conducted to determine the earliest weaning time or the minimum duration of feeding live zooplankton food in *C. macrocephalus* larvae.

Materials and Methods

Three-day old *C. macrocephalus* larvae (8.6 mm total length; 3.7 mg body weight) were obtained through hormone-induced spawning of captive broodfish (Tan-Fermin and Emata 1993) and stocked at 30 larvae per liter in 3-1 capacity plastic jars with mild aeration. Each jar was provided with nylon net "perching substrates" (Fermin and Bolivar 1991) where larvae clung after feeding. Fish were fed newly-hatched *Artemia* nauplii *ad libitum* for 2, 4, and 6 days (Treatments 1, 2, and 3) after which a dry feed was introduced. Larvae that were reared continuously on live *Artemia* and those fed immediately after stocking with dry diet (0-day *Artemia* feeding) for 10 days served as the controls. Each treatment was replicated thrice.

For trial 1, a commercial larval feed ("Alma", Germany, 53.5% analyzed crude protein) with 125-250 µm particle size was used (Table 1). For trial 2, a SEAFDEC formulated feed (42.8% analyzed crude protein) with particle size of 150-765 µm was used. The fish (8.7 mm TL; 3.7 mg BW) were fed to satiation 4x a day. Uneaten feeds and excreta were siphoned every morning and total water change was done prior to feeding. Dissolved oxygen ranged from 6-8 ppm at water temperature of 25-28°C during the course of the experiments. Both trials were terminated on the 11th day of rearing.

Table 1. Proximate composition (% of dry matter) of dry feeds used to wean *C. rnacrocephalus* larvae.

Component	Commercial feed	SEAFDEC feed
Crude protein	53.5	42.8
Crude fat	7.2	11.5
Crude fiber	1.0	6.1
Ash	12.3	12.1
Nitrogen-free extract	26.0	27.5
Moisture	9.3	13.5

Ten fish samples were taken from each jar and total length and body weight measured. Specific growth rate (SGR) was computed based on the formula, SGR = (ln wt (final)- ln wt (initial)/culture period in days] x 100. Percent survival was computed after deducting the number of accumulated dead fish from the original stock. Data were analyzed using a one-way analysis of variance (ANOVA) followed by the Duncan's multiple range test (DMRT). Differences were considered significant at $P < 0.05$.

Results and Discussion

C. macrocephalus larvae can readily accept dry artificial diet even at the start of exogenous feeding. However, outright weaning to dry diet without prior feeding on live zooplankton using newly-hatched *Artemia* nauplii adversely affected the growth and survival of larvae. In trial 1, catfish larvae that were reared initially on live *Artemia* at various durations had significantly better SGR (range: 11.7-20.8%/day) and percent survival (range:64-73%) than those fed exclusively a commercial diet (SGR=7.8%/day; survival=9.7%) (Table 2). Although the unweaned control fish had the highest SGR (20.8%/day), final TL (18.6 mm) and BW (55.4 mg) among treatments, the survival rate was comparable with fish groups that were initially fed with *Artemia* prior to weaning. In trial 2, fish fed only formulated feed survived similarly with those fed initially with live newly-hatched *Artemia* nauplii prior to weaning, but final body size (10.9 mm TL; 12.6 mg BW) and SGR (12.3%/day) were lower than those of fish in the other treatments (Table 3). Growth of catfish larvae was directly related to the duration of feeding with live zooplankton.

Results also indicated that the "adaptation weight" for successful weaning of C. *macrocephalus* larvae to dry diet is affected by the physical characteristics and nutritive quality of feed used (Dabrowski 1984). Although the commercial feed (trial 1) had higher crude protein (53.5%) than that of the formulated feed (trial 2,42.8%),

Table 2. Mean body weight (before and after weaning), specific growth rate and percent survival in *C. macrocephalus* larvae weaned to a commercial feed after feeding on *Artemia* at various durations (Trial 1).

Days on Artemia	Weaning weight (mg)	Final BW at day-11 (mg)	Final TL (cm)	SGR (%/day)	Survival (%)
0	3.7	10.40+1.5^{c}	10.6+0.3^{d}	7.8+1.1^{d}	9.7+2.0^{b}
2	8.4	16.80+0.9^{c}	12.4+0.2^{c}	11.7+0.4^{c}	64.3+5.4^{a}
4	13.9	27.24+2.7^{b}	15.3+0.2^{b}	15.3+0.8^{b}	73.0+1.5^{a}
6	15.3	28.06+1.4^{b}	15.7+0.3^{b}	15.6+0.4^{b}	70.3+5.0^{a}
10	**	55.42+4.4^{a}	18.6+0.2^{a}	20.8+0.6^{a}	68.7+0.9^{a}

** Unweaned group. Fish (3.7 mg initial BW) in this group fed exclusively on *Artemia.*

Table 3. Mean body weight (before and after weaning), specific growth rate and percent survival in *C. macrocephalus* larvae weaned to a formulated diet after feeding on *Artemia* at various durations (Trial 2).

Days on Artemia	Weaning weight	Final BW at day 11	Final TL[1] (cm)	SGR (%/day)	Survival (%)
0	3.7	12.6+1.0[d]	10.9+0. 1[e]	12.3+0.7[d]	75.6+2.6[a]
2	5.5	20.0+1.7[c]	12.8+0.3[d]	16.9+0.8[c]	74.6+2.3[a]
4	10.6	21.0+0.8[bc]	13.8+0.2[c]	18.3+0.3[bc]	85.8+3.3[a]
6	18.7	24.9+0.4[b]	14.6+0.2[b]	19.2+0.2[b]	84.6+6.8[a]
10	**	34.5+1.0[a]	16.1+0.2[a]	22.4+0.3[a]	82.6+3.6[a]

[1]Mean initial TL was 8.7 mm.
**Unweaned group. Fish (3.7 mg initial BW) in this group fed exclusively on *Artemia*.

the higher moisture content of the latter (Table 1) may have played a major role in improving the feeding efficiency of larvae on the diet (Table 1). The present study demonstrated that weaning of *C. macrocephalus* larvae to dry artificial diet can be done four days after zooplankton feeding which corresponded to about 11-14 mg average body weight.

References

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