

Weaning Diet for Striped Murrel *Channa striatus*

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The early post larvae, late post larvae, fry and fingerlings of the different size groups of *Channa striatus* were reared from hatchling stage. The control group were supplied with plankton, whereas the experimental fish were provided with formulated diet and combined diet for a period of 90 days. 100% mortality was noticed in the early post larvae and late post larvae fed on formulated diets. Fry and fingerlings fed formulated diet showed significantly better survival ($p < 0.05$) but poor growth. In terms of length and weight, fish fed on combined diet performed better compared to other treatments

Key words: Weaning, *Channa striatus*, larvae, fry, fingerlings, combined diets, formulated diets

Relative ease of egg production from captive broodstock and the simple and highly effective larval rearing methods are the positive factors in the cultivation of fish (Shelbourne, 1964). Fish larvae usually accept formulated feed during the "eleuterembryonic period" or the "mixed feeding period" (Balon, 1985; Kamler, 1992). However, problems are faced during the transfer from natural to artificial diets, which is consistently associated with high mortality and poor growth (Day *et al.*, 1997). The weaning diet improved their performance significantly, although the problems of availability and cost of the ingredients prohibited their use on a commercial scale (Fonds *et al.*, 1989). The techniques for successful weaning and on-growing have yet to be effectively transferred to an industrial scale, as the progress has been hampered by low growth rates and outbreak of diseases (Mc Vicar & While, 1982). Attempts of Day *et al.* (1997) to wean *Solea solea* and *S. senegalensis* were successful on an experimental level, but not on a commercial scale. The main constraint to the large-scale intensive culture seems to be an acceptable weaning and on-growing formulated diet.

In commercially cultivated species, the initial exogenous feeding of larvae is usually ensured by the supply of live feed organisms like plankton up to "weaning period", the stage (in days after hatching) at which larvae can switch from live food to a formulated dry diet, without significant effect on growth and/or survival (Kestemont, 1995). The weaning period coincides with the stomach becoming functional (Dabrowski, 1992). This paper reports the results of a study on a weaning diet for the obligatory air breathing fish, the snakehead (*Channa striatus*).

Materials and Methods

C. striatus brooders (1.0 ± 0.3 kg) matured at Centre for Aquaculture Research and Extension (CARE), St. Xavier's College, Palayamkottai were induced to spawn in a breeding pond (5x4x1 m) by a single intramuscular injection of ovaprim (0.5ml/kg body weight; Haniffa *et al.*, 1996). Eggs were collected from the tank and incubated at $28 \pm 1^\circ\text{C}$. The individuals used in the experiment belonged to a single batch of eggs. Feeding trials were conducted in 200 l cement tanks. The water temperature

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was $28 \pm 1^\circ\text{C}$ and a photo period of 13 h light and 11 h dark was maintained.

In each tank, 200 larvae were stocked and assigned to one of the feeding regimes of formulated diet (Fd) and combined diet (Cd). The formulated diet was prepared using chicken intestine (63%), ground nut oil cake (15%), rice bran (10%), tapioca (10%) and vitamin-mineral premix (2%). The ingredients were mixed by adding water. The dough was extruded through a pelletiser. The stability of this semi-moist diet was tested according to Farmain *et al.* (1982). The combined diet (Cd) contained the formulated diet and chopped chironomus larvae. The control diet for early post larvae and late post larvae was plankton and for fry and fingerlings, boiled egg white (particle size less than 0.4 mm).

Feeding trials were conducted in three replicate groups for four different size groups of *C. striatus* viz. i) early post larvae (EPL) (live weight 0.12 g; length, 8.0 mm). ii) late post larvae (LPL) (live weight, 0.30 g; length, 15 mm). iii) fry (FR) (live weight 1.3 g, length, 22 mm) and iv) fingerlings (FL) (live weight, 2.0 g; length, 32 mm). EPL and LPL were fed with Fd and Cd up to satiation level (2 mg/larva/day). FR and FL were fed at the rate of 15% of their body weight. Feed was given to all the four groups three times a day at 8 h, 13 h and 18 h. Those fed on Cd were given finely chopped chironomus larvae twice a day at 8 h and 18 h and Fd at 13 h. Faeces and unconsumed feed were removed daily with minimal disturbance to the test animals. Dead larvae/fry/fingerlings were removed every 6 h and counted. Fish were sampled once in a week for growth evaluation. Small fish (less than 10 mm) were measured under a microscope using a grid reference, while large fish were directly measured on a measuring board.

At the end of the experiment, cannibalism for each size group was estimated

based on the difference between initial number of fish and the number of survivors observed (Qin *et al.*, 1997). Survival and growth estimation were based on data collected at the end of the feeding trial for each size group and were analysed employing Turkey's Multiple Range Test (Tukey, 1953).

Results and Discussion

EPL and LPL of *C. striatus* showed 100% mortality in all the treatments (Table 1). It is known that the larvae of *C. striatus* subsist only on zooplankton (Parameswaran & Murugesan, 1975). It has been reported that fish larvae lack the enzymes for digestion of artificial diets and digestion is carried out by the exogenous enzymes present in their live prey (Dabrowski, 1982).

FR and FL fed Fd showed significantly better survival ($p < 0.05$) when compared with those fed on Cd. But in terms of length and weight, fish fed on Cd performed better among the different treatments. The poor growth of FR and FL fed on Fd was probably due to uneven distribution and fast sinking rate of Fd in water. Hoff & Snell (1989) reported that snakehead larvae were successfully reared using plankton which can actively swim for 5 h in freshwater, thereby extending their availability for larval consumption.

Mortality was significantly higher ($p < 0.05$), than cannibalism in FR in all the treatments, whereas FL fed on Fd showed no significant difference ($p > 0.05$) between cannibalism and mortality. FL fed on Cd not only showed more growth but also greater cannibalism. Cannibalism is the most common problem leading to low survival in snakehead culture (Ng & Lim, 1990) because snakehead can easily consume a small fish of more than half its

Table 1. Weight gain, specific growth rate (SGR) and mortality of early post larvae, late post larvae, fry and fingerlings of *C. striatus* fed combined (Cd), formulated (Fd) and control (Cd) diets.

Stage	Diet	Initial weight (gm)	Mortality (%)		Coefficient of variation (CV)	SGR (%/day)	Final weight (gm)
			Cannibalism	Death			
EPL	Fd	0.12±0.01		100	-	-	-
	Cd	0.12± 0.01		100	-	-	-
	FD	0.3±0.01		100	-	-	-
LPL	Cd	0.3±0.01		100	-	-	-
	Fd	1.3±0.06	20	7	3.7	1.0	3.2±0.07
FR	Cd	1.3±0.06	30	10	3.5	1.49	5.0±0.04
	Fd	2.0±0.05	12	28	5.12	1.54	8.0±0.04
FL	Cd	2.0±0.05	15	41	4.54	1.8	10.3±0.03
Control diet							
EPL	Plankton soup	0.12±0.01	3	12	1.66	0.998	2.7±0.02
LPL	Plankton soup	0.3±0.01	5	10	1.4	1.05	3.0±0.06
FR	Boiled egg white	1.3±0.06	9	10	1.85	1.60	5.5±0.05
FL	Boiled egg white	2.0±0.05	10	8	2.0	1.70	9.3±0.8

length (Diana *et al.*, 1985). Folkvord & Ottera (1993) suggested that coefficient of variation of length of fish could be an indicator for size dependent cannibalism in fish. According to Qin *et al.* (1997), cannibalism may be minimized through size sorting by removing large individuals on regular basis.

These findings suggest that snakehead can be successfully weaned by feeding the larvae with live plankton from hatchling to larval stage and with combined diet (live chironomus larvae and formulated feed) during the fry stage. At the fingerling stage these will survive on formulated diet.

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References

- Balon, E.K. (1985) *Early Life Histories of Fisheries developments in EBE*. 55 Junk Publ. Dordrecht, p.13
- Dabrowski, K. (1982) *Environ. Biol. Fish.*, 7, 73
- Dabrowski, K. (1992) *Comp. Biochem. Physiol.* 104, 579
- Diana, J.S., Chang, W.Y.B., Ottey, D.R. & Chuapochuk, W. (1985) In: *International program report No.7 Great Lake and Marine Water Centre*, Univ. of Michigan, Ann. Arbor, MI. p.75
- Day, O.J., Howell, B.R. & Jones, D.A. (1997) *Aquaculture research*, 27, 911
- Farmain, F.A., Lauterio, T. & Ibe, M. (1982) *Aquaculture*, 27, 29
- Fonds, M., Drinkwaard, P., Resink, J.W., Eysink, G.G.J. & Toet, W. (1989) In:

- Aquaculture-A Biotechnology progress* (N. de Pauw, E., Jaspers, H. Hackfors & N. Wilkins Ed.) p.851. European Aquaculture Society Publications, Bredene, Belgium
- Folkvord, A. & Ottera, H. (1993) *Aquaculture*, **114**, 234
- Haniffa, M.A., Shaik Mohamed, J. & Merlin rose, T. (1996) *Fishing Chimes*, p.23
- Hoff, F.H., & Snell, T.W. (1989) *Plankton Culture Manual*, p.125, Florida Aquaforms Inc. Pisces Publishing Group Devon. CT.
- Kamler, K. (1992) *Early Life History of Fish. An Energetic Approach*, London, p.106
- Kestemont, P. (1995) United Ecologie des eaux douces, Facultes Universitaires V.D. de la Paix, 61 rue de Bruxelles. B.5000 Namur Belgium
- Mc Vicar, A.H. & White, P.G. (1982) *Aquaculture* **26**, 213
- Ng, P.K.L. & Lim, K.K.P. (1990) In: *Essays in zoology*. Papers commemorating the 40th Anniversary of the Dept. of Zoology, National Univ. of Singapore, (C.L., Ming & P.K. I.N, Ed) p.127
- Parameswaran, S. & Murugesan, V.K. (1975) *Proc. Nat. Acad. Sci. India*, **45**, 133
- Qin, K.A., Fast, W., Daniel De Anda & Roland V.W. (1997) *Aquaculture*, **148**, 105
- Shelbourne, J.E. (1964) *Advances in Marine Biology*, **2**, 1
- Tukey, J.W. (1953) In: *The Problems of Multiple Comparison*, Princent Univ. Prinpcron, N.J.