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Effect of *Ompok bimaculatus* (Bloch) larvae age at the time of stocking on rearing performance during fingerling production

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Ompok bimaculatus (Siluridae), commonly known as Indian butter catfish, is a freshwater species in high demand because of its great flavor and competitive price (Talwar and Jhingran 1992). The fish is native to South-east Asia and covers a wide geographical distribution in India, including West Bengal, Bihar, and the north-eastern states (Banik *et al*. 2011). *O. bimaculatus* is a piscivorous and carnivorous fish that inhabits lakes, ponds, and rivers at elevations of 100–2500 m (Sridhar *et al*. 1998). Due to heavy exploitation, it remains a near threatened (NT) fish species (IUCN 2012). Rearing patterns vary from species to species. Stocking *O. bimaculatus* larvae in nursery tanks at a precise time may reduce the pressure of larval rearing in the hatchery phase. Information regarding the performance of catfish larvae during nursery rearing is scarce. Therefore, in this study, we explored the potential of rearing different age groups of *O. bimaculatus* larvae and evaluating growth performance during fingerling production in the hatchery phase.

The study was conducted in the laboratory of ICAR's Tripura Centre. The fish bred following the recommended practices of Department of Fisheries, Government of Tripura. Broods of *O. bimaculatus* with an average 100 g body weight were collected from farmers' ponds in Tripura, India. Both male and female fish were injected with ovaprim at 1.5 and 2.5 ml/kg body weight, respectively. Females were stripped for spawning at 8–10 h after hormonal injection, and milt was collected from males by surgically removing their testes. The testes were macerated and mixed with eggs by feather for fertilization. The eggs were subsequently washed thoroughly with clean pond water and transferred into a masonry tank with clean water and constant aeration for hatching. Embryonic development starts after 30 min of fertilization, and eggs begin to hatch 23–25 h after fertilization. Hatchlings were collected and released in a series of cemented tanks at 6 larvae/L of water in the indoor hatchery. After yolk-sac absorption, larvae were fed continuously with mixed zooplankton collected from the pond. The larvae used for these experiments were collected at 5, 10, and 15 d after hatching. Triplicate tanks (2.0 m × 1.0 m) were employed for rearing 3 each larval age groups. The tank was prepared and culture water was fertilized prior to larval stocking by following the practices for catfish (Sahoo *et al.* 2008). Additionally, each tank was inoculated with mixed plankton collected from the earthen nursery for 6–7 d to achieve plankton bloom. Excess bloom was controlled by filtering a portion of water with a plankton net. *Pistia stratiotes,* a floating plant was spread over one-third of the tank area to provide shade and shelter to the larvae. Larvae of the desired age groups were counted and released at 100/ m^2 in the prepared cement tank nursery. Before release, the length and weight of 20 larvae were measured by scale board and electronic balance (Shimadzu; accuracy ± 0.01 mg), respectively. Fish were caught from each tank using a scoop net and twenty larvae were arbitrarily selected for weekly sampling, as similarly done during initial stocking. These sampled fish were released back to their respective tanks. A compound feed was prepared for larvae (Giri *et al*. 2000). This feed was further sieved to 100–150 µm size before feeding to fish. Larvae were regularly fed thrice (0800, 1500, and 2300 h) at 10% of wet body weight per day during the entire rearing period. At the end of 28 d, all surviving larvae were collected and counted. The final total length and wet weight of twenty larvae were recorded, and the total biomass for individual tanks was also noted.

Survival and specific growth rate were calculated as: survival (%) = (number of larvae stocked – number of dead larvae)/ number of larvae stocked × 100; Specific growth rate (in g/day) = ((Ln (final weight) – Ln (initial weight)) / days of experiment × 100. Length, weight, specific growth rate, and total biomass of treatment groups were compared by one-way analysis of variance and Duncan's multiple range test using SAS 9.2 at 5% significance level.

The water temperature, pH, dissolved oxygen, and total alkalinity were ranged from 27.5 to 28.5 ^{0}C, 6.9 to 7.6, 5.6

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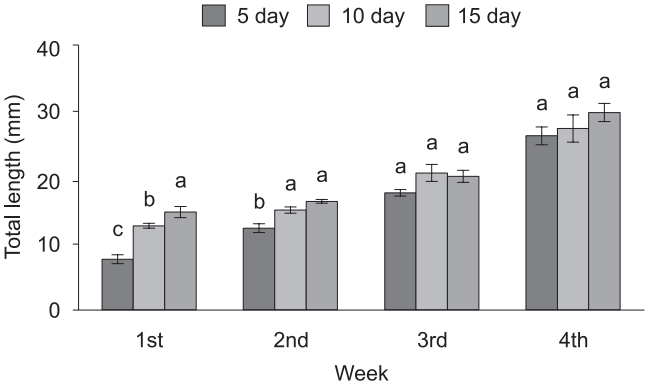

Fig. 1. Weekly changes in total length (mm) of *O. bimaculatus* larvae during the four-week rearing period in a fingerling production trial. Data are based on the means (± SE) of replicate tanks in each group.

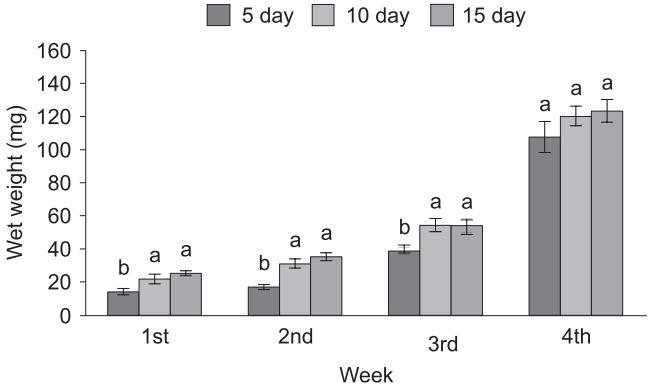

Fig. 2. Weekly changes in wet weight (mg) of *O. bimaculatus* larvae during the four week rearing period in a fingerling production trial. Data are based on the means (± SE) of replicate tanks in each group.

to 6.8 ppm, and 130 to 140 ppm, respectively, throughout the entire rearing period. The trend of an initial difference in total length between the 3 age groups at stocking was maintained at the end of the first rearing week (Fig. 1). The older age groups showed a greater length ($P<0.05$) increment compared to 5-day-old larvae at the end of the second week of the rearing period. A significant difference in length increment ($P<0.05$) was not observed by the end of third week onwards. Weekly changes in the weight increment for the different age groups are depicted in Fig. 2. Larvae from older age groups (10 and 15 day) weighed more ($P<0.05$) than 5-day-old larvae at the end of the first, second, and third weeks of the rearing period, but not by the end of the fourth week. We found no significant difference ($P<0.05$) in SGRs among the three age groups. Larvae in the 15-day-old age group exhibited the highest survival rate ($P<0.05$), followed by the 10– and 5-day-old groups. The total biomass of the higher age groups was equal and overall higher ($P<0.05$) than the 5-day-old larvae (Table 1).

Rearing of proper larval age groups is essential for fingerling production in a hatchery system (Sahoo *et al*. 2008). The higher final length of larvae among different age groups may be due to a higher initial length at stocking. Mean wet weight differences among age groups became equal in subsequent weeks after week three. Five-day-old larvae grew less efficiently compared to two higher age groups. A reduced proportion of feed intake may account for this discrepancy. Tidwell and Webster (1993) reported a negative growth trend in hybrids of *Lepomis cyanellus* and *L. macrochirus* due to a reduction in food intake. Five-day-old larvae grew as efficiently as 15-day-old larvae after the third week of rearing; this may be accounted for by more space created due to higher mortality and its consequent utilization for living and grazing. Specific growth rate similarities among the three age groups can be explained by differences in initial body weights. Higher overall survival in 15-day-old larvae could be explained by better organ development for capturing and consumption capability, digestion, and food absorption. Nutrient availability was maintained to an optimum level throughout the study period, yet high mortality still occurred. Inefficient utilization of ration by 5-day-old larvae due to the lack of essential digestive enzymes could explain the mortality (Cahu and Infante 2001). A similar high mortality rate in early larval stages was reported in 3-day-old *Clarias gariepinus* larvae (Hogendoorn 1979, De Graaf *et al*. 1995) and 5-day-old *C. batrachus* larvae (Sahoo *et al*. 2008) during nursery rearing. In this study, cannibalism most likely did not influence survival; rather, regular feeding, size grading, and light were found to be critical factors. Tucker and Robinson (1990) suggested that yolk sac channel catfish fry should be reared into swim up fry in a hatchery before releasing them to a nursery pond to improve the survival rate. The lowest final biomass in 5-day-old fish during harvest could be explained by poor fingerling recovery from these

Table 1. Rearing performance of *Ompok bimaculatus* larvae different age groups and changes in total length, weight, SGR, and survival rate during a four-week rearing period. Data is based on the means (± SE) of replicate tanks in each group. [a, b, c] Mean values bearing different superscripts in a column differ significantly ($P< 0.05$)

Larval age (days)	Initial length (mm)	Initial weight (mg)	Final length (mm)	Final weight (mg)	Specific growth rate	Survival (%)	Total biomass (g L^{-1})
5	3.12±0.20^{c}	8.5±0.61^{b}	26.22±1.34^{a}	114.05±9.97^{a}	9.25±0.21^{a}	21.6±1.36^{c}	2.48±0.30^{b}
10	7.56±0.59^{b}	10.97±0.99^{ab}	27.32±2.05^{a}	127.1±6.29^{a}	8.79±0.27^{a}	31.8±3.02^{b}	4.09±0.54^{a}
15	10.36±0.50^{a}	10.52±0.45^{a}	29.74±1.37^{a}	130.66±7.17^{a}	8.99±0.23^{a}	41.4±3.09^{a}	5.43±0.58^{a}

tanks. The water quality parameters in the present study fell within the acceptable range of fish cultures (Sahoo *et al*. 2010, Sahoo *et al*. 2004, Al-Harbi and Siddiqui 2000, Tucker and Robinson 1990). The ammonia concentration remained low due to minimal sediment accumulation in the experimental tanks from waste removal twice daily. Therefore, we observed no adverse effects of water quality parameters on *O. bimaculatus* larvae survival in our tank system.

Thus, the present study revealed that releasing *O. bimaculatus* larvae younger than 10-day-old should be avoided for fingerling production, as this practice harms the profitability of a hatchery by establishing a low survival rate. Therefore, it is essential to rear larvae in an indoor hatchery for a reliable fingerling production of this silurid catfish. At least 10 rearing days are recommended before releasing larvae into nursery tanks for robust growth and survival during fingerling production.

SUMMARY

The rearing performance of different aged *Ompok bimaculatus* (Siluridae) larvae was evaluated for improved growth and survival during fingerling production with the goal of reducing the rearing time of catfish larva in a hatchery system. Larvae were reared for 5, 10, and 15 days prior to being stocked in nursery tanks. The specific growth rate remained constant between treatment groups. The survival and total biomass (gL^{-1}) were significantly lower in the 5-day-old larvae. An optimized rearing period for *O. bimaculatus* larvae was found to be 10 days before their nursery tank transfer.

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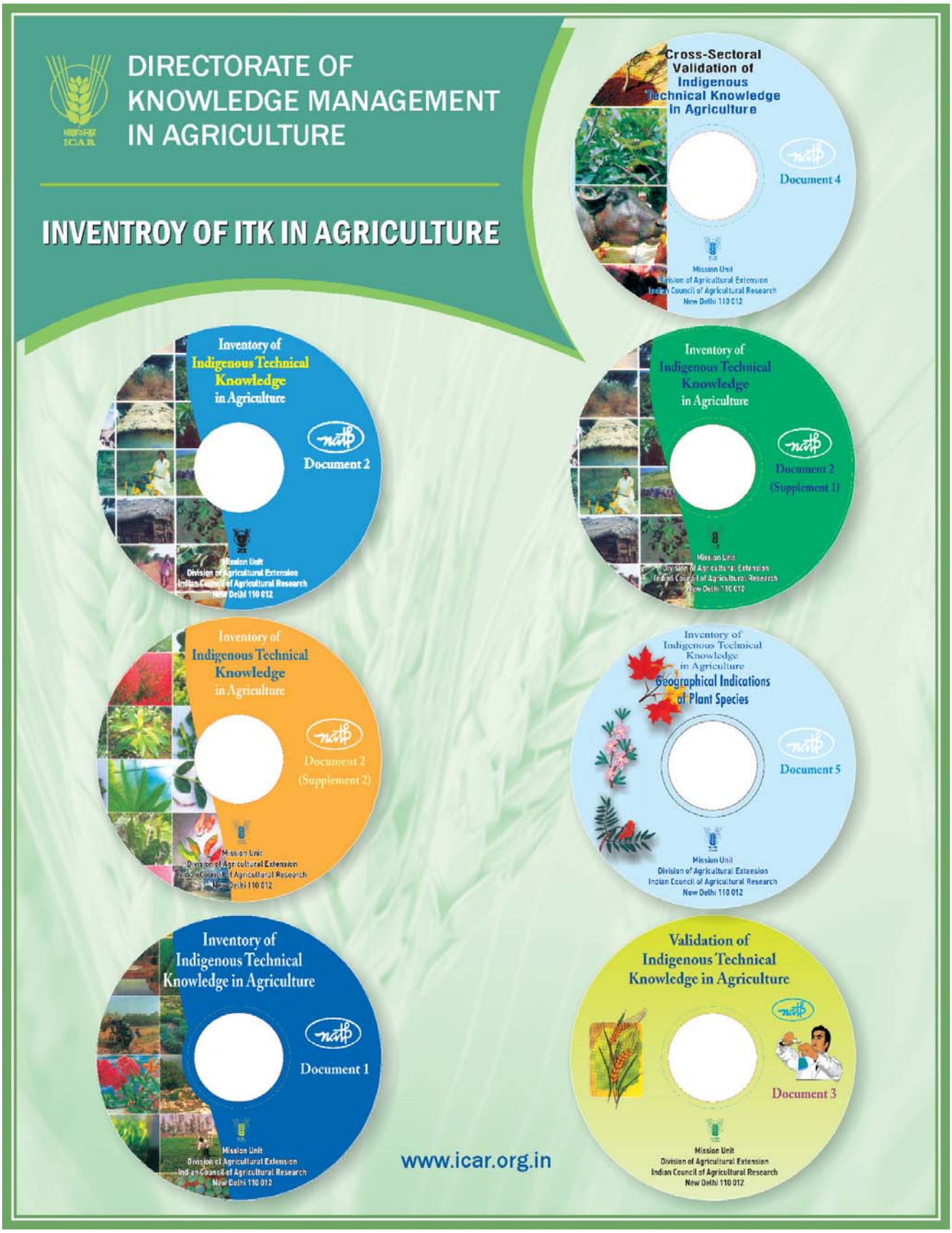
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