Channel catfish *Ictalurus punctatus* growth in single and multiple-batch production

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Research at the University of Arkansas at Pine Bluff (UAPB) indicated that, as stocking density increases in single-batch channel catfish production ponds, the number of market-size fish produced in a single season declines (Southworth *et al.* 2006a, Engle 2010). The same effect was observed for advanced size stockers as well as smaller juveniles (Figs. 1 and 2). The effect was more pronounced in ponds stocked with smaller juveniles. This suggests that social dominance becomes a significant factor as stocking density increases. As size disparity grows, the effect would be amplified.

Because processors and large retail buyers demand specific fish sizes, channel catfish are harvested on the basis of size, using size-selective nets. Fish of desired size are removed, allowing undersize fish to remain and continue growing. To maintain maximum year-round production, catfish fingerlings are periodically stocked with the larger, remaining undersize catfish in multiple-batch production (“under-stocking”). This creates a mixed size-class fish population in production ponds. The combined fish population is fed to satiation with floating feeds that target larger fish. Survival of under-stocked fingerlings has been reported to be around 70 percent but is frequently less (Engle and Stone 2002, SRAC 2007). Survival ranging from 24 to 76 percent (Table 1) was observed in multiple-batch channel catfish research ponds at UAPB (Engle and Valderamma 2001, Southworth *et al.* 2006b). None of the fingerlings in the UAPB research ponds grew to market size in a single growing season. It is likely that the larger fish already present when fingerlings were stocked were more aggressive at feeding time. The dominant, more aggressive fish consumed more feed than needed, leaving insufficient feed to promote good growth and survival of under-stocked fingerlings.

Fingerling growth is exponential. They grow significantly faster and require more feed per unit of body weight than 0.4-0.6 kg catfish. Feed deprivation slows fingerling growth during this critical period of the production cycle. As a result, they do not reach market size during a single production season. Larger and near food-size catfish are stronger and more aggressive. It is unlikely that under-stocked fingerlings can compete effectively with larger fish for bigger, floating feed pellets (Tucker *et al.* 1994, Wurts 2001). If 1400-3500 kg/ha of large 0.4-0.6 kg fish are crowding out smaller fingerlings at mealtime,
the fingerlings are not likely to perform well in terms of growth or survival.

As channel catfish grow, feed intake as percent of body weight (biomass) decreases. But their feed conversion ratio increases with size. The amount of feed it takes to produce a kilogram of fish increases as fish get larger. It takes 1.1 kg of feed to produce 1.0 kg of gain in 15-cm catfish, and 1.9 kg of feed for 1.0-kg of gain in 38-cm catfish (Robinson et al. 1998), 73 percent more feed for the same amount of growth in 38-cm catfish. Because juvenile channel catfish smaller than 200 g are growing much faster, require more feed, and convert feed to weight gain more efficiently; producers must do their best job of feeding when fish are young (Wurts 2001).

It is likely that under-stocked juvenile catfish do not compete effectively with larger fish for larger, floating feed pellets. An alternative feeding practice could improve growth, survival and health of channel catfish fingerlings in a mixed size-class population (multiple-batch production), promoting the development of a more sustainable channel catfish production system. A sinking feed with a smaller pellet size could be used to increase the availability of food for fingerlings. The amount fed would be adjusted in accordance with the rapid growth rate of fingerlings. A smaller sinking feed (Wurts 2001, Li and Robinson 2008) could be simultaneously offered to fingerlings along with the floating pellets for larger fish. Satiation feeding with floating feed would be used for larger fish.

### Table 1. Channel catfish fingerling survival in multiple batch production ponds.

<table>
<thead>
<tr>
<th>Study</th>
<th>Fingerling Size (g)</th>
<th>Density fingerlings/ha</th>
<th>Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engle and Valderarma, 2001*</td>
<td>6</td>
<td>15,000</td>
<td>50</td>
</tr>
<tr>
<td>Engle and Valderarma, 2001*</td>
<td>12</td>
<td>15,000</td>
<td>76</td>
</tr>
<tr>
<td>Engle and Valderarma, 2001*</td>
<td>37</td>
<td>15,000</td>
<td>68</td>
</tr>
<tr>
<td>Southworth et al., 2006a/2</td>
<td>19</td>
<td>8,600-34,600</td>
<td>24-36</td>
</tr>
</tbody>
</table>

*1369 kg/ha carryover biomass, average initial fish weight = 0.58 kg each. Mean harvest weights for fingerlings stocked = 0.28-0.46 kg after 203 days.

*2268 kg/ha carryover biomass, average initial fish weights = 0.37-0.45 kg each. Mean harvest weights for fingerlings stocked = 0.32-0.35 kg after 196 days.

*This sequence of photographs (right and below) shows larger catfish, not quite harvest size, feeding aggressively. (All photos by Charles Weibel at Kentucky State University)*
The use of growth-adjusted feeding with sinking feed for several weeks after stocking could significantly improve health and survival of fingerlings in a mixed size-class catfish population. However, it might be simpler to routinely feed a fixed percentage of the daily allotment as sinking feed for 8-12 weeks after new fingerlings have been stocked. Higher fingerling survival rates and efficient feeding would reduce costs of production and decrease the time required to grow fingerlings to market size fish.

Notes

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References

Engle, C.R. and N. Stone. 2002. Costs of small scale catfish produc-

Calendar

March 11-13, 2012 International Boston Seafood Show and Seafood Processing America Boston Convention and Exhibition Center Boston, Massachusetts, USA www.bostonseafood.com


April 24-26, 2012 2012 European Seafood Exposition Brussels Exhibition and Conference Centre Brussels, Belgium www.euroseafood.com

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July 2-6, 2012 36th Annual Larval Fish Conference Solstrand Hotel and Bad Bergen, Norway larvalfishconf.org

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