EFFECT OF DIFFERENT FEEDING LEVELS ON THE PRODUCTION OF 
Heterobranchus bidorsalis IN OUTDOOR CONCRETE TANKS

BY
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ABSTRACT

Fry of Heterobranchus bidorsalis (mean weight, 0.03±0.01g) were fed at 10, 20, 30, 40 or
50% of their body weight (bw) / day in outdoor concrete tanks. The fry attained the highest
average weight of 666g in 10 weeks when fed at 40% bw/day. Feed conversion ratio ranged from
2.13 to 9.65, the protein efficiency ratio from 1.33 to 5.93.

Results indicated that H. bidorsalis are efficient feed converters. Feed intake was
significantly different (p<0.05) between the treatments, specific growth rate (SGR), daily growth
rate (DGR), production and average weight gain indicated that 40% of fish biomass was the
optimum feeding level.

INTRODUCTION

In hatchery management systems, supplemental feeding constitutes 40 to 60% of the total
production cost. Determining the optimum ration level is one of the most difficult tasks in hatchery
management. Optimum feeding levels result in minimum wastage and minimal deterioration of the
water quality and promote fish growth, thus increasing the profitability of the enterprise.

In channel catfish cultur, fry are fed several times per day, up to 50% of the biomass
(desilva and Anderson, 1995). However such high feeding rates result in deterioration of water
quality and excessive feeding does not necessarily result in higher growth.

Many studies have been conducted on the effect of feeding level on fish growth (Shell,
1969; Hogendoorn, 1981; Santiago et al, 1987; Chiu et al, 1987; Pouomogne and Mbongblang,
1993), but information on the optimum feeding level for the growth of the African catfish,
Heterobranchus bidorsalis fry under outdoor nursery management system is unavailable.

According to Hogendoorn (1981), growth of Clarias gariepinus (o.85g) increased by three
times when the feeding level was increased from 2% to 10% of the live body weight; and when
increased to satiation level, there was no additional growth.

Santiago et al (1987) fed Oreochromis niloticus fry (initial weight 12mg) for 5 weeks on
crumbled pellets (35% crude protein); and fish fed 15, 30, 45, and 60% of body weight reached
mean weight of 63, 198, 232 and 228mg, respectively.

The present study was initiated to provide information of the optimum feeding regime for
rearing Heterobranchus bidorsalis fry in outdoor concrete tanks.

MATERIALS AND METHODS

The study was carried out in the hatchery complex of the National Institute for Freshwater
Fisheries Research New Bussa, Nigeria comprising fifteen outdoor concrete tanks (2x2x1m³). The
tank bottom were lined with 15cm of fine rive sand. Prior to stocking, quicklime was applied to the
wet tanks bottom at 12.5g/m² to eliminate parasites and invertebrate predators. Ten days later, the
tanks were filled with filtered water to a depth of 0.6m. Dried pig manure was added as the initial
pond fertiliser at 100g/m² to develop plankton blooms.

Full siblings obtained from hormone induced spawning of Heterobranchus bidorsalis
(0.03g, about 3 weeks old) were stocked into the tanks at 25 fish/m².

A 40% protein diet was formulated and prepared using fish meal, soyabean meal, blood meal, yellow maize, oil (vegetable) and vitamin premix as ingredients (Table I).

The experimental diet was randomly assigned to triplicate tanks according to the following feeding levels 10%, 20%, 30%, 40% and 50% body weight/day for 70 days. Fish were fed the diet daily; 7 days a week, in three equal meals given every 5 hours between 08:00 and 18:00. All fish were weighed and counted fortnightly and feeding rates adjusted according to mean fish weight in each tank. After 70 days the remaining fish were counted and weighted, and the total lengths recorded.

Water temperature pH and dissolved oxygen concentration were monitored weekly. These parameters varied as follows: temperature, 26.00 - 28.50°C; dissolved oxygen, 4.10 - 6.05mg/l; pH, 7.20-7.60.

Moisture crude protein (N x 6.25), crude lipid, crude fibre and ash content of the experimental diet and the fish samples were determined according to AOAC (1990).

Growth performance and feed utilisation parameter were computed and subjected to analysis of variance and multiple means comparison using Turkey's HSD test to determine the differences between treatment means.

RESULTS

Mean fish growth throughout the trial is presented in fig. 1. All fish fed actively and appeared healthy. Survival of the fish during the experiment ranged from 37.5 to 68.0 and was not related to the feeding level. The best growth response was achieved at 40% feeding level as shown by the results of the final weights (Table 2). Final mean weights showed no significant differences between the treatments (P>0.05) (Table 2).

Similarly no significant differences (P>0.05) was found between the DGR and SOR in the treatments (table 3). However, feed intake was significantly different (P<0.05) between the treatments. Feed conversion and protein efficiency ratios showed significant (P<0.05) variations among treatments. The water quality parameters measured were within the desired range recommended for catfishes (Viveen et al, 1986).

Carcass composition (Table 4) shows an increase in crude protein and a decrease in fat and ash contents as the feeding level increased.

DISCUSSION

Based on growth performance indices (SGR, DGR, MWG and final mean weight), the best growth performance was achieved by feeding H. bidorsalis fry at 40% of feeding level per day attaining a body weight of about 6.66g/fish within 10 weeks of rearing in the outdoor concrete tanks. This rate of weight development compares favourably with high values reported for other cultured species e.g 4.5g for carp (Cyprinus carpio) in a week at 23°C (Huisman, 1974), 9.5g for channel catfish (Ictalurus punctatus) in 4 weeks at 28°C (Stickney et al; 1972) and 7.4g for Clarias gariepinus in 3 weeks at 30°C (Hogendoorn, 1981).

Increasing feeding level significantly resulted in decreased in feed utilisation. The feed conversion rates and protein efficiency ratio were remarkably low. This agrees with values reported for fry of C. gariepinus (Hogendoorn,1981) but differs from the values reported for small carp C. carpio at 27°C (which was> 1) (Huisman et al; 1979).

Based on the results and the foregoing, it could be concluded that in practice, when supplementary feed is provided for H. bidorsalis fry under outdoor nursery/rearing (where natural food is available), feeding at 40% feeding level is optimal to attain maximum growth and efficient feed utilisation within 10 weeks, being the normal fry rearing period.
REFERENCES


Table 2. Summary of growth and production of H. bidorsalis fed at different Levels. Initial mean body weight + SD, 0.03cm + 0.01g; Total length 1.57 ± 0.03cm.

<table>
<thead>
<tr>
<th>Feeding level (%) body weight</th>
<th>Stocking rate (No / m²)</th>
<th>Final Length (cm)</th>
<th>Final Weight (g)</th>
<th>Percent Survival</th>
<th>Production (g / m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>25</td>
<td>6.62 ± 1.61</td>
<td>4.15 ± 1.51</td>
<td>68.0 ± 5.7</td>
<td>70.55 ± 5.87</td>
</tr>
<tr>
<td>20</td>
<td>25</td>
<td>6.41 ± 1.31</td>
<td>4.51 ± 1.66</td>
<td>51.5 ± 23.3</td>
<td>58.07 ± 26.31</td>
</tr>
<tr>
<td>30</td>
<td>25</td>
<td>7.20 ± 1.69</td>
<td>4.70 ± 1.73</td>
<td>61.5 ± 12.0</td>
<td>72.26 ± 14.12</td>
</tr>
<tr>
<td>40</td>
<td>25</td>
<td>7.75 ± 1.99</td>
<td>6.66 ± 2.54</td>
<td>44.0 ± 11.3</td>
<td>73.26 ± 18.84</td>
</tr>
<tr>
<td>50</td>
<td>25</td>
<td>7.79 ± 2.01</td>
<td>6.65 ± 2.62</td>
<td>37.5 ± 12.0</td>
<td>62.32 ± 19.99</td>
</tr>
</tbody>
</table>

Values in parentheses are standard deviations. Values in each column followed by the same letter are not significantly different (P>0.05).
Table 3  Effect of difference feeding levels on feed utilisation parameters and Growth of H. bidorsalis fry.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCR(^1)</td>
<td>2.13</td>
<td>3.38</td>
<td>7.87</td>
<td>7.94</td>
<td>9.65</td>
</tr>
<tr>
<td>PER(^2)</td>
<td>5.93</td>
<td>2.92</td>
<td>2.38</td>
<td>1.76</td>
<td>1.33</td>
</tr>
<tr>
<td>DGR (g/fish/day)(^3)</td>
<td>0.06(^a)</td>
<td>0.06(^ac)</td>
<td>0.07(^c)</td>
<td>0.09(^b)</td>
<td>0.09(^b)</td>
</tr>
<tr>
<td>SGR (%/day)(^4)</td>
<td>7.04(^a)</td>
<td>7.16(^a)</td>
<td>7.22(^b)</td>
<td>7.72(^b)</td>
<td>7.72(^b)</td>
</tr>
</tbody>
</table>

Figures in each row having different superscripts are Significantly different (P<0.05) according to Turkey HSD test.

1FCR = Dry food intake / weight gain
2PER = weight gain / protein intake.
3DGR = (Wf – Wi) / growth period.
4SGR = 100 (In Wf – In Wi) / growth period.

<table>
<thead>
<tr>
<th>Composition</th>
<th>Initial</th>
<th>T1 (10%)</th>
<th>T2 (20%)</th>
<th>T3 (30%)</th>
<th>T4 (40%)</th>
<th>T5 (50%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>85.73</td>
<td>75.65</td>
<td>75.16</td>
<td>74.75</td>
<td>73.53</td>
<td>72.87</td>
</tr>
<tr>
<td>Crude protein</td>
<td>10.28</td>
<td>16.19</td>
<td>16.72</td>
<td>17.33</td>
<td>17.46</td>
<td>17.84</td>
</tr>
<tr>
<td>Crude fat</td>
<td>3.05</td>
<td>3.80</td>
<td>3.26</td>
<td>2.80</td>
<td>2.75</td>
<td>2.70</td>
</tr>
<tr>
<td>Ash</td>
<td>1.25</td>
<td>3.20</td>
<td>2.97</td>
<td>2.60</td>
<td>2.56</td>
<td>2.53</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>0.40</td>
<td>0.89</td>
<td>1.00</td>
<td>1.11</td>
<td>1.43</td>
<td>1.65</td>
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