Survival and growth of juvenile silver pompano *Trachinotus blochii* (Lacepède, 1801) at different salinities in tropical conditions

C. KALIDAS, M. SAKTHIVEL, G. TAMILMANI, P. RAMESH KUMAR
A. K. ABDUL NAZAR, R. JAYAKUMAR, BALAMURUGAN, RAMKUMAR,
PREM JOTHI AND G. GOPAKUMAR

Mandapam Regional Centre of Central Marine Fisheries Research Institute, Marine Fisheries P.O.
Ramanathapuram - 623 520, Tamil Nadu, India
e-mail: dascift@gmail.com

ABSTRACT

The objectives of the present study were to evaluate the tolerance of juvenile silver pompano to different salinity conditions in order to determine the minimum salinity required for survival and also to study the effect of different salinities on survival and growth. Wild caught juveniles of the silver pompano *Trachinotus blochii* (average initial length: 4.38±0.44 cm, average initial weight: 1.6±0.09 g) were used in the experiments. The experiments were conducted in triplicate with 15 fish per tank. Control groups were maintained at 34±1 ppt. Juvenile silver pompano reared at ambient salinity (34±1 ppt) were transferred directly to lower salinities (25, 15, 10, 5, 4, 3 and 1 ppt) and monitored for survival. Results indicated that the minimum salinity required for the survival of juvenile *T. blochii* is 4 ppt and 100% mortality was observed within 7-8 h in 1 ppt salinity.

In another experiment, three salinity reduction protocols were followed and the three treatment groups were exposed to 25, 15 and 5 ppt salinity for a period of 56 days and the growth and survival were monitored. Survival and growth in terms of weight was not significantly different in the treatments from the control group except in the case of 5 ppt, which showed comparatively lower survival and specific growth rate (SGR). The results indicate that the culture of juvenile pompano might be feasible in salinities up to 15 ppt in tropical conditions.

Keywords: Euryhaline, Salinity tolerance, Silver pompano, *Trachinotus blochii*

**Introduction**

The silver pompano *Trachinotus blochii* is an euryhaline, pelagic, active swimming, omnivorous fish with good meat quality. It is comparatively easy to domesticate and breed under controlled conditions. The species is ideal for mariculture because of its fast growth rate and easy weaning to pellet feeds. Silver pompano larvae, fingerlings and adult are hardy and can be easily acclimatised to lower salinities. Sampaio *et al.* (2003) found that pompano tolerate wide range of salinity, between 7 and 58 ppt on acute exposure of individuals acclimated to seawater (35 ppt), and on gradual exposure to diluted seawater with even lower salinities. The objectives of the present study were to evaluate the salinity tolerance of juvenile pompano exposed to various salinity conditions in order to determine the minimum salinity required for survival and also to study the effect of different salinities on survival and growth.

**Material and methods**

Juveniles of *Trachinotus blochii* caught from the sea off Mandapam in Tamil Nadu were used for the experiments. Experiments were conducted in triplicate in 30 l tanks with 15 juveniles (average initial length: 4.38±0.44 cm, average initial weight: 1.6±0.09 g) per tank. Control groups were maintained at 34±1 ppt. Two sets of experiments were conducted. In the first experiment, juvenile silver pompano reared at ambient salinity (34±1 ppt) were transferred directly to lower salinities (25, 15, 10, 5, 4, 3 and 1 ppt) and monitored continuously. They were fed twice daily with artificial diet (INVE-NRD feed, Thailand) of appropriate pellet size. Uneaten feed and fecal matter were removed periodically. Dead fishes, if any, were removed and recorded. Fish from each tank were counted and weighed every week (7th day) until the end of 56 days to monitor survival and growth.
Percentage survival (%) was determined as: Number of survivors at the end of the experiment × 100/number stocked initially. Specific growth rate (SGR) was determined as: SGR (% body weight day⁻¹) = [(In (W₂ – W₁)) x 100]/∆t, where, W₁ = initial wet weight of fish at stocking, W₂ = final wet weight of fish, t = growout period.

Water exchange (50%) was done daily and care was taken to maintain the treatment salinity with reverse osmosis water. Multi-parameter kit (Eutech instruments – PCD 650 model) was used for measuring the water quality parameters in the rearing tanks. Temperature ranged from 28°C to 31°C, pH ranged from 7.5 to 8.23 and dissolved oxygen (DO) ranged from 4.51 to 6.34 mg l⁻¹ in the rearing tanks.

Statistical analysis

The data were analysed using SPSS version 16.0, using one-way ANOVA and Duncan’s multiple range test was carried out for post hoc comparison of mean. A significance level of p<0.05 was used.

Results and discussion

The results of the first experiment indicated that the minimum salinity required for survival of juvenile *T. blochii* is 4 ppt. Mortality (100%) was observed in 3 ppt salinity within 10-12 h of the experiment. In 1 ppt salinity, 100% mortality was observed within 7-8 h (Fig. 1).

In the second experiment, survival rate was not significantly different among different treatments throughout the experiment, except in T-3 (5 ppt) which showed lower survival than the control fishes (Fig. 2). The growth in terms of weight gain (Fig. 3) was not significantly different between the treatment and control groups and SGR was lower in the 5 ppt treatment when compared to other groups (Table 1).

Table 1. Survival and growth of juvenile silver pompano at different salinities

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Survival (%)</th>
<th>Initial length (cm)</th>
<th>Final length (cm)</th>
<th>Initial weight (g)</th>
<th>Final weight (g)</th>
<th>Weight gain (g)</th>
<th>SGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>93.33±3.85</td>
<td>4.64 ±0.05</td>
<td>7.61 ± 0.05</td>
<td>1.94 ± 0.05</td>
<td>7.20 ± 0.09</td>
<td>5.30±0.04</td>
<td>2.07± 0.03</td>
</tr>
<tr>
<td>T₁</td>
<td>77.80±2.22</td>
<td>4.59 ±0.30</td>
<td>7.56 ± 0.35</td>
<td>1.91 ± 0.38</td>
<td>7.29 ± 0.57</td>
<td>5.38±0.19</td>
<td>2.18± 0.20</td>
</tr>
<tr>
<td>T₂</td>
<td>82.20±2.01</td>
<td>4.47 ±0.40</td>
<td>7.59 ± 0.34</td>
<td>1.33 ± 0.56</td>
<td>6.92 ± 0.52</td>
<td>5.59±0.05</td>
<td>2.42±0.10</td>
</tr>
<tr>
<td>T₃</td>
<td>73.33±3.84</td>
<td>4.38 ±0.14</td>
<td>7.18 ±0.16</td>
<td>1.44 ± 0.11</td>
<td>6.65±0.19</td>
<td>5.21±0.10</td>
<td>1.83±0.32</td>
</tr>
</tbody>
</table>

Values within a column, and with same superscript in the case of SGR, are not significantly different (p>0.05).
wide range of salinity (35 to 3 ppt) and grew to marketable size (approximately 500 g) in one year under moderate salinity. Juveniles of pompano have been captured in water bodies with salinities as low as 9 ppt and as high as 50 ppt (Finucane, 1969; Perret et al., 1971; Gilbert and Parsons, 1986).

The 72 h LC$_{so}$ of wild caught pompano captured at 23 ppt was 3.5 ppt (Allen and Avault, 1970). The 72 h LC$_{so}$ of the same wild caught pompano acclimated for 12 days at 5 ppt was 1 ppt. Allen and Avault (1970) also observed that juvenile pompano were able to grow at a salinity of 5 ppt. At temperatures of 22-27 °C and an initial salinity of 32-33 ppt, juvenile pompano were able to tolerate salinities as low as 2 ppt and as high as 45 ppt (Kumpf, 1971). Juveniles apparently tolerate a somewhat greater range of salinity, some having been observed in waters with salinities as low as 9 ppt (Gunter and Hall, 1963) and as high as 50 ppt (Perret et al., 1971). When Moe et al. (1968) transferred five pompano directly from seawater to freshwater, the fish went into a state of shock and died within 7.5 h and from the results of the experiment they inferred that pompano possibly could, under controlled conditions, adapt to freshwater. The same observation was confirmed in the present study too. Four numbers of pompano taken from waters with a salinity of 29 ppt and placed in water with a salinity of 9 ppt showed no stress, and were maintained at 9 ppt for 16 days. The salinity was then gradually reduced over 3 days to 1.3 ppt without mortality.

Main et al. (2008) found that, T. carolinus reared in salinities as low as 5 ppt suffered high mortalities and reported that minimum salinity concentration of 10 ppt may be better for pompano farming. Wills et al. (2007) studied the growth and survival of T. carolinus in different salinities of 1, 3 and 28 ppt and observed 42%, 52% and 96% survival respectively at 28 °C. Jian-sheng et al. (2008) studied the effect of different salinity levels (10, 15, 20, 25, 30 and 35 ppt) on T. ovatus juveniles and concluded that salinity of 25 ppt is favourable for its growth and the maximum SGR observed was 3.21% day$^{-1}$. Chavez et al. (2011) reported that in T. blochii cultured in the salinity range of 30-35 ppt, the SGR ranged from 2.63 to 2.72% BW day$^{-1}$.

In our observation, reduction of salinity to 5 ppt resulted in relatively lower survival as well as growth (p< 0.5%) and the recommended range for low salinity culture of pompano is 15-25 ppt (Table 2). The present study indicates that the culture of silver pompano in low saline (15 ppt to 25 ppt) water bodies might be feasible.

### Acknowledgements

The authors are extremely thankful to the Director, Central Marine Fisheries Research Institute (CMFRI), Kochi for providing opportunity to work on the topic and also for the constant encouragement to pursue the work.

### References


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### Table 2. Recommended range for low salinity culture of pompano in Inland waters

<table>
<thead>
<tr>
<th>Species</th>
<th>Minimum salinity required for survival</th>
<th>Recommended range for low salinity culture</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trachinotus ovatus</td>
<td>1.5 ppt</td>
<td>15 - 25 ppt</td>
<td>Chervinski et al. (1973); Jian-sheng et al. (2008)</td>
</tr>
<tr>
<td>Trachinotus carolinus</td>
<td>1.3 ppt</td>
<td>12 - 19 ppt</td>
<td>Moe et al. (1968); Wills et al. (2007)</td>
</tr>
<tr>
<td>Trachinotus marginatus</td>
<td>5 ppt</td>
<td>10 - 20 ppt</td>
<td>Costa et al. (2008)</td>
</tr>
<tr>
<td>Trachinotus blochii</td>
<td>4 ppt</td>
<td>15 - 25 ppt</td>
<td>Present study (2011)</td>
</tr>
</tbody>
</table>


Date of Receipt : 30.03.2012
Date of Acceptance : 13.07.2012