Rate of water filtration in the mussel, *Musculista senhousia* (Benson) from Cochin backwaters, west coast of India

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Younger mussels showed higher filtration rate (studied using neutral red dye clearance technique) than older ones when filtration rate was expressed as per gram body weight per hour. The mussels showed no significant variation in filtration rate in different salinities indicating their wide tolerance to salinity changes.

Suspension feeding organisms obtain their food by filtering finely dispersed organic matter from the surrounding water. Filtration is a function of (i) amount of water transported across the feeding surface (ctenidia), (ii) amount of food present in the surrounding water, and (iii) retention ability of ctenidia. Filtration rate is influenced by a number of environmental factors like temperature, salinity, dissolved oxygen, flow rate, etc. Lamellibranchs have been extensively studied for their water transport and filtration activity under different conditions.

The mussel, *Musculista senhousia* (Benson) inhabits highly productive estuarine zone rich in organic detritus in suspended form. This area is subjected to wide range of salinity fluctuations. The present paper highlights the filtration rate of *M. senhousia* in different salinities encountered in its habitat (Cochin backwaters).

*M. senhousia* were collected from Cochin backwaters. In the laboratory, mussels were maintained in tanks containing ambient seawater for 2 d under aeration. Later mussels of different sizes (9-24 mm in length) were selected and acclimated in different experimental salinities 10, 15, 20, 25 and 30×10⁻³ for 7 d.

After 7 d, 10 specimens each of uniform size were transferred to beakers containing 2 mg l⁻¹ neutral red in seawater of different experimental salinities. At intervals of 30 min, 10 ml of test seawater was removed for 2 h using a pipette and concentration of the dye after acidification was estimated using a spectrophotometer (Hitachi 200-20). The experiment was repeated several times. Filtration rate was evaluated by dye clearance technique and calculated using Quayle's equation. After the experiment, soft tissues were dissected and dried at 80°C for 24 h.

Controls with empty shells in test seawater and with only test seawater were sampled in order to measure the possible difference due to absorption of the neutral red by shells and settling of the suspension.

The relationship between body weight and filtration rate in different salinities was studied by fitting the regression equation, \( Y = aX^b \), where \( Y \) represent filtration rate, \( X \), body weight and \( a \) and \( b \), fitted parameters. The constants \( a \) and \( b \) were estimated by the method of least squares after logarithmic transformation. Analysis of covariance was done for the comparison of the regression values.

Filtration rates of standard weights in different experimental salinities are given in Table 1. In all salinities and size groups, filtration rate (ml.h⁻¹) increased with body weight, and weight specific filtration rate (ml.mg⁻¹.h⁻¹) decreased.

Comparison by covariance analysis of the linear regression of logarithm of filtration rate in different salinities on logarithm of body weight showed non-significant 'F' value of 1.68. That is, in respective experimental salinities the filtration rate-body weight values were homogeneous.

As the water passes through the gills of bivalve, all particles therein would be completely removed. Changes in the rate of clearing of the dye may be interpreted as resulting from changes in the amount of water filtered. In the present study, filtration rate was less in small mussels (Table 1), indicating that the rate of filtration and body weight showed a positive relationship. But the weight-specific filtration rate followed an opposite trend. The higher filtration rate per
Table 1—Filtration rate and weight specific filtration rate in *M. senhau sia* in different experimental salinities

<table>
<thead>
<tr>
<th>Std. wt. (mg dry wt.)</th>
<th>Salinity (×10⁻²)</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
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<td>25</td>
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<td>11.00</td>
<td>16.00</td>
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<tr>
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<td>21.00</td>
<td>19.00</td>
<td>24.50</td>
<td>18.68</td>
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<tr>
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<td>25.00</td>
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<tr>
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<td>31.00</td>
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</tr>
<tr>
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<td>36.75</td>
<td>40.50</td>
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<tr>
<td>150</td>
<td>48.50</td>
<td>50.50</td>
<td>59.00</td>
<td>43.00</td>
<td>47.50</td>
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</tr>
</tbody>
</table>

*Weight specific filtration rate (ml.g⁻¹ h⁻¹)*

<table>
<thead>
<tr>
<th>Std. wt.</th>
<th>Salinity (×10⁻²)</th>
<th>10</th>
<th>15</th>
<th>20</th>
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<td>0.37</td>
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<tr>
<td>100</td>
<td>0.63</td>
<td>0.44</td>
<td>0.43</td>
<td>0.33</td>
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<td>0.46</td>
<td>0.34</td>
<td>0.41</td>
<td>0.31</td>
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</tr>
<tr>
<td>150</td>
<td>0.29</td>
<td>0.23</td>
<td>0.39</td>
<td>0.28</td>
<td>0.31</td>
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</table>

Influence of salinity on filtration rate varies in different species of bivalves. It may also be the result of acclimation in respective experimental salinities prior to the experiment. Thus, in the present study after the acclimation for a period of 7 d the mussels showed no significant variation in filtration rate in different salinities. This indicates their wide tolerance to the drastically changing salinity conditions of the backwaters.

References