Invasive Tunicates in Longline Mussel Farms

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INTRODUCTION

Four invasive tunicates have recently established and proliferated in Prince Edward Island (PEI), Canada (Figs. 1 & 2). The clubbed tunicate (Systylia clava) was first identified on cultured mussels (Mytilus edulis) in 1997. The colonial golden star (Botryllus schlosseri) and violet (Botryllidae violaceus) tunicates were then reported in 2001 and 2002, respectively, whereas the vase tunicate- (Ciona intestinalis) appeared in 2004.

The objective of this study was to compute lease-scale clearance rates for tunicate-infested and non-infested leases.

METHODS

In October 2011, cultivated mussels and invasive tunicates were collected from commercial mussel sleeves and brought to a nearby field laboratory. Clearance rate (CR) was measured on individuals using the indirect “static method” described in Riisgard (2001) and Petersen et al. (2004). CR represents the volume of water cleared of suspended particles per unit time (l h⁻¹ ind⁻¹). CR per unit leased area (CRₚₐₐₑₐ) was then calculated based on mussel and tunicate abundances.

RESULTS

Mean CRₚₐₐₑₐ for non-infested leases ranged from 293 to 365 l h⁻¹ m⁻² and was statistically similar amongst the different mussel crop scenarios (Table I, scenarios 1–4). The addition of B. violaceus as a fouling organism (scenario 5) had no significant effect on CRₚₐₐₑₐ. However, the addition of C. intestinalis (scenario 6) or S. clava (scenario 7) significantly increased CRₚₐₐₑₐ to 1057 and 1129 l h⁻¹ m⁻², respectively. Note that these fouling scenarios relate to non-treated sleeves.

CONCLUSION

When mussel sleeves are heavily fouled with solitary tunicates, there is a three-fold increase in the demand for food particles. Therefore, solitary tunicates effectively reduce the carrying capacity for longline mussel culture.

REFERENCES


Table I. Different lease scenarios with corresponding clearance rates per unit area (CRₚₐₐₑₐ). Values represent means ± 1 SE, n = 12–18 mussel sleeves. CRₚₐₐₑₐ sub-groups identified using Tukey’s HSD Post-hoc test.

<table>
<thead>
<tr>
<th>Lease scenario</th>
<th>Species, Year-Class</th>
<th>Individual size (mm)</th>
<th>Clearance rate (l h⁻¹ ind⁻¹)</th>
<th>Individuals per sleeve (no.)</th>
<th>Individuals per leased m² (no.)</th>
<th>CRₚₐₐₑₐ (l h⁻¹ m⁻²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>M. edulis, Year-Class 0</td>
<td>16.10±1.75</td>
<td>0.56±0.11</td>
<td>5551±740</td>
<td>749±100</td>
<td>293±123</td>
</tr>
<tr>
<td>Grow Out</td>
<td>M. edulis, Year-Class 1</td>
<td>37.13±0.67</td>
<td>2.15±0.06</td>
<td>1418±117</td>
<td>191±16</td>
<td>365±32</td>
</tr>
<tr>
<td></td>
<td>M. edulis, Year-Class 2</td>
<td>53.21±0.54</td>
<td>3.94±0.06</td>
<td>633±64</td>
<td>83±9</td>
<td>298±51</td>
</tr>
<tr>
<td></td>
<td>M. edulis, Year-Classes 1 &amp; 2 (50%)</td>
<td>70.89±0.84</td>
<td>5.83±0.08</td>
<td>442±42</td>
<td>60±10</td>
<td>338±20</td>
</tr>
<tr>
<td>Fouled Grow Out</td>
<td>B. violaceus</td>
<td>1–2</td>
<td>0.83±0.15</td>
<td>152±9</td>
<td>21±3</td>
<td>356±19</td>
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<tr>
<td></td>
<td>C. intestinalis</td>
<td>48.83±1.26</td>
<td>1.31±0.22</td>
<td>406±6</td>
<td>54±9</td>
<td>1057±260</td>
</tr>
<tr>
<td></td>
<td>S. clava</td>
<td>47.83±1.25</td>
<td>1.87±0.27</td>
<td>313±6</td>
<td>42±3</td>
<td>1129±20</td>
</tr>
</tbody>
</table>

* Abbots 2000: Reported as 15.8% of gross M. edulis; ** Reported as 15.8% of gross B. violaceus; *** Reported as gross M. edulis; **** Reported as gross B. violaeus per sleeve; ***** Reported as gross M. edulis per lease m²; ****** Ramsay et al. 2006; ******* Ramsay, Prince Edward Island Department of Agriculture, Fisheries and Aquaculture, pers. com.