Population Density of the Limpet, *Cellana radiata* (Born), in Polluted Waters at Porbandar, West Coast of India

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Population density and biomass of *C. radiata* are very low at those sites which are nearer to the effluent outlet from the local chemical industry. Increase in salinity, temperature and pH and decrease in dissolved oxygen in the seawater, due to release of effluent, seem to be the major factors for lower biomass and density of *C. radiata* in the polluted area.

Aqueous wastes from chemical, rayon and cement industries are released into the coastal waters of Saurashtra. These wastes contain generally carbonates, bicarbonates, chlorides and sulphates of calcium, magnesium and zinc. No attempt has been made to study the possible effects of the effluents from these industries on benthic flora and fauna of the Saurashtra coast. The present investigation has been undertaken to find out the effect of effluents, mostly containing chlorides, carbonates and sulphates of calcium and magnesium, released by the Chemical Industry at Porbandar on the population density and biomass of the limpet *Cellana radiata* (Born) (Mollusca: Gastropoda) inhabiting the intertidal zone.

Porbandar coast (lat. 21° 38'N; long. 69° 37'E) consists of rocky as well as sandy beaches. The study area extends from the entrance of old harbour to Chowpati area where the Chemical Industry discharges its effluents into the sea which move along the intertidal zone by tidal waves. The intertidal zone in this area remains practically covered by milky white seawater due to excess amount of carbonates, bicarbonates and chlorides.

Five sites were selected in the intertidal zone at an equidistance of about 1/2 km from the effluent release point towards the old harbour. Three distinct size groups of varying shell diameter (cm) of *C. radiata* (a, 0.6-1.4; b, 1.5-2.8; and c, 2.9 and above) were selected and their population distribution and size frequency were worked out by Belt transect method. Biomass of each size group per quadrat was determined in terms of their whole dry weight. Temperature, pH, salinity and dissolved oxygen of seawater samples collected from each site were determined.

Population (comprising adults, medium and juveniles) density (Fig. 1) was low at site I, which is nearest (1/2 km) to the effluent release point. The density increased with increasing distance from the release point. The lower values may be due to toxic effects of effluent leading to mortality of these limpets.

Density of juveniles of *C. radiata* was lower than the medium and adults indicating high susceptibility of juveniles to the effluent.

The biomass of *C. radiata* (Fig. 2) was also much lower at sites I to III compared to sites IV and V. The low availability of diatoms, which form the food of these limpets, may be one of the limiting factors for the low density and biomass observed.

Polymorphic colour banding patterns were reported on the shells of *C. radiata* from the coast of Saurashtra. However, in the present study, the shell did not show any distinct colour banding patterns. The presence of salt and lime in the effluent and their interaction with the surface of the shell may be responsible for the removal of colour banding on the shells.

![Fig. 1 — Population density of *C. radiata* at different sites](image-url)
Temperature, salinity and pH were high, while dissolved oxygen was low at sites I and II compared to sites III to V (Table 1). Survival of C. radiata in high salinity waters has been reported earlier\textsuperscript{6,8}.

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### Table 1—Characteristics of Seawater at Study Sites of Porbandar Coast

<table>
<thead>
<tr>
<th>Sites</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour of water</td>
<td>White</td>
<td>White</td>
<td>White</td>
<td>Clear</td>
<td>Clear</td>
</tr>
<tr>
<td>Turbid</td>
<td>Turbid</td>
<td>Turbid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water temp. ((^\circ)C)</td>
<td>40</td>
<td>34</td>
<td>34</td>
<td>32</td>
<td>32</td>
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<tr>
<td>pH</td>
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<td>8.8</td>
<td>8.3</td>
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<tr>
<td>Sal ((^\circ)/oo)</td>
<td>42.75</td>
<td>40</td>
<td>37.13</td>
<td>34.22</td>
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<tr>
<td>Dissolved oxygen (ppm)</td>
<td>2.63</td>
<td>3.04</td>
<td>5.2</td>
<td>5.53</td>
<td>5.65</td>
</tr>
</tbody>
</table>

### References