CAULERPA TAXIFOLIA – 2007 SURVEY OF CURRENT DISTRIBUTION AND HIGH RISK AREAS

Prepared for PIRSA Biosecurity

Keith Rowling

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Executive Summary

The distribution of the marine pest, *Caulerpa taxifolia*, has substantially expanded such that the alga cannot be eradicated from South Australia with current technology. Ongoing monitoring of its distribution has become critical to the management of the alga. The current distribution of *C. taxifolia* is still contained within the Port River area, and is found in much higher densities in areas impacted by thermal effluent. Isolated colonies of the alga have been located further downstream than in previous surveys, although there appears to be fewer colonies, possibly due to the winter senescence of the alga. There is no evidence that the alga has been translocated to boat ramps along the Adelaide metropolitan coastline.
Acknowledgements

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1. **Background**

The distribution of the marine pest, *Caulerpa taxifolia*, has substantially expanded such that the alga cannot be eradicated from South Australia with current technology. The management response to the alga has thus shifted from eradication to management of the existing population with the hope of slowing or stopping its future spread. Determining the potential impact of the alga on local environments and industries through ongoing monitoring of the population is thus critical to the management of the alga.

*C. taxifolia* expands its distribution by means of fragmentation. Of particular concern is the discovery of healthy fragments drifting off the coast of Adelaide (Largs Beach), outside the Port River region (Westphalen and Rowling 2005). Additionally, in spite of the restrictions on anchoring within the Port River/Barker Inlet area, there is substantial boating traffic in the area. Equipment associated with recreational vessels (in particular anchors) has been identified as a high-risk vector for the spread of *C. taxifolia*. Therefore, it is probable that the next areas to be infected will be those immediately adjacent to the Port River, and/or at boat ramps along the metropolitan coast.

There are three main areas of concern in terms of distribution monitoring:

1. The existing population in the Port River and Barker Inlet system.

2. Possible populations immediately outside the Port River (North Haven).

3. Sites to which the infestation may spread along the coast, particularly metropolitan boat ramps.

The possibility of an infestation of *C. taxifolia* at North Haven is currently being assessed through video transects being undertaken by SARDI to determine the distribution and abundance of seagrass across the Adelaide coastal waters, and will not be addressed in this report.

The objectives of this report are to document the current distribution of *C. taxifolia* in the Port River and to determine if the alga has become established at metropolitan boat ramps.
2. Methods

The Port Rivers surveys comprised a series of 100 m SCUBA diving and snorkelling transects along the major channels and areas of likely accumulation. Coverage of * Caulerpa taxifolia* was estimated in terms of a modified Braun-Blanquet scale (Table 1; Mueller-Dombois and Ellenberg 1974). Percent cover values in the table from 1 – 50 % correspond to light cover, and 51% to 100 % correspond to a heavy infestation. The start and end point of each transect was referenced using a GPS from the tender vessel.

There were also Braun-Blanquet estimates made of the cover of major community types (seagrasses, bare sand, etc) as well as other * Caulerpa* species (notably *Caulerpa racemosa*) and any large marine pests (*Sabella spallanzani, Ciona intestinalis*, etc) noted for future reference. The surveys took 15 days and were completed between 10th April 2007 and 12th July 2007.

Four major bot ramp facilities across the metropolitan coast were surveyed: St Kilda, North Haven, West Beach and O’Sullivan’s Beach. At each site, approximately 2 hours of SCUBA or snorkel surveys were conducted. No cover data was collected, but the presence of marine pests was noted. Position fixing of the survey area was achieved using shore referenced GPS points and features. The surveys accounted for man-made structures (pontoons, pilings) and the adjacent soft substrate. The boat ramp surveys were undertaken on 7th and 8th June 2007.
**Table 1:** Braun-Blanquet scale that was used to record coverage of *Caulerpa taxifolia* (and other major community types) during the survey (based on a method developed in Mueller-Dombois and Ellenberg 1974)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Percent Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>absent</td>
</tr>
<tr>
<td>1</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>2</td>
<td>5 to 25</td>
</tr>
<tr>
<td>3</td>
<td>25 to 50</td>
</tr>
<tr>
<td>4</td>
<td>50 to 75</td>
</tr>
<tr>
<td>5</td>
<td>75 to 95</td>
</tr>
<tr>
<td>6</td>
<td>&gt; 95</td>
</tr>
</tbody>
</table>

3. **Results**

The current distribution of *Caulerpa taxifolia* from this survey is shown below (Figure 1). A comparative map showing distribution from 2004-2006 is attached for comparison (Figure 2). Methods used for the 2004-2006 surveys were the same as above, although they took place earlier in the year (usually completed by April-May). There appears to be a similar pattern between years in the higher density areas, with the area to the east of Garden Island, both sides of the North Arm, and the eastern channel of the Port River having a high density of algae over the past few years. On the north-eastern side of Torrens Island the presence of *C. taxifolia* was much lower in 2007 compared to the previous year’s survey. Isolated colonies (single plants) were found further downstream than previous surveys, in areas adjacent to Section Bank and the northern bank of the Port River (in the bend, south of Section Bank).

*C. taxifolia* was not found during the surveys of the four boat ramps (Figure 3). *Caulerpa racemosa* was found at North Haven and O’Sullivans Beach, which confirms previous observations of this alga in these locations.
Figure 1. Distribution of *Caulerpa taxifolia* in 2007 surveys.
Port River Surveys: Progression from 2004 to 2006

Figure 2. Comparative distribution of *Caulerpa taxifolia* through 2004-2006.
**Figure 3.** Location of 2007 boat ramp surveys indicating where *Caulerpa racemosa* was located.
4. Discussion

The overall indication from the survey is that Caulerpa taxifolia continues to be present in high density in many areas of the Port River system. It is particularly dense around the eastern side of Garden Island, the North Arm area and the western side of Torrens Island. These are areas which would be affected by thermal effluent from the Torrens Island Power Station, and have fine sediment size and high nutrient loads in the sediment and the water (EPA, unpublished data). The fine sediments in these areas may be advantageous to C. taxifolia growth.

The distribution of C. taxifolia appears to still be spreading, with colonies found further downstream in the Port River and further out of the Barker Inlet than in previous years. Even thought the alga appears to be spreading further downstream, there are fewer colonies found in these outer regions than in previous surveys. The fact that the 2007 survey was much later than in previous years could mean that the onset of winter senescence of the alga may have resulted in a lower colony observation rate. In a related project, SARDI had permanent quadrats out in the Section Bank area, and over one summer observed C. taxifolia colonies appear then disappear within these quadrats. There will be more permanent quadrats put out over this summer, which may provide more information regarding this growth/die-off scenario.

The decision to reduce the biomass at the high-density areas and not target the fringes of distribution appears to be supported by the fact that although the distribution of the alga is spreading, there are no high biomass colonies, nor a smothering of other benthos, at these outer sites. The alga does not appear to increase in biomass over the winter, and in some cases does not appear to survive the winter senescence period in these outer regions.

It may be useful in the future to survey twice in a year, once in late summer when the density is highest and again in late winter, just after the winter senescence period, to get the complete picture of distribution changes that occur over a year.

The fact that C. taxifolia was not found during the boat ramp surveys suggests that the alga has not become established at detectable densities or has not been translocated from the Port River. Given the substantial boat traffic at these facilities, and the presence of C. racemosa (another alga well established in the Port River area) at two of the ramps indicates that the risk of translocation to metropolitan ramps is high. It is interesting to note that C. racemosa has not been observed
outside the O’Sullivans Beach revetments (Greg Collings, pers comm.), and although previously observed outside the North Haven revetments, it has not persisted in this area (SARDI, unpublished data). The survival off the Adelaide metropolitan coast, the life history, and competitive interactions of both Caulerpa spp. are being investigated in a related project.

A continuation of the education campaign for commercial and recreational boat users is likely to decrease the risk of translocation to these high risk locations, but it is very likely that the alga will be transported to these areas in the future. The presence of C. racemosa at two of these sites indicates that they are suitable for colonisation by Caulerpa spp. These surveys should be continued, while adding some sites on the western side of the Gulf St Vincent (Stansbury or Port Vincent) would be useful for monitoring further spread of the alga. Early detection at these sites may allow the alga to be eradicated from them quickly, slowing further spread.

5. References
