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Hutt River Estuary

Intertidal Macroalgal Monitoring 2010/11

Prepared for Greater Wellington Regional Council April 2011

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By

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Extensive growths of *Ulva intestinalis* along the intertidal margins of Hutt River Estuary.

1. INTRODUCTION AND METHODS

INTRODUCTION

Macroalgae is an important feature of estuaries, contributing to their high productivity and biodiversity. However, when high nutrient inputs combine with suitable growing conditions, nuisance blooms of rapidly growing algae (e.g. *Ulva* (sea lettuce), *Gracilaria*) can occur. At nuisance levels such growths can deprive seagrass of light causing its eventual decline, while decaying macroalgae can accumulate on shorelines causing localised depletion of sediment oxygen, and nuisance odours.

This brief report summarises the results of the second annual survey of intertidal macroalgal cover in Hutt River Estuary, undertaken in January 2011. The report describes intertidal macroalgal cover - a broad scale indicator of estuary eutrophication - using a macroalgal coefficient (described below) developed for Wellington's estuaries to rate the condition of the estuary, and recommend monitoring and management actions. These actions need to be considered in conjunction with the fine scale monitoring results presented in Robertson and Stevens (2010, 2011).

METHODS

Broad scale mapping of the percentage cover of macroalgae throughout all the intertidal habitat of Hutt River Estuary was undertaken in January 2011 using a combination of aerial photography, ground-truthing, and ArcMap 9.3 GIS-based digital mapping. The procedure, originally described for use in NZ estuaries by Robertson et al. (2002), has subsequently been modified and successfully applied to various estuaries to develop a separate GIS macroalgal layer (e.g. Stevens and Robertson 2009, 2010).

Rectified aerial photographs of the estuary (2008 Hutt City Council ~0.3 metre per pixel and 2005 LINZ 2.0 metre per pixel images) were used as base maps. Experienced coastal scientists then recorded the percentage cover of macroalgae directly onto laminated photos during field assessment of macroalgal cover. The field maps were then used to create a GIS layer from which the percentage cover information was subsequently calculated.

The report outputs are used to both identify and classify macroalgal cover, and to show changes in macroalgal cover over time by comparisons with previous surveys (annually if a problem estuary, or 5 yearly if not). The current report presents the 2011 percentage cover of macroalgae within the estuary as a GIS-based map (Figure 1), and a summary table of the dominant species and percentage cover classes (Table 1).

WELLINGTON ESTUARIES: MACROALGAE CONDITION RATING

A continuous index (the macroalgae coefficient - MC) has been developed to rate macroalgal condition based on the percentage cover of macroalgae in defined categories using the following equation: ***MC=((0 x %macroalgal cover <1%)+(0.5 x %cover 1-5%)+(1 x %cover 5-10%)+(3 x %cover 10-20%)+(4.5 x %cover 20-50%)+(6 x %cover 50-80%)+(7.5 x %cover >80%))/100.*** Overriding the MC is the presence of either nuisance conditions within the estuary, or where >5% of the intertidal area has macroalgal cover >50%. In these situations the estuary is given a minimum rating of FAIR and should be monitored annually with an Evaluation & Response Plan initiated.

MACROALGAE CONDITION RATING

RATING	DEFINITION (+Macroalgae Coefficient)	RECOMMENDED RESPONSE
Over-riding rating: Fair	Nuisance conditions exist, or >50% cover over >5% of estuary	Monitor yearly. Initiate Evaluation & Response Plan
Very Good	Very Low (0.0 - 0.2)	Monitor at 5 year intervals after baseline established
Good	Low (0.2 - 0.8)	Monitor at 5 year intervals after baseline established
	Low Low-Moderate (0.8 - 1.5)	Monitor at 5 year intervals after baseline established
Fair	Low-Moderate (1.5 - 2.2)	Monitor yearly. Initiate Evaluation & Response Plan
	Moderate (2.2 - 4.5)	Monitor yearly. Initiate Evaluation & Response Plan
Poor	High (4.5 - 7.0)	Monitor yearly. Initiate Evaluation & Response Plan
	Very High (>7.0)	Monitor yearly. Initiate Evaluation & Response Plan
Early Warning Trigger	Trend of increasing Macroalgae Coefficient	Initiate Evaluation and Response Plan

FIGURE 1. MAP OF INTERTIDAL MACROALGAL COVER - HUTT RIVER ESTUARY, JAN. 2011

2. RESULTS, RATING AND MANAGEMENT

RESULTS

2011 MACROALGAL COVER CONDITION RATING

FAIR

Figure 1 and Table 1 summarise the results of intertidal macroalgal mapping within Hutt River Estuary. As the highly modified estuary is confined within extensive flood-banks, the intertidal area is restricted to narrow bands along steep rip-rap rock walls and small areas of mudflat habitat present at the mouths of the Te Mome and Moera Streams. *Ulva intestinalis* is growing on almost every part of the intertidal habitat with an extensive cover extending from the railway overbridge to the Hutt River mouth. *Gracilaria* and the green alga *Ulva* sp. (sea lettuce) were largely confined to the lower intertidal reaches, with subtidal growths extensive near the Hutt River mouth.

Table 1. Summary of macroalgal cover results, 21 January 2011.

MACROALGAE	Hutt River Estuary		
Percentage Cover	Ha	%	Dominant species
<1%	0	0	-
1-5%	0.7	6.7	*U. Intestinalis*
5-10%	1.0	10.4	*U. Intestinalis*
10-20%	3.3	34.1	*U. Intestinalis, Ulva sp., Gracilaria*
20-50%	0.7	7.1	*U. Intestinalis, Gracilaria*
50-80%	2.0	20.9	*U. Intestinalis*
>80%	2.0	20.8	*U. Intestinalis*
TOTAL	**9.7**	**100.0**	

* Note, *Ulva intestinalis* is synonymous with *Enteromorpha intestinalis* (reported as *Enteromorpha* in Stevens and Robertson 2010) .

The Macroalgae Coefficient (MC) for the estuary was 4.3, a condition rating of "fair". This reflects an increase in cover from 2010 (MC=3.9 - see Table 2, Stevens and Robertson 2010), with the greatest increases evident in the lower part of the estuary below the Waione Street bridge. Subtidal growths of *U. intestinalis* were noticeably more luxuriant than in 2010.

Overall, macroalgae is present over the vast majority of the intertidal area within Hutt River Estuary - 9ha (93.3%) had greater than 5% cover, and 4ha (42% of the intertidal area) exceeded 50% cover. Despite the high cover, nuisance conditions (e.g. rotting macroalgae and poorly oxygenated and sulphide rich sediments) were not widespread in intertidal areas. However, nuisance conditions remain in subtidal areas near the mouth which is currently muddy, poorly oxygenated, and sulphide rich.

Table 2. Summary of condition rating and results, 2010-11.

Year	Rating	MC	Result
2010	FAIR	3.9	High cover (80-100%) of *U. intestinalis* along rip-rap walls and near Moera Stream mouth. Moderate cover (20-80%) of *U. intestinalis* and *Ulva sp.* at Te Mome Stream mouth.
2011	FAIR	4.3	Increase in *U. intestinalis* at Te Mome Stream mouth and on true left bank downstream of Waione Street bridge compared to 2010.

CONCLUSION

Macroalgal cover had a condition rating of "fair", with extensive growth throughout the estuary, and had increased compared to 2010. Nuisance conditions (rotting macroalgae and poorly oxygenated and sulphide rich sediments) were not present intertidally, but exist in subtidal areas near the Hutt River mouth.

2. Results, Rating and Management (Continued)

RECOMMENDED MONITORING AND MANAGEMENT	The condition rating triggers annual monitoring. The next monitoring in Hutt River Estuary is due in January 2012, and the latest available aerial photographs from the estuary should be used where appropriate. The likely cause of macroalgal growths should also be further evaluated (e.g. catchment wide nutrient inputs or localised sources), and a management response plan initiated. In particular, it is recommended that management actions be taken to reduce nuisance macroalgal growth to non-nuisance levels. This should include deriving a guideline limit for nutrient (likely to be nitrogen) inputs as the first step, followed by identification of major sources and their subsequent reduction to meet the guideline.
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