
Suelen Properties Ltd

Horseshoe Bay and Surrounds, Stewart Island

Oyster Farm Consent Compliance Monitoring 2017

prepared by

Ryder Consulting

August 2017



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1. Introduction

Suelen Properties Ltd hold a permit to occupy the coastal marine area with a marine farm at three sites at Nathan's Island, Nugget Point and Horseshoe Bay, Stewart Island, for the purpose of farming Bluff oysters. The areas allowed to be occupied comprise approximately 3.35 h, 0.73 ha and 1.82 ha, totalling 5.9 hectares (Figure 1).

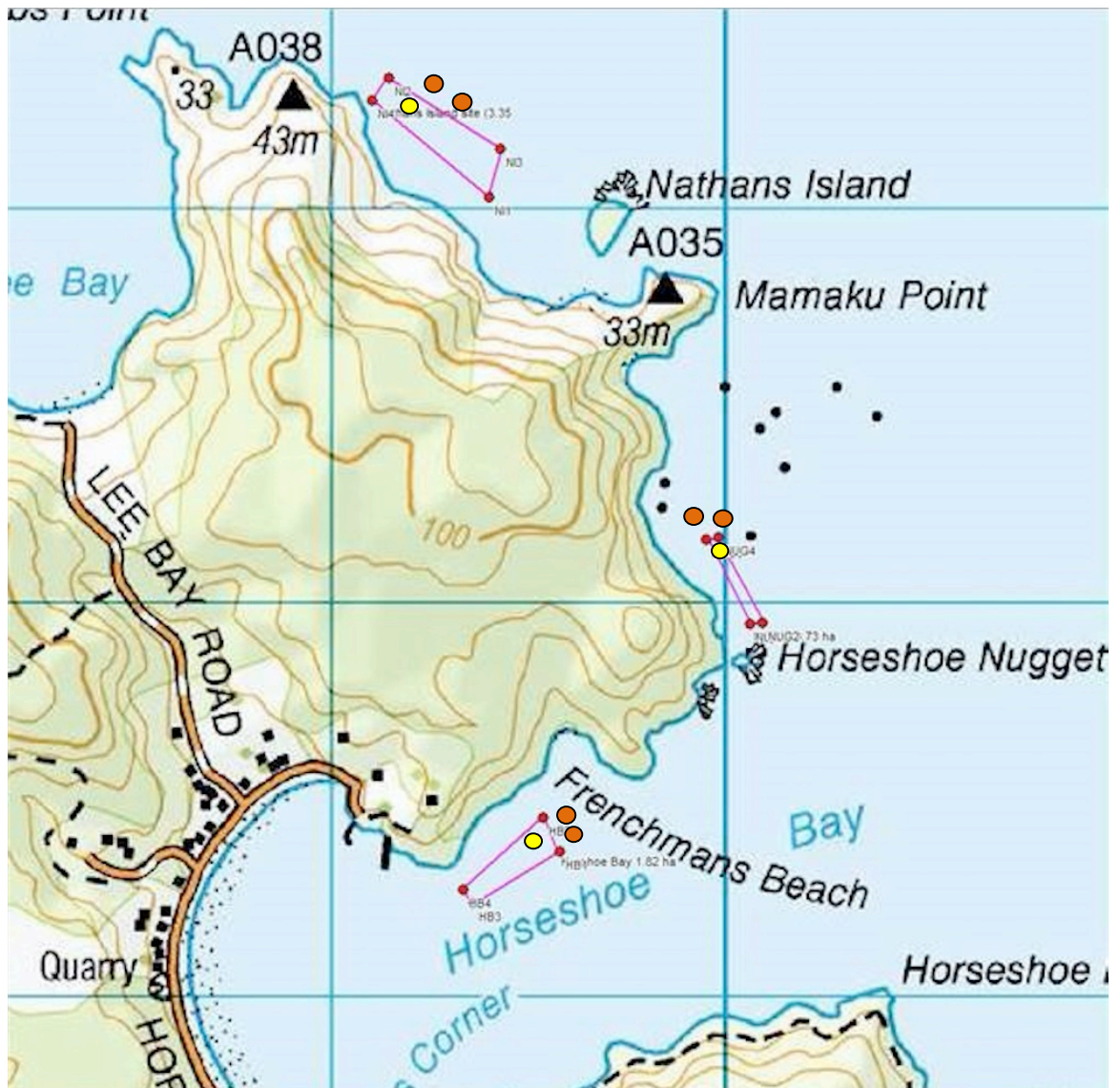


Figure 1 Marine farms (red polygons) surveyed around Horseshoe Bay, Stewart Island, showing approximate locations of survey sites (yellow dots) and control sites (orange dots).

Condition 1 of the permit states that the consent holder must undertake environmental monitoring. The relevant condition requires that:

1. *The consent holder shall monitor the effects of the marine farming activities on the seabed, as follows:*
 - (a) (i) *monitoring of the seabed at representative locations under the marine farm sites shall be undertaken twice in the first year of activity and thereafter annually for the duration of the consent. The monitoring locations shall be approved, in writing, by the Council's Compliance Manager.*
 - (ii) *in addition to Clause 1(a)(i), monitoring of the seabed in the wider area associated with the marine farms, at two control sites approved, in writing, by the Council's Compliance manager. The monitoring shall occur twice each year for the first three years, then once every year thereafter.*
 - (b) *the samples will be analysed for the following to assess the sediment quality:*
 - *sediment colour, including providing a colour photograph of the sediment sample;*
 - *depth of the oxygenated layer below the sediment surface;*
 - *occurrence of hydrogen sulphide;*
 - *sediment texture and grain size;*
 - *total organic carbon content; and*
 - *infaunal and epifaunal community composition.*

Monitoring shall include photographic evidence.

2. *The consent holder shall monitor the effects of the marine farming activity on water quality, as follows:*
 - (a) (i) *monitoring the water column shall be undertaken three times during the period 1 November to 30 June each year and once during the period of 1 July to 31 October each year for the first two years after commencement of this consent, by taking a sample at each marine farm site and two control sites outside the marine farm sites, at a depth of 5 metres.*
 - (ii) *after the first two years outlined in Clause 2(a)(i), monitoring of the water column shall be undertaken once during the period of 1 November to 30 June each year and once in the period of 1 July to 31 October each year, by taking a sample at each marine farm site and two control sites outside the marine farm sites at a depth of 5 metres.*
 - (iii) *the location of the sample sites in Clause 2(a)(i) and 2(a)(ii) above shall be approved in writing, by the Council's Compliance Manager.*
 - (b) *the water quality samples will be analysed for the following:*
 - *water temperature;*
 - *chlorophyll a;*
 - *vertical secchi disc depth; and*
 - *dissolved oxygen*

Paul Stirling, on behalf of Suelen Properties Ltd, originally engaged Ryder Consulting Limited to undertake the initial 2016 survey. Mr Stirling asked that he be

instructed in the methods used to collect the samples such that for future rounds of sampling he could undertake the sampling himself.

This report details the findings from samples collected by Mr Stirling at the Horseshoe bay and Horseshoe Nuggets sites (Figure 1.1) in August 2017 and sent to Ryder Consulting for analyses of macroinvertebrate infauna.

2. Methods

To assess infauna three cores, one within the farm site and two control cores outside the farm site, were taken to a depth of 180 mm using a 90 mm diameter plastic corer. Material obtained was then sieved through a 500 µm mesh sieve. Infaunal organisms retained in the sieve were preserved in 70% alcohol and sent to Ryder Consulting for identification and enumeration.

3. Results

A moderately diverse and abundant infauna was present at all sites (Table 1).

Table 1 Invertebrate fauna from cores taken at three sites around Horseshoe Bay, Stewart Island. HB = Horseshoe Bay; N = Nuggets; C = Control.

Phylum		Family	Genus/species	HB	HB-C1	HB-C2	NI	NI-C1	NI-C2
Annelida	Polychaeta	Capitellidae							
		Glyceridae		2			2	1	1
		Nephtyidae		3			1	1	1
		Nereididae		2	1	1		1	1
		Maldanidae						1	
		Spionidae		2		1	3	2	2
Crustacea		Callianassidae	<i>Callianassa filholi</i>						
	Amphipoda	Haustoriidae				1	2	3	3
		Oedicerotidae					1		
		Phoxocephalidae					1	1	
	Ostracoda				1	1		1	1
	Cumacea			1	1	1			1
	Tanaidacea					1		1	
Mollusca	Gastropoda	Trochidae	<i>Zethalia zealandica</i>				2		
		Turritellidae	<i>Zeacolpus symmetricus</i>					1	
	Bivalvia	Veneridae	<i>Tawera spissa</i>						
			<i>Dosina zealandica</i>				1		
		Mactridae	<i>Mactra discors</i>						1
		Mesodesmatidae	<i>Paphies australis</i>	1		1			
Number of animals				11	3	8	12	13	11
Number per m2				1727	471	1256	1884	2041	1727
Number of Taxa				6	3	8	7	10	8
Diversity index				0.75	0.48	0.9	0.81	0.96	0.86

As in 2016 the most abundant animals at all sites were polychaete worms and amphipods. Where molluscs more common at the Horseshoe Bay sites than at the Nuggets site last year, this year we see the opposite, albeit with very low densities of molluscs overall (Table 1). Density of animals ranged from 471 m⁻² at the Horseshoe Bay C1 site to 2041 at the Nathan Island C1 site. Diversity ranged from just three taxa at the Horseshoe Bay C1 to 10 taxa at the Nuggets C1 site.

Diversity index is a measure of diversity that takes into account the number of species present, as well as the relative abundance of each species (Table 3.2). When diversity indices (H') for farm sites are compared with control sites using ANOVA we find there is no significant difference ($F_{1,5} = 0.014$, $p = 0.909$).

4. Discussion

The infaunal organisms observed are also typical of the communities found in enclosed harbours and estuaries around southern New Zealand (Morton and Miller 1973; Cook 2010; Stewart 2009, 2016) and show no significant difference when diversity indices at farm and control sites were compared.

It would appear that the marine farms at Horseshoe Bay, Nugget Point and Nathan Island, Stewart Island, are having no discernible adverse effect on the benthic community beneath them, nor on underlying sediments.

5. References

- Cook, S de C. (2010). *New Zealand Coastal Marine Invertebrates*. Canterbury University Press. pp. 640.
- Morton, J. and Miller, M. 1968. *The New Zealand sea shore*. Collins, Auckland.
- Stewart B. (2009). *Habitat Mapping of the Catlins Estuary*; Otago Regional Council State of the Environment Report. Prepared for the ORC by Ryder Consulting Ltd. pp. 37.
- Stewart, B. G. 2016. *Tahuna wastewater treatment plant outfall – discharge consent 2002.623: Offshore sediment survey: January 2016*. Prepared by Ryder Consulting Ltd for Dunedin City Council.