

TAFI INTERNAL REPORT

ENVIRONMENTAL ASSESSMENT OF POTENTIAL MARINE FARMING AREAS IN MACQUARIE HARBOUR TASMANIA

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The opinions expressed in this report are those of the author/s and are not necessarily those of the Tasmanian Aquaculture and Fisheries Institute.

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Environmental Assessment of Potential Marine Farming Areas in Macquarie Harbour Tasmania

Executive Summary

An environmental assessment of nine areas in Macquarie Harbour in which marine farming zones may be located was conducted between the 17th and 21st of January 2011. The environmental assessment covered an area of approximately 2533.61 ha from the northwest of the Harbour, between Liberty Point and Sophia Point and to the southeast between Steadman Point and Coal Head.

This survey describes the substrate type, habitat distribution, bathymetry, and benthic flora and fauna in the nine proposed zones. The primary substrate for all nine zones was silt. There were some seabed surface anomalies in the acoustic data in Zone 8 which were inconsistent with the standard acoustic signature for consolidated habitat and which appeared to be debris on the seafloor (e.g. tree logs or concrete moorings). The surface layer of the silt sediment was characterized by a coppery brown surface deposit followed by dark grey (generally not black) sediment below. At several sampling locations there were small lumps of more densely aggregated mud within the body of the main sediment. The majority of the sediment grabs showed no evidence of anoxia (visual or smell).

The areas sampled ranged in depth from 10 m (Zone 9) to 50 m (Zone 2). The bathymetric range within each zone differed, but generally sloped towards the centre of the channel from the landward sides. Zone 6 and 7 both had their deepest margins in the centre of the proposed zones. Zone 8 showed no variation in bathymetry maintaining a consistent 16 m water depth.

Large and small polychaete tubes were frequently observed on the surface of the sediment in the video footage. Other fauna observed included heart urchins, bait fish and flathead (*Platycephalidae*). Two skates were observed in the video footage from zone 3 (20m depth) but the images were not clear enough to determine whether this was the threatened Port Davey Skate (*Zearaja maugeana*).

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Environmental Assessment of Potential Marine Farming Areas in Macquarie Harbour, West Coast Tasmania.

1. Introduction

In order to assess the suitability of proposed sites for marine farming activities in Tasmania, the *Marine Farming Planning Act* (1995) requires the preparation of an environmental impact statement (EIS). This environmental assessment is a preliminary component of the required EIS and represents a review of the habitats and sediment condition (i.e. bathymetry, distribution of seabed habitats and dominant flora and fauna) for areas in which marine farming zones may be located within Macquarie Harbour on the West coast of Tasmania. The EIS is used to assess site suitability and to assist in defining the environmental conditions prior to lease development.

This report covers an environmental assessment conducted between the 17th and 23rd of January 2011. Data on habitat distribution, bathymetry, sediment and benthic flora and fauna were collected from an area of approximately 2533.61 ha between Liberty Point and Sophia Point in the northwest region of the Harbour and Coal Head in the southeast (Figure 1).

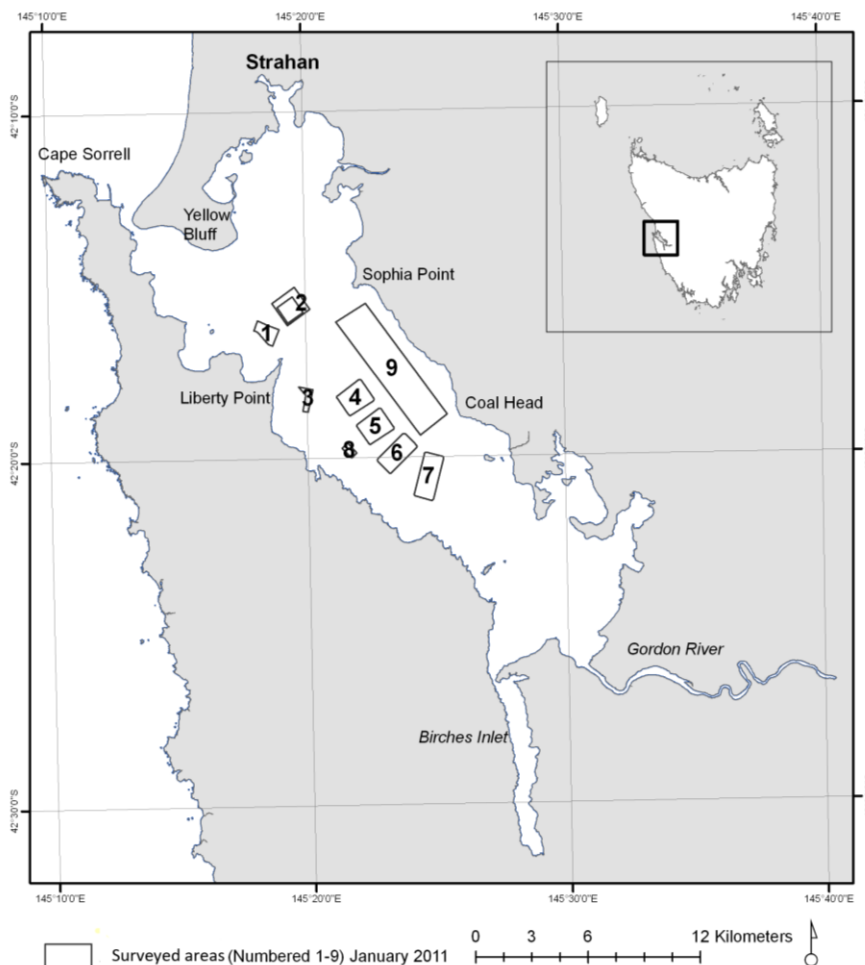


Figure 1. Location of survey areas in Macquarie Harbour 2011

2. Methods

Field surveys were conducted from the FRV *Nubeena II*. The vessel was driven along a series of parallel transects approximately 50 m apart for sites 1-8 and 150-100 m apart for zone 9 (Figure 2). Positional information was acquired using an OmniLite132 differential GPS receiver. GPS data was logged into a laptop computer and displayed in real-time, to aid in navigation, using *ArcPad6*.

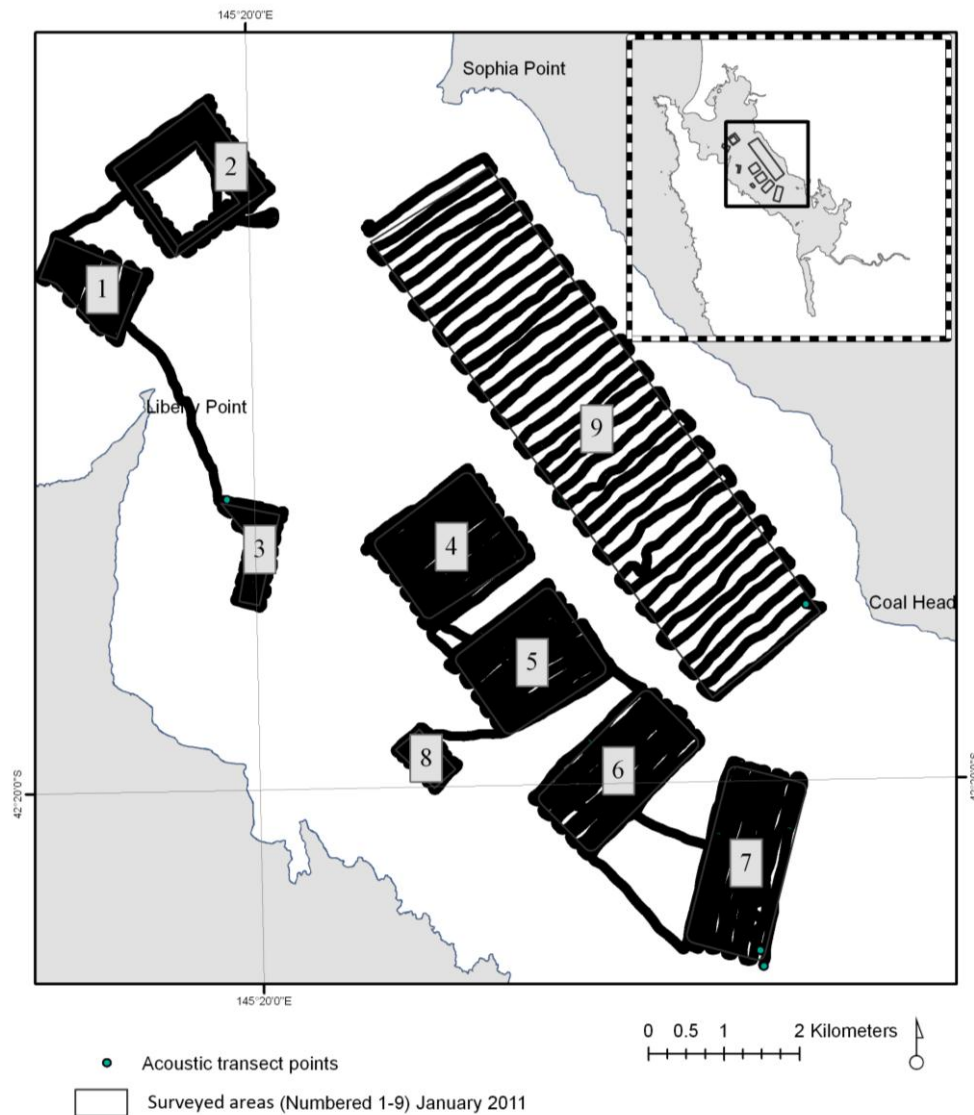


Figure 2. Nine potential marine farming areas showing acoustic transect distribution.

A Simrad ES60 scientific echo sounder was used to collect bathymetric data and the signal for discriminating different habitat types. The raw echo signal was logged in the field and stamped with time and positional information from the differential GPS. This signal was post processed using the commercially available acoustic analysis software *EchoView3.30*. Different substrate types were identified based on their

acoustic roughness and hardness, these interpretations were then confirmed with video and sediment samples.

Sediment samples were collected using a sediment grab at 47 sample sites; these are shown in Figure 3. A minimum of 5 sediment samples were collected from each survey area, with the sampling locations being chosen via a random point generator in ArcGIS 9.3. Sediment samples were used to characterise the sediment type and provide additional information on the biota. The sediment was characterised by colour, texture, and odour, and photos were taken at most sites. The sediment profile was also examined for layering and the presence of shell matter.

A submersible digital video camera was deployed at 43 sample sites from survey areas 1-8, in order to verify the habitat classification and obtain more detailed information on habitat attributes (Figure 4). Unfortunately, due to time constraints, video data was not collected in survey area 9. Where footage was collected the camera was allowed to drift 30-50 cm above the seafloor for two minutes. The video footage for each sample site was recorded on miniDV tape and was stamped with date, time and differential GPS position using a video overlay unit. All video footage was reviewed back in the laboratory to provide a description of the substrate and to identify the predominant flora and fauna (flora and fauna were identified to the lowest easily recognisable taxonomic level). The video footage linked to the habitat and bathymetric maps is available on the attached CD ROM and can be viewed with Image Mapper.

The habitat classifications generated from the acoustics, underwater video and sediment grabs were imported into *ArcGIS* (ESRI) as point data and these points were used to generate habitat polygons through on screen digitising of habitat boundaries. Points of similar habitat type were connected to form polygons. These polygons were referenced to the 1:25000 coastline supplied by the Land Information Services Tasmania, Department of Primary Industry Water. The bathymetric data was used to construct a GRID using Inverse Distance Weighting interpolation from which contour lines were generated at 2 m intervals. The bathymetric data was not tidally corrected in order to be consistent with the previous mapping results from Macquarie Harbour (SeaMap Tasmania) and because the local port (Hobart) and was deemed too far, away both in terms of distance and time lag, to affect the data from this period.

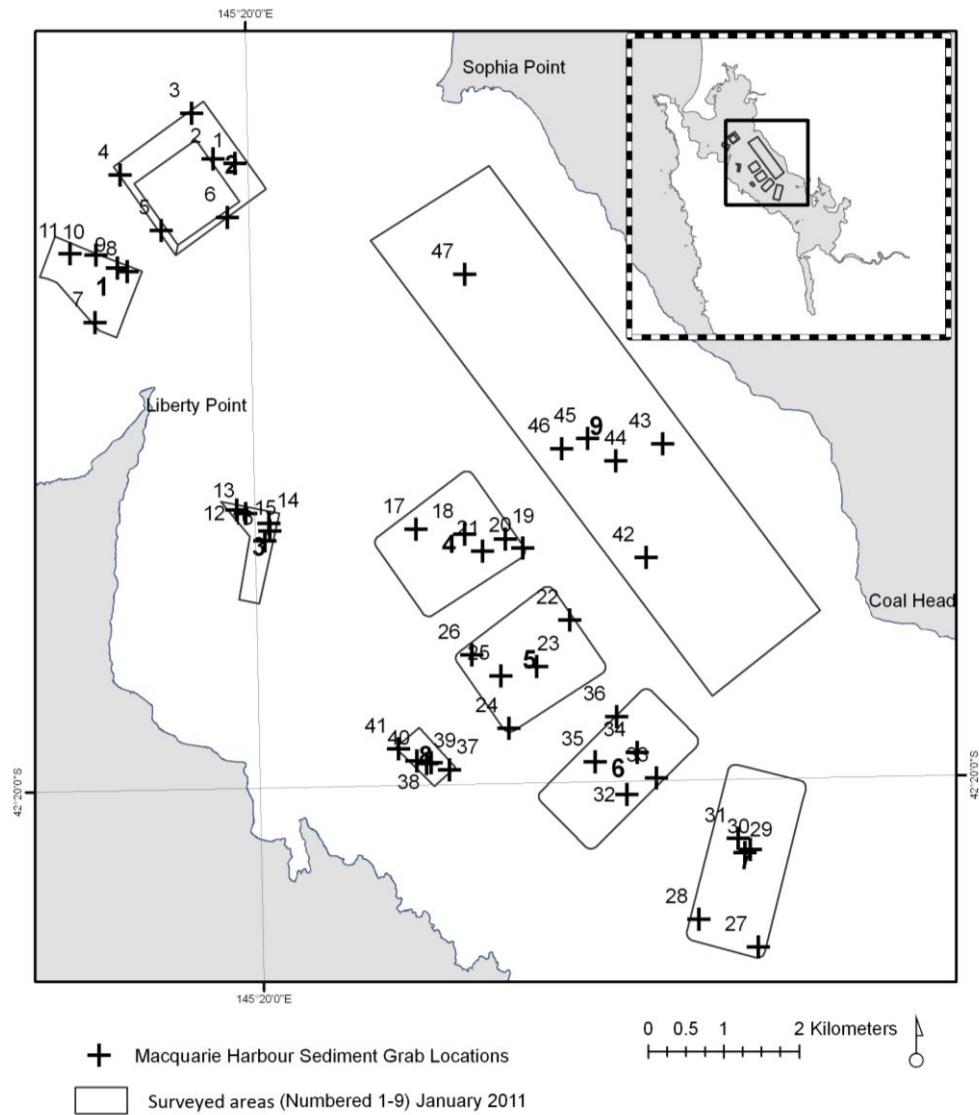


Figure 3. Location of sediment grabs collected throughout the nine survey areas.

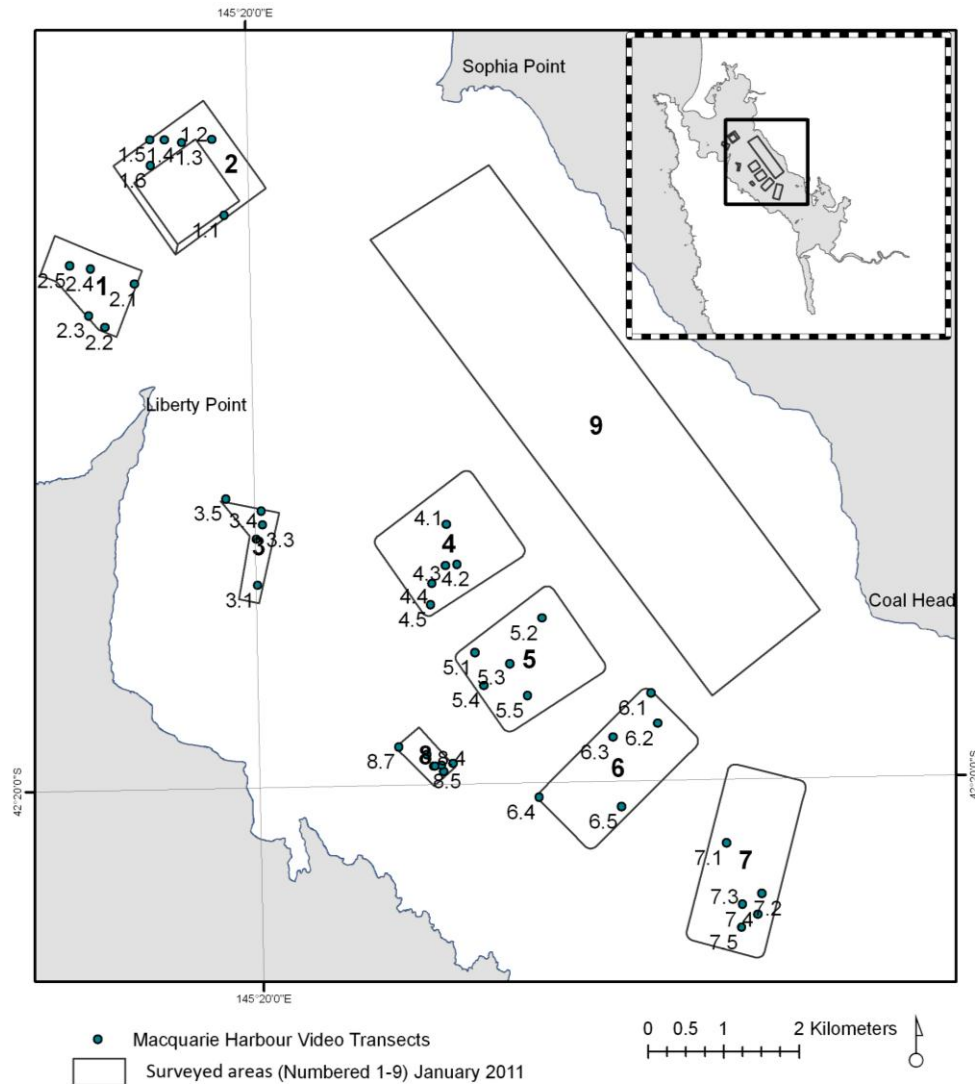


Figure 4. Distribution of video transects throughout the nine survey areas in Macquarie Harbour.

3. Results

3.1 Habitats and bathymetric results

The acoustic data, validated with the sediment grab assessments and video review, was used to generate substrate habitat maps for the nine survey areas. The sediment in all survey areas appeared to be predominantly silt (Figure 5, Table 1). Additional acoustic transects were undertaken in survey area 8 (Figure 6) to verify an unusual acoustic echo observed in this area which suggested the presence of a consolidated object on the seabed. The additional sampling suggested that the original echo was not consolidated substrate (i.e. reef) but was a smaller hard object, probably either a tree log or a small concrete tyre mooring on the seabed. Unfortunately the object could not be located using the towed video.

The bathymetry of the region is shown in Figure 7. Depths in survey area 1 ranged from 16 m in the southeastern corner near Liberty Point to 32 m on the northwestern boundary. Survey area 2 inclined steeply on the eastern boundary from 36 to 50 m

over a distance of 1 km. In contrast survey area 3 was comparatively flat, with depths consistently between 20 and 22 m. Survey area 4 sloped evenly from 22 m to 48 m with the shallowest margin being the landward boundary to the south west. A similar slope was evident in survey area 5 with depths ranging from 18 to 44m. Depths in survey areas 6 and 7 ranged from 24 m to 36 m and 26 m to 42 m respectively, with the deepest point in each zone being in the centre. Survey area 8 was relatively shallow with a consistent depth of 16 m. However, the shallowest area mapped was to the landward (eastern) side of survey area 9 where the depth was only 10 m at the point closest to Sophia Point. The deepest part of survey area 9 was located towards the centre of Macquarie Harbour and at the margin of the survey area, at around 42 m depth.

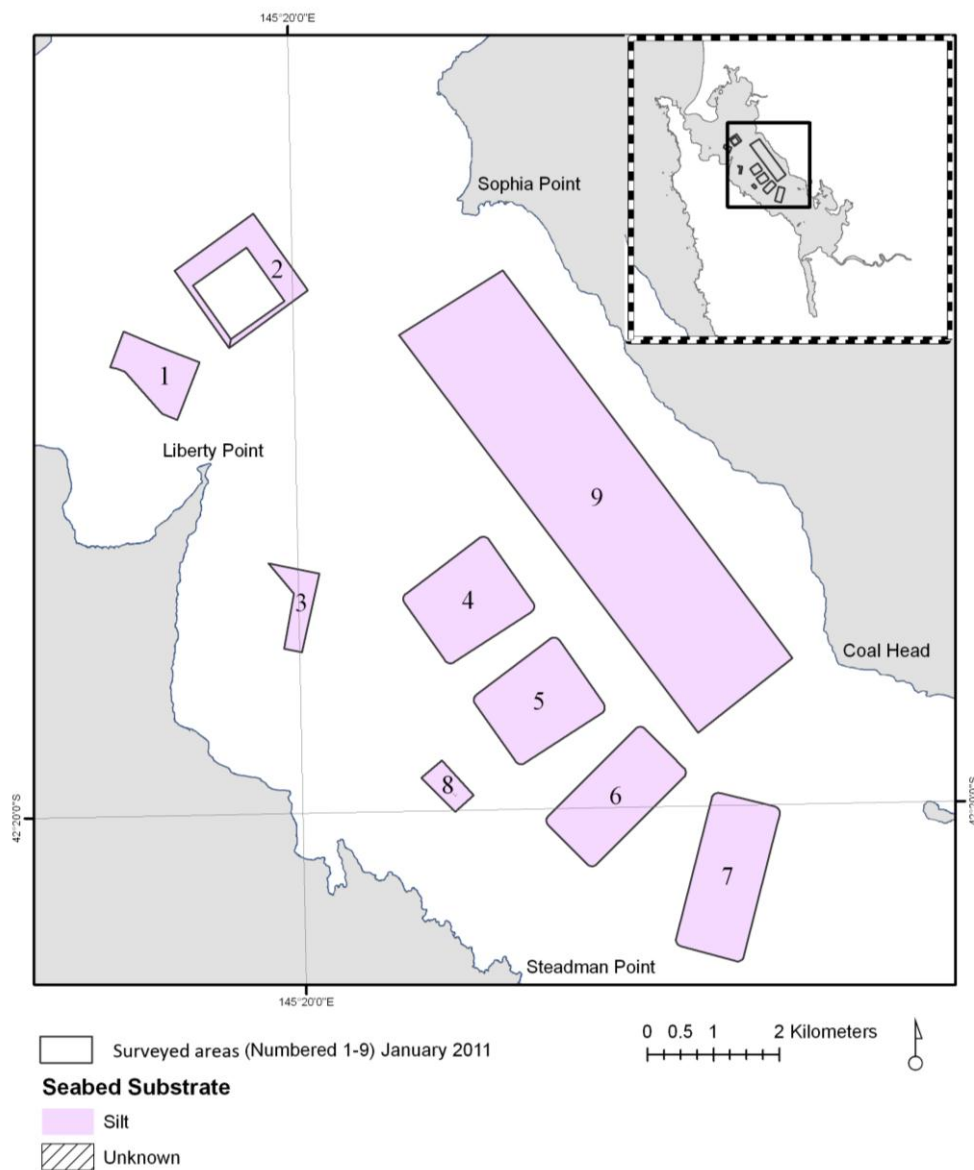


Figure 5. Habitat distribution map showing silt as the dominant substrate at each of the 9 survey areas in Macquarie Harbour.

Table 1. Area and substrate calculations for each of the nine survey areas.

ID	SUBSTRATE	AREA	PERIMETER	ACRES	HECTARES
1	Silt	925032.399	4087.588	228.580	92.503
2	Silt	1113745.103	10073.605	275.211	111.375
3	Silt	456320.399	3730.022	112.759	45.632
4	Silt	2096879.778	5666.823	518.148	209.688
5	Silt	2099830.593	5666.344	518.877	209.983
6	Silt	2141953.342	6047.072	529.286	214.195
7	Silt	2552027.231	6772.914	630.617	255.203
8	Silt	195714.606	1782.703	48.362	19.571
8	Unknown	80.185	34.529	0.020	0.008
8	Unknown	61.023	32.850	0.015	0.006
8	Unknown	143.685	51.046	0.036	0.014
8	Unknown	55.448	29.405	0.014	0.006
8	Silt	86304.998	1367.922	21.326	8.630
9	Silt	13668054.966	18569.058	3377.436	1366.805

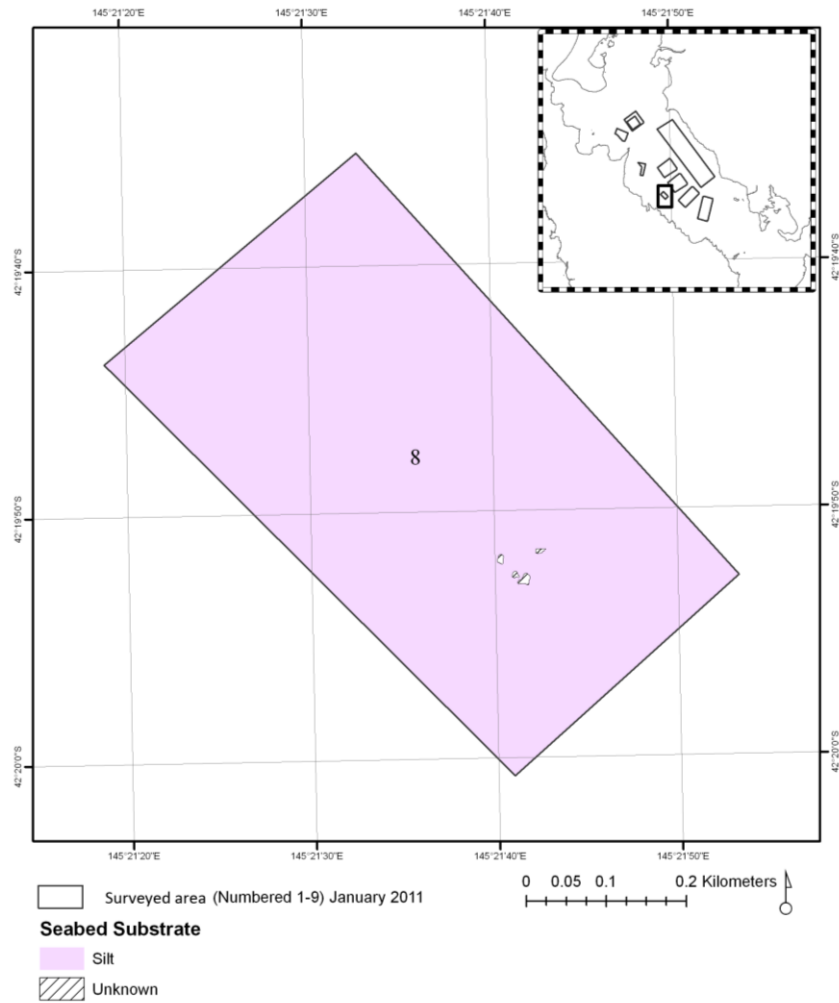


Figure 6. Habitat characterisation for survey area 8 showing location of the areas of undefined substrate (0.034 ha)

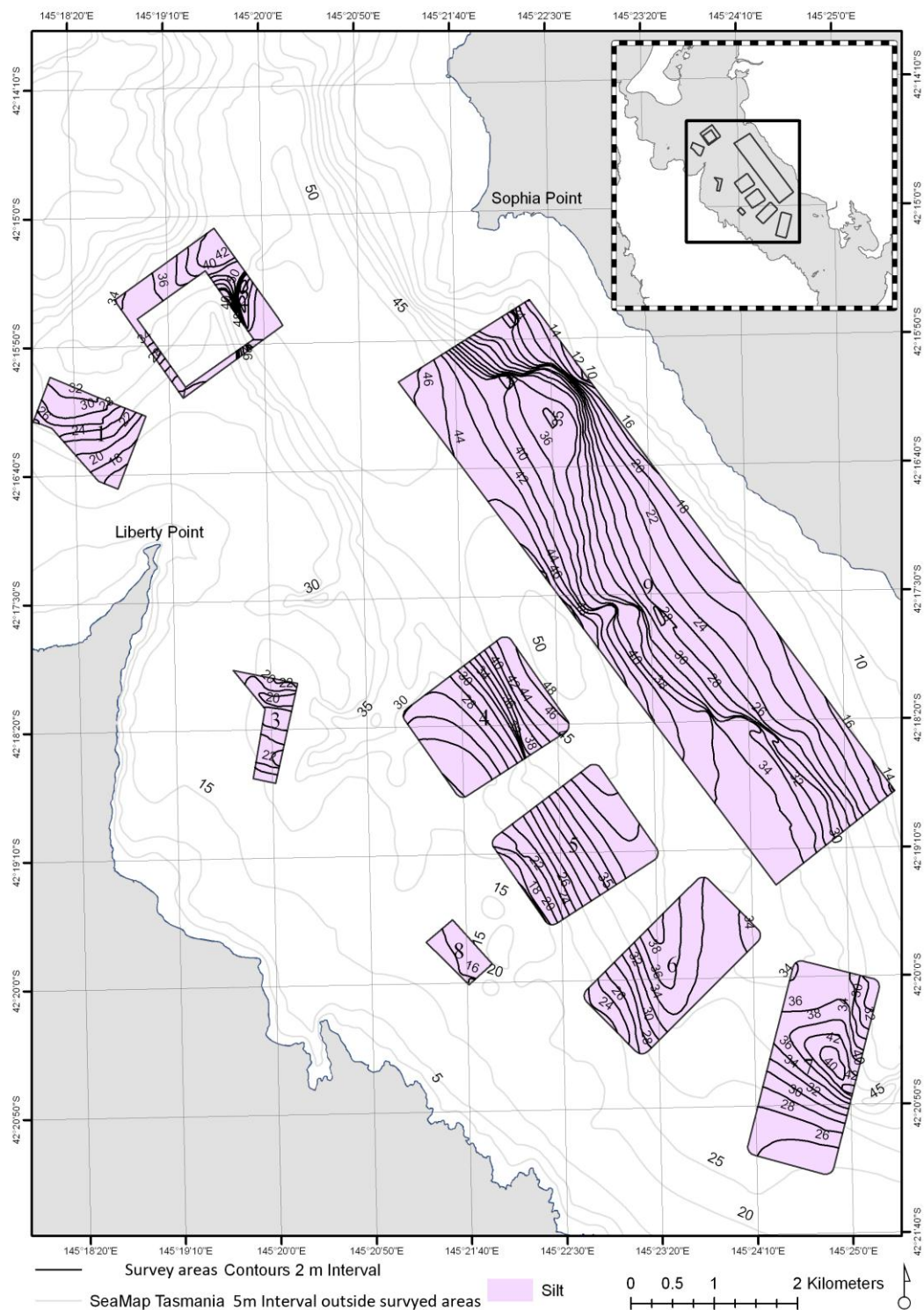





Figure 7. Bathymetric contours of the nine survey areas in Macquarie Harbour.




3.2 Sediment sample results

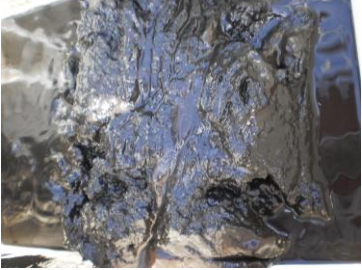


Forty seven sediment samples were collected from the nine survey areas. The characterisation of the sediments from each of these grabs is described in Table 2,

with photographs where available. The contents of the majority of the grabs are described as dark grey silt with a thin copper coloured top surface layer. In most cases the sediment appearance was relatively healthy with no obvious signs of anoxia. Very few of the grabs had any sulphurous odour.


Table 2. Sediment descriptions of the samples taken within the nine survey areas (n=47)


Survey Area	Grab	Easting	Northing	Description	Example Image
1	1	362365	5320137	Silt with a stratified, red oxygenated surface layer 1-2mm deep. Sparse to medium density soft, papery worm tubes (with collected specimens identified as <i>Terebellid</i> sp.). No smell.	
1	2	362072	5320202	Silt with a copper coloured, brown surface layer then 20mm of mixed black anoxic and oxygenated grey. Black below. Some fine sand particles in lowest layer. No smell.	
1	3	361787	5320804	Silt with a thin surface layer of copper coloured brown then very dark but not black silt below. Slight sulphur smell.	
1	4	360844	5319983	Silt with a very fine (<1mm) reddish brown surface layer then dark brown below. Sparse, fine worm tubes. Slight sulphur smell. Large heart urchin collected and identified as <i>Echinocardium cordatum</i>	


1	5	361385	5319251	Silt with a thin surface layer of copper coloured brown then very dark but not black silt below. No smell.	
1	6	362260	5319426	Noted as harder on acoustics so additional grab taken for particle size analysis. Silty sand with a thin surface layer of reddish brown silt. Some pebbles scattered through the sediment (approximately 10 -15 mm diameter). Lots of dead shells including mussels (subsequently identified as <i>Modiolus</i> sp.) and one Venerid bivalve shell (subsequently identified as <i>Nemocardium</i> sp.). No smell	
2	1	360510	5318030	Silt with a dark brown copper coloured surface layer up to a few mm deep. Very dark but not black below. Sparse papery worm tubes and one <i>Nassariid</i> gastropod. No smell	
2	2	360937	5318706	Silt with a dark brown copper coloured surface layer up to a few mm deep. Dark grey below. No smell	


2	3	360804	5318753	Silt with a dark brown copper coloured surface layer up to a few mm deep. Dark grey. No smell	
2	4	360518	5318926	Silt with a dark brown copper coloured surface layer up to a few mm deep. Very dark but not black below. Two live heart urchins collected (<i>Echinocardium cordatum</i>) and occasional small polychaetes (subsequently identified as a tubiculous Terebellid). No smell.	
2	5	360179	5318943	Silt with a brown surface layer up to a few mm deep then very dark but not black below. Lots of terrestrial organic matter present like tree bark pieces and twigs. Several tubiculous polychaetes collected and subsequently identified as Terebellid sp. No smell.	
3	1	362388	5315545	Silt. Surface layer red brown up to a few mm deep with very dark but not black sediment below. Globules of slightly more consolidated sediment in lower layer. 1 dead heart urchin shell. No smell	
3	2	362508	5315502	Silt. Surface layer red brown up to a few mm	

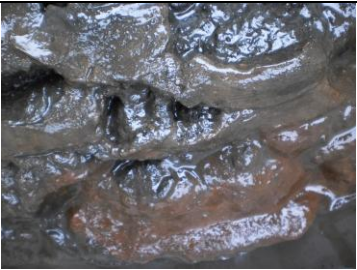
				deep with very dark but not black sediment below. Globules of slightly more consolidated sediment in lower layer. One live large Venerid bivalve with prominent concentric ridges & dark brown periostracum (cf <i>Dosinia</i> sp.). No smell	
3	3	362815	5315368	Silt. Surface layer red brown up to a few mm deep with very dark but not black sediment below. Globules of slightly more consolidated sediment in lower layer. No smell	
3	4	362827	5315269	Silt. Surface layer red brown up to a few mm deep with very dark but not black sediment below. Globules of slightly more consolidated sediment in lower layer. 2 large dead heart urchin shells and some small polychaete tubes. No smell	
3	5	362760	5315138	Silt. Surface layer red brown up to a few mm deep with very dark but not black sediment below. Globules of slightly more consolidated sediment in lower layer. No smell.	
4	1	364765	5315295	Silt. Surface layer red brown up to a few mm deep with very dark but not black sediment below. Globules of	

				slightly more consolidated sediment in lower layer. No smell.	
4	2	365411	5315225	Silt. Surface layer copper coloured, brown up to a few mm deep with dark grey sediment below. Globules of slightly more consolidated sediment in lower layer. 1 dead heart urchin shell. No smell.	
4	3	365950	5315164	Silt. Surface layer slightly consolidated, copper coloured, brown colour up to a few mm deep. Lower layer very dark but not black. Sparse, small polychaete tubes. No smell.	
4	4	366179	5315042	Silt. Surface layer reddish brown up to a few mm deep. Lower layer very dark but not black. Several dead heart urchin tests and some medium size polychaetes (subsequently identified as a Terebellid) present.	
4	5	365646	5315002	Silt. Surface layer copper coloured, brown up to a few mm deep with dark grey sediment below. Globules of slightly more consolidated sediment in lower layer. No smell.	
5	1	366804	5314087	Silt. Surface layer copper coloured, brown up to a few mm deep with dark grey sediment	

				below. Some dead heart urchin shells and some medium size polychaetes comparable with those observed in zone 4 site 4. No smell.	
5	2	366366	5313471	Silt. Surface layer copper coloured, brown up to a few mm deep with dark grey sediment below. 2 medium size polychaetes again comparable with those observed in zone 4 site 4.. No smell.	
5	3	365999	5312654	Silt slightly consolidated with a copper coloured brown surface layer up to a few mm deep. Some sand particles. No smell.	
5	4	365890	5313347	Silt slightly consolidated with a copper coloured brown surface layer up to a few mm deep. Some sand particles. No smell.	
5	5	365503	5313629	Silt slightly consolidated with a copper coloured brown surface layer up to a few mm deep. Some sand particles. 1 dead heart urchin shell. One live heart urchin. No smell.	
6	1	367559	5311779	Silt. Brown surface layer about 10 mm deep. Lower layer very dark but not black. No smell.	

6	2	367955	5311996	Silt. Brown surface layer up to a few mm deep. Lower layer very dark but not black. 1 dead heart urchin shell. No smell.	
6	3	367695	5312334	Silt. Brown surface layer up to a few mm deep. Lower layer very dark but not black. No smell.	
6	4	367139	5312208	Silt. Brown surface layer up to a few mm deep. Lower layer very dark but not black. No smell.	
6	5	367428	5312808	Silt. Brown surface layer up to a few mm deep. Lower layer very dark but not black. No smell.	
7	1	369305	5309760	Silt. Brown surface layer up to a few mm deep. Lower layer very dark but not black. One live and one dead heart urchin. Some small polychaete tubes and one live bivalve with concentric ridges cf <i>Dosinia</i> sp. – same as zone 3 site 2. No smell.	
7	2	368518	5310126	Silt. Brown surface layer up to a few mm deep. Lower layer very dark but not black. 2 dead heart urchin shells. No smell.	
7	3	369128	5311008	Silt. Brown surface layer up to a few mm deep. Lower layer very dark but not black. No smell.	

7	4	369199	5311047	Silt. Brown surface layer up to a few mm deep. Lower layer very dark but not black. One live bivalve with concentric ridges comparable with zone 3 site 2. No smell.	
7	5	369035	5311197	Silt. Brown surface layer about 10mm deep. Lower layer very dark but not black. One dead heart urchin shell. No smell.	
8	1	365206	5312105	Silt. Copper coloured brown surface layer. Dark grey colour below with pockets of black. Occasional grain of sand. No smell.	
8	2	364963	5312201	Silt. Copper coloured brown surface layer. Dark grey colour below with pockets of black. Occasional grain of sand. No smell.	
8	3	364909	5312189	Silt. Copper coloured brown surface layer. Dark grey colour below with pockets of black. Occasional grain of sand. No smell.	
8	4	364776	5312221	Silt. Copper coloured brown surface layer. Dark grey colour below with pockets of black. Less sand grit than grab 8.1, 8.2 and 8.3. One polychaete tube. No smell.	
8	5	364532	5312380	Silt. Copper coloured brown surface layer. Dark grey colour below	

				with pockets of black. One polychaete tube. No smell.	
9	1	367813	5314917	Dark brown silt with less noticeable stratification than other sites. Some pockets of black sediment. One dead heart urchin shell. No smell.	
9	2	368034	5316427	Silt. Reddish/copper brown surface layer up to a few mm deep. Lower layer uniform and very dark brown but not black. No smell.	
9	3	367412	5316198	Silt. Reddish/copper brown surface layer up to a few mm deep. Lower layer uniform and very dark brown but not black. No smell.	
9	4	367037	5316496	Silt. Reddish/copper brown surface layer up to a few mm deep. Lower layer uniform and very dark brown but not black. No smell.	
9	5	366694	5316361	Silt. Reddish/copper brown surface layer up to a few mm deep. Lower layer uniform and very dark brown but not black. One heart urchin. No smell.	
9	6	365411	5318668	Silt. Reddish/copper brown surface layer up to a few mm deep. Lower layer uniform and very dark brown but not black. No smell.	

3.3 Benthic flora and fauna results

Forty three video transects were conducted across the nine survey areas (Figure 4). All of substrate observed in the video tows was classified as “silt”. The surface of the sediment was generally characterised by small polychaete tubes and some burrows. In three of the video transects (survey area 1, video 1.6; survey area 3, video 3.2; survey area 4, video 4.3) small bait fish, unidentifiable fish, heart urchin tests and a skate were observed.

Photos captured from the video footage showing the two skates observed in survey area 3, video site 3.2 are shown below, but the images are not clear enough to identify the species as the threatened Port Davey skate (*Raja maugeana*) (Figure 8 a and b).

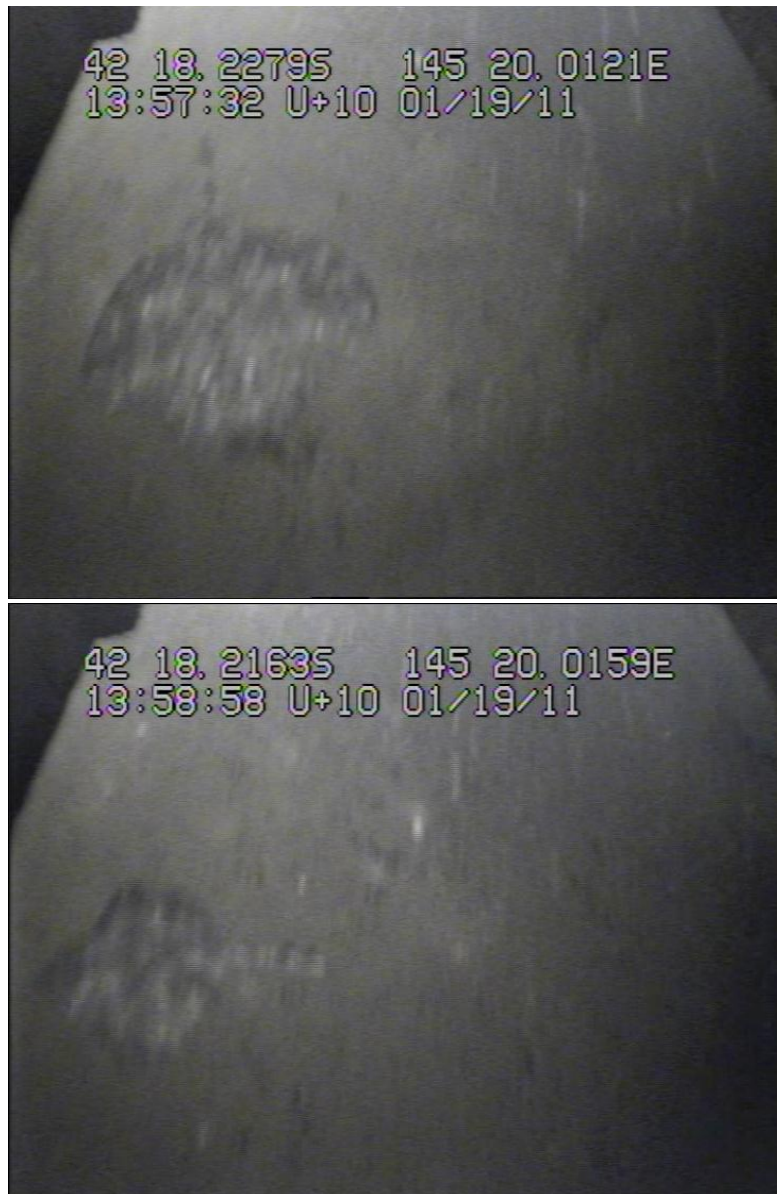


Figure 8 . Still images of two skate specimens observed in survey area 3 (video 3.2, 20 m depth).

Table 1. Descriptions of video footage at each of the video drops conducted in the 9 survey areas (n=43).

Survey Area	Video No.	Easting	Northing	Description
1	1.1	362214	5319447	Silt. Some small polychaete tubes extending just above the sediment and some large burrows.
1	1.2	362052	5320451	Silt. Some small polychaete tubes extending just above the sediment. One larger polychaete extending well above the sediment. Some large and medium size burrows.
1	1.3	361652	5320407	Silt. Occasional small polychaete tubes extending just above the sediment and some large burrows.
1	1.4	361421	5320440	Silt. Occasional small polychaete tubes extending just above the sediment and some large burrows. Some dead shell.
1	1.5	361230	5320445	Silt. Occasional small polychaete tubes extending just above the sediment and some large burrows.
1	1.6	361241	5320104	Silt. Only a few small polychaete tubes extending just above the sediment. Occasional burrows. One fish appears like a flathead – <i>Platycephalidae</i> .
2	2.1	361025	5318532	Silt. Numerous small polychaete tubes and some large polychaete tubes that extend well above the sediment. One unidentifiable fish. Several large burrows.
2	2.2	360632	5317959	Silt. Occasional small polychaete tubes extending just above the sediment. Occasional large polychaete tube extending well above sediment. Some large burrows. One small bait fish.
2	2.3	360423	5318114	Silt. Numerous small polychaete tubes and some large polychaete tubes that extend well above the sediment. Some large burrows.
2	2.4	360443	5318733	Silt. Occasional polychaete tubes. Some dead shell matter.
2	2.5	360165	5318777	Silt. Numerous small polychaete tubes. Some dead shell matter.

3	3.1	362662	5314545	Silt. Occasional polychaete tubes. Some dead shell matter.
3	3.2	362644	5315153	Silt. Occasional small polychaete tubes extending just above the sediment. Occasional large polychaete tube extending well above sediment. Numerous large burrows. Two skate that appear like thornback skate - <i>Dipturus lempieri</i> , but inconclusive from video evidence (Figure 10) to be Maugean skate - <i>Zearaja maugeana</i> .
3	3.3	362725	5315344	Silt. Occasional large polychaete tube extending well above sediment. Some dead shell matter.
3	3.4	362709	5315529	Silt. Some small polychaete tubes extending just above the sediment. Numerous large burrows. Some dead shell matter.
3	3.5	362240	5315691	Silt. Occasional large polychaete tube extending well above sediment. Some dead shell. Several heart urchins.
4	4.1	365161	5315349	Silt. Numerous small polychaete tubes. Occasional large burrow. Some dead shell matter.
4	4.2	365302	5314827	Silt. Numerous small polychaete tubes. Some dead shell matter.
4	4.3	365147	5314806	Silt. Numerous small polychaete tubes. Occasional large burrow. Some dead shell. One small fish appears like a goby – <i>Gobiidae</i> .
4	4.4	364971	5314570	Silt. Some small polychaete tubes extending just above sediment. Some burrows.
4	4.5	364954	5314291	Silt. Sparse small polychaete tubes extending just above sediment.
5	5.1	365543	5313656	Silt. Occasional patches of dense small polychaete tubes extending just above sediment.
5	5.2	366430	5314113	Silt. Dense small polychaete tubes extending just above sediment. Some large burrows. Some dead shell matter.
5	5.3	366000	5313511	Silt. Some small polychaete tubes extending just above sediment.

5	5.4	365660	5313220	Silt. Occasional large polychaete tube extending well above sediment. Some large burrows.
5	5.5	366239	5313087	Silt. Dense small polychaete tubes extending just above sediment.
6	6.1	367876	5313122	Silt. Some small polychaete tubes extending just above sediment and some large polychaete tubes extending well above the sediment. Numerous large burrows.
6	6.2	367963	5312721	Silt. Some small polychaete tubes extending just above sediment and some large polychaete tubes extending well above the sediment. Numerous large burrows.
6	6.3	367374	5312534	Silt. Some small polychaete tubes extending just above sediment and some large polychaete tubes extending well above the sediment. Some large burrows.
6	6.4	366393	5311740	Silt. One large polychaete tube extending well above the sediment. One large burrow.
6	6.5	367484	5311616	Silt. Some small polychaete tubes extending just above sediment and some large polychaete tubes extending well above the sediment.
7	7.1	368876	5311138	Silt. Some small polychaete tubes extending just above sediment. Occasional large polychaete tube extending well above sediment. Some large burrows.
7	7.2	369342	5310467	Silt. Some small polychaete tubes extending just above sediment. Some large burrows.
7	7.3	369091	5310324	Silt. Occasional large polychaete tube extending well above sediment.
7	7.4	369290	5310191	Silt. Occasional small polychaete tube extending just above sediment. One dead shell.
7	7.5	369079	5310016	Silt. Occasional small polychaete tube extending just above sediment. Some large polychaete tubes extending well

				above sediment.
8	8.1	365128	5312079	Silt. Some large polychaete tubes extending well above sediment. Some small polychaete tubes extending just above sediment. Some dead shell.
8	8.2	365094	5312163	Silt. Some small polychaete tubes extending just above sediment. Numerous large burrows.
8	8.3	365247	5312190	Silt. Numerous small polychaete tubes extending just above sediment. Numerous large burrows. Occasional dead shell.
8	8.4	364995	5312151	Silt. Numerous small polychaete tubes extending just above sediment. Occasional large polychaete tube extending well above sediment. Numerous large burrows. Occasional dead shell.
8	8.5	365012	5312150	Silt. Numerous small polychaete tubes extending just above sediment. Numerous large burrows. Occasional dead shell.
8	8.6	364907	5312309	Silt. Occasional large polychaete tube extending well above sediment. One heart urchin.
8	8.7	364534	5312408	Silt. Occasional large polychaete tube extending well above sediment. Two heart urchins.