

Impacts of a novel shellfishing gear on macrobenthos in a marine protected area: pump-scoop dredging in Poole Harbour, UK

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This supplementary file presents a species list and similarity percentage (SIMPER) outputs from each of the sampling sites across all months and in June and November 2015, as well as a nMDS plot of June and November data separately.

Table S1. Mean (\pm S.E.) abundances per m² of taxa across each site in June and November 2015. Names are concurrent with those provided by the World Register of Marine Species (WoRMS, 2017).

Species	Control				Newly Opened				Heavy dredging			
	June		November		June		November		June		November	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
PHYLUM CNIDARIA												
Actiniaria	0.00	0.00	5.31	5.31	26.53	15.29	37.14	16.22	328.92	72.27	424.41	73.38
PHYLUM ANNELIDA												
Polychaeta												
<i>Alitta virens</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31
Ampharetidae spp.	0.00	0.00	0.00	0.00	0.00	0.00	31.83	31.83	53.05	42.61	5.31	5.31
<i>Aphelochaeta marioni</i>	21.22	12.52	15.92	15.92	244.04	94.77	917.79	302.60	1145.91	294.64	2047.79	490.31
<i>Capitella capitata</i>	0.00	0.00	0.00	0.00	10.61	10.61	0.00	0.00	228.12	153.66	90.19	54.99
Capitellidae spp.	0.00	0.00	0.00	0.00	5.31	5.31	0.00	0.00	180.38	113.14	137.93	82.51
Cirratulidae spp.	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	10.61	10.61	0.00	0.00
<i>Cirratulus cirratulus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.22	12.52
<i>Desdemona ornata</i>	10.61	7.34	10.61	7.34	15.92	11.65	15.92	11.65	37.14	23.60	58.36	47.85
<i>Eteone longa</i>	37.14	17.94	10.61	7.34	5.31	5.31	10.61	7.34	63.66	27.63	42.44	18.24
<i>Glycera tridactyla</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	0.00	0.00	21.22	12.52
<i>Hediste diversicolor</i>	758.64	105.22	742.72	87.61	864.74	143.78	2790.51	459.39	1946.99	232.65	2339.57	368.97
<i>Heteromastus filiformis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.22	16.56
<i>Marphysa sanguinea</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	5.31	5.31	0.00	0.00
<i>Melinna palmata</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Neanthes fucata</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	0.00	0.00
<i>Nephtys hombergii</i>	0.00	0.00	0.00	0.00	10.61	7.34	0.00	0.00	0.00	0.00	0.00	0.00
Phyllodocidae spp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	0.00	0.00
Polydora spp.	26.53	21.65	10.61	7.34	0.00	0.00	31.83	22.01	31.83	22.01	42.44	23.83
Spionidae spp.	5.31	5.31	15.92	8.78	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31

<i>Streblospio shrubsolii</i>	47.75	37.40	79.58	28.48	53.05	22.89	228.12	51.40	37.14	14.30	148.54	45.12
Oligochaeta												
Tubificidae spp.	5.31	5.31	5.31	5.31	0.00	0.00	5.31	5.31	26.53	13.23	10.61	10.61
<i>Tubificoides</i> spp.	366.06	143.65	779.86	305.92	1246.71	231.82	1793.14	373.02	1575.63	318.11	2461.59	462.49
Oligochaeta spp.	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	37.14	37.14	26.53	26.53
Cirripedia												
<i>Austrominius modestus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	31.83	31.83
Isopoda												
<i>Cyathura carinata</i>	90.19	37.14	334.22	63.58	15.92	8.78	249.34	70.02	15.92	11.65	63.66	21.68
Amphipoda												
<i>Gammarus</i> spp.	5.31	5.31	0.00	0.00	0.00	0.00	0.00	0.00	26.53	26.53	5.31	5.31
Ostracoda												
<i>Eusarsiella zostericola</i>	0.00	0.00	0.00	0.00	5.31	5.31	21.22	12.52	10.61	10.61	31.83	13.82
<i>Ostracoda</i> sp.	525.21	120.53	875.35	233.00	318.31	84.65	583.57	96.92	31.83	19.16	74.27	25.32
Decapoda												
<i>Carcinus maenas</i>	5.31	5.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYLUM MOLLUSCA												
<i>Abra alba</i>	0.00	0.00	0.00	0.00	0.00	0.00	10.61	10.61	0.00	0.00	0.00	0.00
<i>Abra</i> spp.	5.31	5.31	0.00	0.00	5.31	5.31	0.00	0.00	5.31	5.31	5.31	5.31
<i>Abra tenuis</i>	360.75	62.11	530.52	72.98	572.96	125.70	435.02	91.62	381.97	56.32	74.27	35.88
<i>Cerastoderma edule</i>	0.00	0.00	10.61	10.61	15.92	11.65	26.53	15.29	26.53	21.65	58.36	17.10
<i>Cerastoderma glaucum</i>	0.00	0.00	0.00	0.00	15.92	11.65	10.61	7.34	0.00	0.00	0.00	0.00
<i>Dosinia lupinis</i>	0.00	0.00	0.00	0.00	0.00	0.00	21.22	16.56	21.22	21.22	5.31	5.31
<i>Hydrobiidae</i> sp.	169.76	169.76	5.31	5.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Juv. M. arenaria</i>	0.00	0.00	0.00	0.00	31.83	15.80	90.19	37.14	42.44	12.52	212.21	53.47
<i>Leptochiton asellus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	0.00	0.00
<i>Littorina saxatilis</i>	37.14	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Macoma balthica</i>	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	10.61	7.34	5.31	5.31
<i>Mya arenaria</i>	0.00	0.00	0.00	0.00	21.22	21.22	5.31	5.31	10.61	10.61	5.31	5.31

<i>Peringia ulvae</i>	291.78	51.68	684.36	144.77	249.34	66.14	376.67	241.81	106.10	33.99	100.80	36.74
<i>Retusa obtusa</i>	5.31	5.31	0.00	0.00	68.97	48.46	5.31	5.31	5.31	5.31	5.31	5.31
<i>Ruditapes decussatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	0.00	0.00	0.00	0.00
<i>Ruditapes phillipinarium</i>	0.00	0.00	5.31	5.31	5.31	5.31	31.83	17.56	37.14	23.60	31.83	15.80
<i>Scrobicularia plana</i>	0.00	0.00	10.61	7.34	5.31	5.31	15.92	8.78	0.00	0.00	0.00	0.00
PHYLUM INSECTA												
Insecta sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.31	5.31	0.00	0.00
Carabidae	0.00	0.00	10.61	7.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chironomidae	0.00	0.00	0.00	0.00	5.31	5.31	0.00	0.00	0.00	0.00	0.00	0.00
Total	2779.9	357.23	4153.93	439.45	3825.02	445.33	7777.35	1086.74	6466.98	443.12	8620.87	1138.44

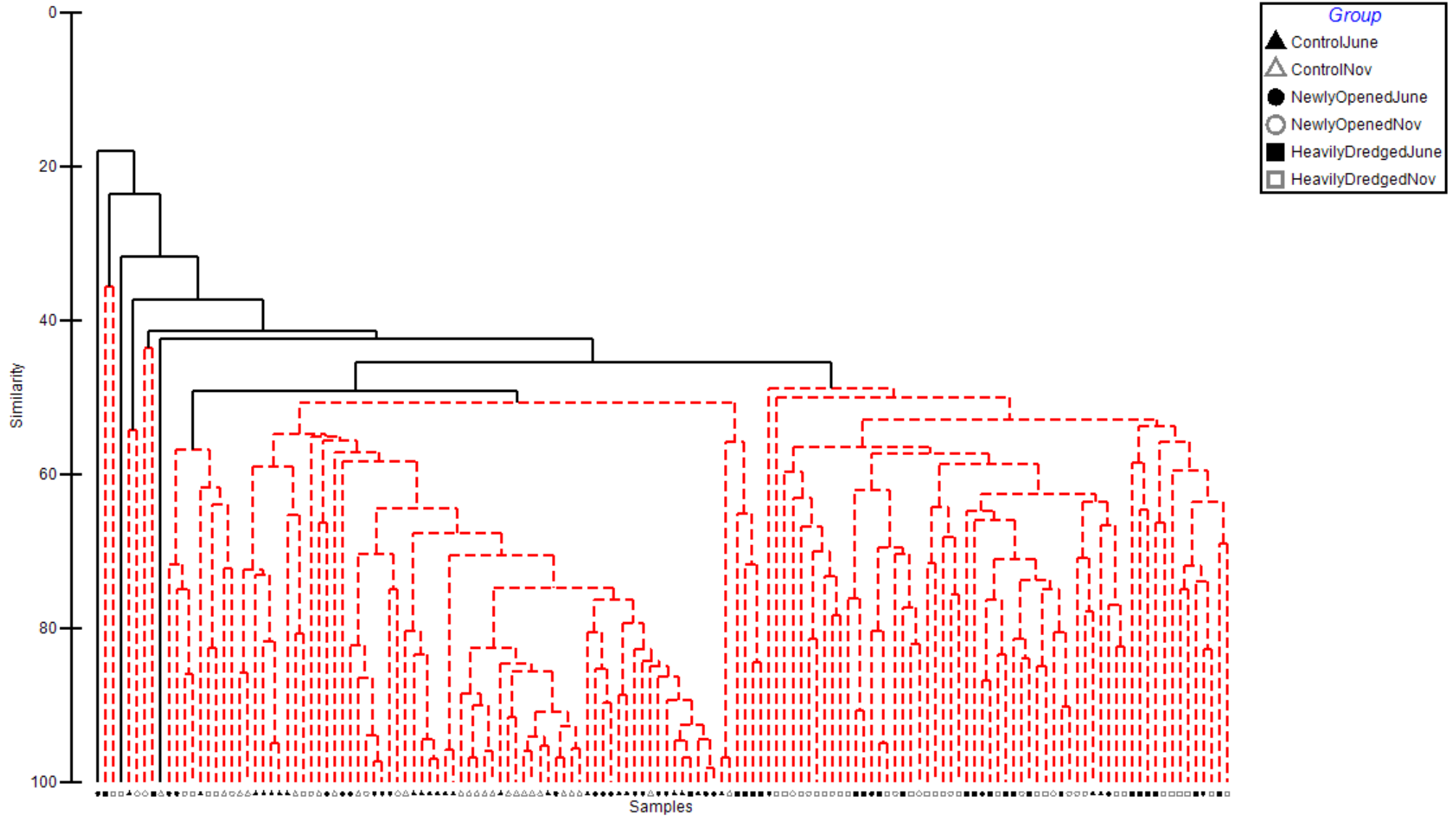


Figure S1. Output of SIMPROF/CLUSTER procedure performed on Bray-Curtis similarity matrix from log-transformed abundance data. Linked black lines indicate significant groups ($p < 0.05$)

Supplementary Material

Table S2. Results of SIMPER analysis on samples taken from the control site across all months. A 90% similarity cut-off has been used.

Species	Mean Abundance (sqrt transformed /m ²)	Mean Similarity	% Contribution	Cumulative %
<i>H. diversicolor</i>	26.11	21.04	38.27	38.27
<i>A.tenuis</i>	18.63	12.75	23.19	61.46
<i>P. ulvae</i>	18.42	10.74	19.53	80.99
<i>Tubificoides spp.</i>	16.24	5.94	10.80	91.78

Table S3. Results of SIMPER analysis on samples taken from the site newly opened to dredging across all months. A 90% similarity cut-off has been used.

Species	Mean Abundance (sqrt transformed /m ²)	Mean Similarity	% Contribution	Cumulative %
<i>H. diversicolor</i>	38.14	18.44	36.75	36.75
<i>Tubificoides spp.</i>	34.30	15.88	31.64	68.39
<i>A.tenuis</i>	18.70	7.67	15.29	83.68
<i>P. ulvae</i>	10.80	2.49	4.96	88.64
<i>A.marioni</i>	14.39	2.19	4.36	93.01

Table S4. Results of SIMPER analysis on samples taken from the heavily dredged site across all months. A 90% similarity cut-off has been used.

Species	Mean Abundance (sqrt transformed /m ²)	Mean Similarity	% Contribution	Cumulative %
<i>H. diversicolor</i>	42.57	17.07	34.97	34.97
<i>Tubificoides spp.</i>	38.26	11.70	23.96	58.94
<i>A.marioni</i>	31.98	8.55	17.52	76.46
Actinaria	16.02	4.84	9.91	86.37
<i>A.tenuis</i>	10.63	2.53	5.17	91.54

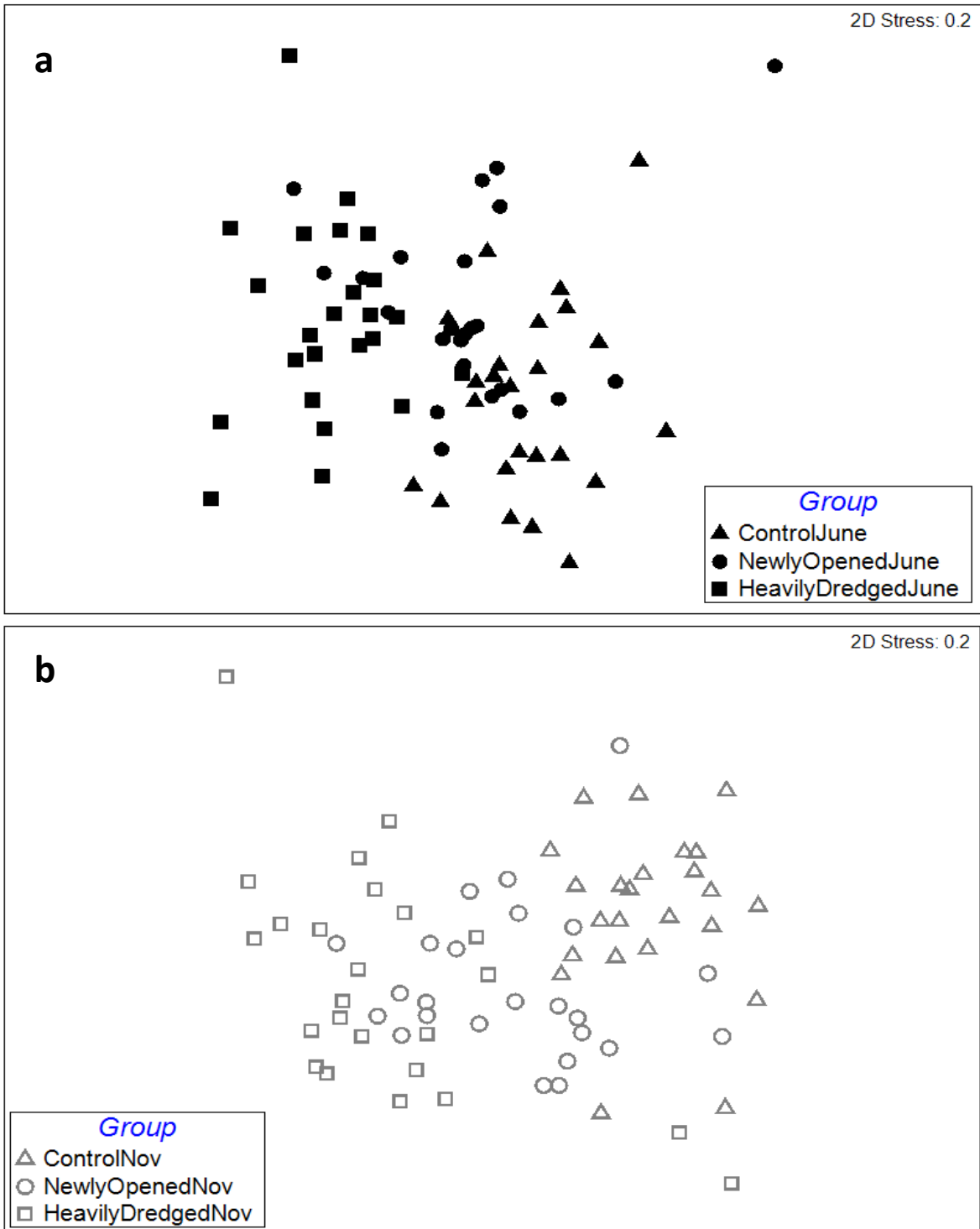


Figure S2. Two-dimensional MDS plot derived from the $\log(x+1)$ transformed similarity matrix indicating the similarity between the macrofaunal assemblages at sampling locations in a) June and b) November 2015.

Table S5. SIMPER outputs indicating species dissimilarity for community data at control site in June and November with a 70% cut-off.

Species	Mean abundance (sqrt transformed per m ²) Jun 2015	Mean abundance (sqrt transformed per m ²) Nov 2015	Mean Dissimilarity	% Contribution	Cumulative %
<i>Tubificoides spp.</i>	12.36	20.12	8.58	18.62	18.62
<i>Peringia ulvae</i>	15.54	22.29	6.90	14.97	33.58
<i>Cyathura carinata</i>	5.12	15.07	6.37	13.82	47.41
<i>Abra tenuis</i>	16.22	21.04	5.67	12.31	59.71
<i>Hediste diversicolor</i>	26.06	26.15	4.75	10.31	70.02

Table S6. SIMPER outputs indicating species dissimilarity for community data at the site newly opened to dredging in June and November with a 70% cut-off.

Species	Mean abundance (sqrt transformed per m ²) Jun 2015	Mean abundance (sqrt transformed per m ²) Nov 2015	Mean Dissimilarity	% Contribution	Cumulative %
<i>Hediste diversicolor</i>	26.98	49.30	8.68	16.67	16.67
<i>Tubificoides spp.</i>	31.57	37.03	7.09	13.61	30.27
<i>Aphelochaeta marioni</i>	8.34	20.43	6.15	11.80	42.07
<i>Abra tenuis</i>	20.14	17.26	5.01	9.62	51.70
<i>Peringia ulvae</i>	11.33	10.27	4.48	8.60	60.30
<i>Streblospio</i>	3.28	11.99	3.84	7.37	67.68

shrebsolii

<i>Cyathura carinata</i>	1.41	11.56	3.71	7.12	74.79
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Table S7. SIMPER outputs indicating species dissimilarity for community data at the heavily dredged site in June and November with a 70% cut-off.

Species	Mean abundance (sqrt transformed per m ²) Jun 2015	Mean abundance (sqrt transformed per m ²) Nov 2015	Mean Dissimilarity	% Contribution	Cumulative %
<i>Tubificoides</i> spp.	33.22	43.29	7.35	14.05	14.05
<i>Aphelochaeta marioni</i>	27.71	36.24	7.17	13.71	27.76
<i>Hediste diversicolor</i>	41.34	43.80	5.58	10.66	38.42
<i>Abra tenuis</i>	17.21	4.04	4.11	7.85	46.27
Actinaria	14.15	17.90	3.42	6.54	52.81
Juv. <i>M. arenaria</i>	3.29	9.96	2.52	4.81	57.61
Capitellidae	5.11	5.14	2.17	4.15	61.77
<i>Peringia ulvae</i>	6.36	5.29	2.15	4.11	65.88
<i>Capitella capitata</i>	4.97	3.91	2.12	4.05	69.93
<i>Streblospio shrubsolii</i>	3.02	7.83	2.02	3.86	73.79