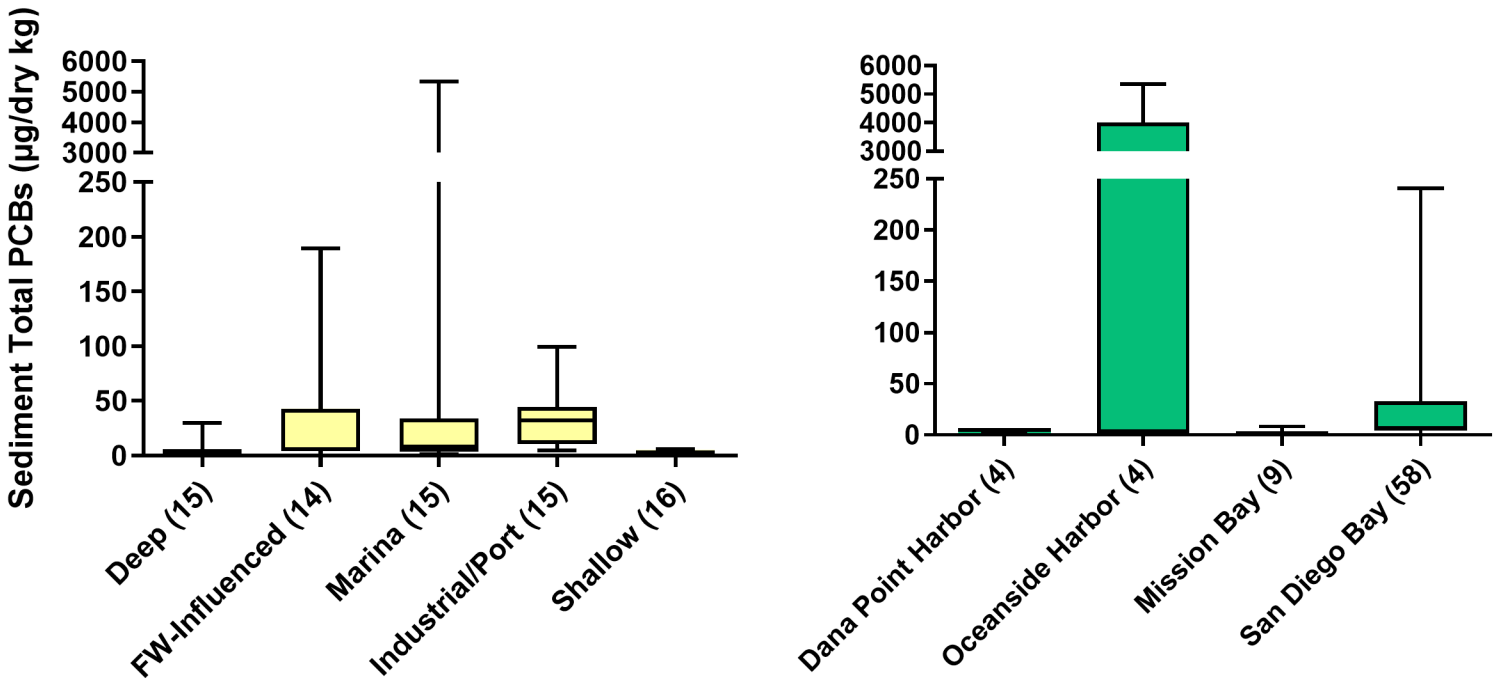
APPENDIX K

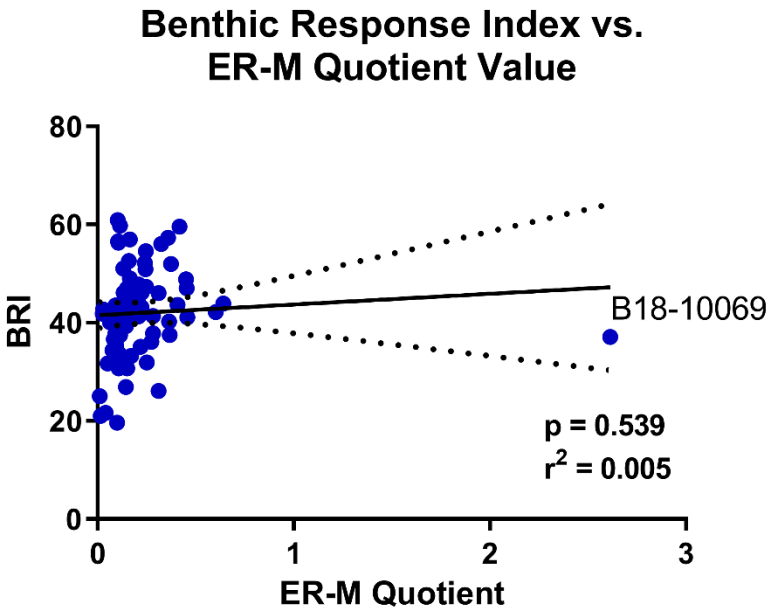
STATISTICAL ANALYSES

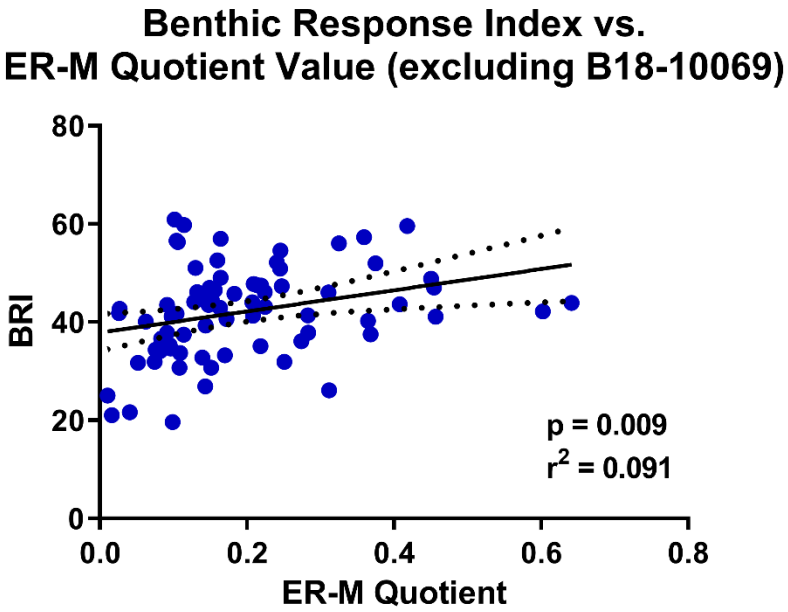
Supplemental Figures



Box plots showing median, 25th percent quartiles, and range of values. The number of stations (n) is shown in parentheses.

Total PCBs includes sum of 62 reported congeners (PCB-3, 5, 8, 15, 18, 27, 28, 29, 31, 33, 37, 44, 49, 52, 56(60), 66, 70, 74, 77, 81, 87, 95, 97, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 137, 138, 141, 149, 151, 153, 156, 157, 158, 167, 168+132, 169, 170, 174, 177, 180, 183, 187, 189, 194, 195, 199(200), 201, 203, 206, and 209)





For the ER-M quotient analysis, a single station (B18-10069) with high PCB concentrations skewed the analysis to a substantial degree (left figure). The ER-M quotient at this site was 4 to 261 times greater than other sites throughout the San Diego Regional Harbors, suggesting that site B18-10069 is not representative of regional conditions and should be evaluated on an individual basis. Therefore, statistical analyses were also performed without Site B18-10069 to better evaluate the relationship between the ER-M quotient and the BRI on a regional scale (right figure). When the outlier was excluded (confirmed statistically using the Grubb's test), the r^2 value increased from 0.005 to 0.091).

Statistical Comparisons for Chemistry and Indices by Strata (2018 Only)

Water Chemistry

Statistical Comparisons for Water Chemistry by Strata (2018 Only)

Water Column Dissolved Copper (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	29.14

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-24.99	Yes	*	0.0203
Deep (15) vs. Marina (15)	-37.67	Yes	****	<0.0001
Deep (15) vs. Industrial/Port (15)	-24.43	Yes	*	0.0214
Deep (15) vs. Shallow (16)	-7.100	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-12.67	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	0.5595	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	17.89	No	ns	0.2487
Marina (15) vs. Industrial/Port (15)	13.23	No	ns	0.9634
Marina (15) vs. Shallow (16)	30.57	Yes	***	0.0010
Industrial/Port (15) vs. Shallow (16)	17.33	No	ns	0.2690

Statistical Comparisons for Water Chemistry by Strata (2018 Only)

Water Column Dissolved Nickel (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	25.86

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-21.24	No	ns	0.0871
Deep (15) vs. Marina (15)	6.367	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-28.17	Yes	**	0.0040
Deep (15) vs. Shallow (16)	-8.319	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	27.61	Yes	**	0.0065
FW-Influenced (14) vs. Industrial/Port (15)	-6.924	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	12.92	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	-34.53	Yes	***	0.0001
Marina (15) vs. Shallow (16)	-14.69	No	ns	0.6079
Industrial/Port (15) vs. Shallow (16)	19.85	No	ns	0.1127

Statistical Comparisons for Water Chemistry by Strata (2018 Only)

Water Column Dissolved Zinc (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	28.65

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-10.51	No	ns	>0.9999
Deep (15) vs. Marina (15)	-31.27	Yes	***	0.0009
Deep (15) vs. Industrial/Port (15)	-12.10	No	ns	>0.9999
Deep (15) vs. Shallow (16)	8.290	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-20.76	No	ns	0.1038
FW-Influenced (14) vs. Industrial/Port (15)	-1.590	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	18.80	No	ns	0.1842
Marina (15) vs. Industrial/Port (15)	19.17	No	ns	0.1602
Marina (15) vs. Shallow (16)	39.56	Yes	****	<0.0001
Industrial/Port (15) vs. Shallow (16)	20.39	No	ns	0.0924

Statistical Comparisons for Water Chemistry by Strata (2018 Only)

Water Column Total PAHs (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0008
Exact or approximate P value?	Approximate
P value summary	***
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	19.03

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	10.11	No	ns	>0.9999
Deep (15) vs. Marina (15)	10.80	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-16.53	No	ns	0.3726
Deep (15) vs. Shallow (16)	12.78	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	0.6905	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-26.64	Yes	**	0.0097
FW-Influenced (14) vs. Shallow (16)	2.670	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	-27.33	Yes	**	0.0057
Marina (15) vs. Shallow (16)	1.979	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	29.31	Yes	**	0.0018

Sediment Chemistry

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Arsenic (log transformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary	
F	3.016
P value	0.0235
P value summary	*
Significant diff. among means (P < 0.05)?	Yes
R squared	0.1470

Tukey's multiple comparisons test	**Mean Diff.**	**95.00% CI of diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-0.1505	-0.3673 to 0.06627	No	ns	0.3042
Deep (15) vs. Marina (15)	-0.2319	-0.4449 to -0.01888	Yes	*	0.0261
Deep (15) vs. Industrial/Port (15)	-0.2194	-0.4324 to -0.006383	Yes	*	0.0404
Deep (15) vs. Shallow (16)	-0.1830	-0.3927 to 0.02666	No	ns	0.1158
FW-Influenced (14) vs. Marina (15)	-0.08137	-0.2982 to 0.1354	No	ns	0.8306
FW-Influenced (14) vs. Industrial/Port (15)	-0.06888	-0.2857 to 0.1479	No	ns	0.8998
FW-Influenced (14) vs. Shallow (16)	-0.03248	-0.2460 to 0.1810	No	ns	0.9930
Marina (15) vs. Industrial/Port (15)	0.01249	-0.2005 to 0.2255	No	ns	0.9998
Marina (15) vs. Shallow (16)	0.04889	-0.1608 to 0.2586	No	ns	0.9655
Industrial/Port (15) vs. Shallow (16)	0.03640	-0.1733 to 0.2461	No	ns	0.9884

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Cadmium (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0391
Exact or approximate P value?	Approximate
P value summary	*
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	10.08

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-24.36	Yes	*	0.0263
Deep (15) vs. Marina (15)	-5.067	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-10.63	No	ns	>0.9999
Deep (15) vs. Shallow (16)	-8.183	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	19.30	No	ns	0.1719
FW-Influenced (14) vs. Industrial/Port (15)	13.73	No	ns	0.9004
FW-Influenced (14) vs. Shallow (16)	16.18	No	ns	0.4251
Marina (15) vs. Industrial/Port (15)	-5.567	No	ns	>0.9999
Marina (15) vs. Shallow (16)	-3.117	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	2.450	No	ns	>0.9999

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Chromium (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	0.0023
Exact or approximate P value?	Approximate
P value summary	**
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	16.64

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-15.62	No	ns	0.5379
Deep (15) vs. Marina (15)	-23.23	Yes	*	0.0351
Deep (15) vs. Industrial/Port (15)	-31.00	Yes	***	0.0010
Deep (15) vs. Shallow (16)	-19.08	No	ns	0.1484
FW-Influenced (14) vs. Marina (15)	-7.614	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-15.38	No	ns	0.5755
FW-Influenced (14) vs. Shallow (16)	-3.464	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	-7.767	No	ns	>0.9999
Marina (15) vs. Shallow (16)	4.150	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	11.92	No	ns	>0.9999

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Copper (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	36.99

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-17.05	No	ns	0.3532
Deep (15) vs. Marina (15)	-39.23	Yes	****	<0.0001
Deep (15) vs. Industrial/Port (15)	-36.60	Yes	****	<0.0001
Deep (15) vs. Shallow (16)	-9.460	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-22.19	No	ns	0.0615
FW-Influenced (14) vs. Industrial/Port (15)	-19.55	No	ns	0.1576
FW-Influenced (14) vs. Shallow (16)	7.585	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	2.633	No	ns	>0.9999
Marina (15) vs. Shallow (16)	29.77	Yes	**	0.0014
Industrial/Port (15) vs. Shallow (16)	27.14	Yes	**	0.0053

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Lead (log transformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary	
F	7.544
P value	<0.0001
P value summary	****
Significant diff. among means (P < 0.05)?	Yes
R squared	0.3012

Tukey's multiple comparisons test	**Mean Diff.**	**95.00% CI of diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-0.3518	-0.6706 to -0.03310	Yes	*	0.0232
Deep (15) vs. Marina (15)	-0.3920	-0.7052 to -0.07880	Yes	**	0.0070
Deep (15) vs. Industrial/Port (15)	-0.6042	-0.9174 to -0.2910	Yes	****	<0.0001
Deep (15) vs. Shallow (16)	-0.3108	-0.6191 to -0.002558	Yes	*	0.0471
FW-Influenced (14) vs. Marina (15)	-0.04016	-0.3589 to 0.2786	No	ns	0.9966
FW-Influenced (14) vs. Industrial/Port (15)	-0.2523	-0.5711 to 0.06639	No	ns	0.1856
FW-Influenced (14) vs. Shallow (16)	0.04102	-0.2729 to 0.3549	No	ns	0.9961
Marina (15) vs. Industrial/Port (15)	-0.2122	-0.5254 to 0.1010	No	ns	0.3285
Marina (15) vs. Shallow (16)	0.08118	-0.2271 to 0.3894	No	ns	0.9470
Industrial/Port (15) vs. Shallow (16)	0.2934	-0.01490 to 0.6016	No	ns	0.0698

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Mercury (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	23.72

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-5.000	No	ns	>0.9999
Deep (15) vs. Marina (15)	-26.23	Yes	**	0.0098
Deep (15) vs. Industrial/Port (15)	-31.57	Yes	***	0.0007
Deep (15) vs. Shallow (16)	-9.406	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-21.23	No	ns	0.0875
FW-Influenced (14) vs. Industrial/Port (15)	-26.57	Yes	*	0.0104
FW-Influenced (14) vs. Shallow (16)	-4.406	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	-5.333	No	ns	>0.9999
Marina (15) vs. Shallow (16)	16.83	No	ns	0.3169
Industrial/Port (15) vs. Shallow (16)	22.16	Yes	*	0.0467

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Nickel (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0418
Exact or approximate P value?	Approximate
P value summary	*
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	9.917

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-15.92	No	ns	0.4933
Deep (15) vs. Marina (15)	-16.53	No	ns	0.3774
Deep (15) vs. Industrial/Port (15)	-23.70	Yes	*	0.0290
Deep (15) vs. Shallow (16)	-9.915	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-0.6143	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-7.781	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	6.004	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	-7.167	No	ns	>0.9999
Marina (15) vs. Shallow (16)	6.619	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	13.79	No	ns	0.7839

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Zinc (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	0.0001
Exact or approximate P value?	Approximate
P value summary	***
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	22.94

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-26.55	Yes	*	0.0104
Deep (15) vs. Marina (15)	-30.50	Yes	**	0.0013
Deep (15) vs. Industrial/Port (15)	-33.20	Yes	***	0.0003
Deep (15) vs. Shallow (16)	-16.89	No	ns	0.3101
FW-Influenced (14) vs. Marina (15)	-3.950	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-6.650	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	9.656	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	-2.700	No	ns	>0.9999
Marina (15) vs. Shallow (16)	13.61	No	ns	0.8236
Industrial/Port (15) vs. Shallow (16)	16.31	No	ns	0.3735

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Total PAHs (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	23.98

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-13.08	No	ns	>0.9999
Deep (15) vs. Marina (15)	-10.40	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-31.00	Yes	***	0.0010
Deep (15) vs. Shallow (16)	4.008	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	2.681	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-17.92	No	ns	0.2693
FW-Influenced (14) vs. Shallow (16)	17.09	No	ns	0.3215
Marina (15) vs. Industrial/Port (15)	-20.60	No	ns	0.0964
Marina (15) vs. Shallow (16)	14.41	No	ns	0.6585
Industrial/Port (15) vs. Shallow (16)	35.01	Yes	****	<0.0001

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Total Chlordanes (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	0.0002
Exact or approximate P value?	Approximate
P value summary	***
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	22.30

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-23.36	Yes	**	0.0012
Deep (15) vs. Marina (15)	-2.667	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-16.40	No	ns	0.0594
Deep (15) vs. Shallow (16)	-3.875	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	20.69	Yes	**	0.0065
FW-Influenced (14) vs. Industrial/Port (15)	6.957	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	19.48	Yes	*	0.0111
Marina (15) vs. Industrial/Port (15)	-13.73	No	ns	0.2123
Marina (15) vs. Shallow (16)	-1.208	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	12.53	No	ns	0.3278

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Total DDTs (log transformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary	
F	8.167
P value	<0.0001
P value summary	****
Significant diff. among means (P < 0.05)?	Yes
R squared	0.3182

Tukey's multiple comparisons test	**Mean Diff.**	**95.00% CI of diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-0.8732	-1.476 to -0.2708	Yes	**	0.0012
Deep (15) vs. Marina (15)	-0.3427	-0.9346 to 0.2492	No	ns	0.4892
Deep (15) vs. Industrial/Port (15)	-0.6290	-1.221 to -0.03704	Yes	*	0.0317
Deep (15) vs. Shallow (16)	0.1601	-0.4225 to 0.7427	No	ns	0.9385
FW-Influenced (14) vs. Marina (15)	0.5305	-0.07186 to 1.133	No	ns	0.1103
FW-Influenced (14) vs. Industrial/Port (15)	0.2443	-0.3581 to 0.8466	No	ns	0.7872
FW-Influenced (14) vs. Shallow (16)	1.033	0.4401 to 1.627	Yes	****	<0.0001
Marina (15) vs. Industrial/Port (15)	-0.2863	-0.8782 to 0.3056	No	ns	0.6585
Marina (15) vs. Shallow (16)	0.5028	-0.07978 to 1.085	No	ns	0.1229
Industrial/Port (15) vs. Shallow (16)	0.7891	0.2065 to 1.372	Yes	**	0.0028

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Total PCBs (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	29.71

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-19.86	No	ns	0.1420
Deep (15) vs. Marina (15)	-21.57	No	ns	0.0672
Deep (15) vs. Industrial/Port (15)	-35.03	Yes	***	0.0001
Deep (15) vs. Shallow (16)	0.2833	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-1.707	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-15.17	No	ns	0.6098
FW-Influenced (14) vs. Shallow (16)	20.14	No	ns	0.1155
Marina (15) vs. Industrial/Port (15)	-13.47	No	ns	0.9059
Marina (15) vs. Shallow (16)	21.85	No	ns	0.0528
Industrial/Port (15) vs. Shallow (16)	35.32	Yes	****	<0.0001

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Total Pyrethroids (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	25.48

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-31.48	Yes	***	0.0006
Deep (15) vs. Marina (15)	-7.833	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-11.60	No	ns	>0.9999
Deep (15) vs. Shallow (16)	4.513	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	23.65	Yes	*	0.0255
FW-Influenced (14) vs. Industrial/Port (15)	19.88	No	ns	0.1118
FW-Influenced (14) vs. Shallow (16)	35.99	Yes	****	<0.0001
Marina (15) vs. Industrial/Port (15)	-3.767	No	ns	>0.9999
Marina (15) vs. Shallow (16)	12.35	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	16.11	No	ns	0.3349

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Total PBDEs (log transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test

P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	26.84

Data summary

Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	Mean rank diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-33.70	Yes	***	0.0003
Deep (15) vs. Marina (15)	-21.37	No	ns	0.0698
Deep (15) vs. Industrial/Port (15)	-22.00	No	ns	0.0547
Deep (15) vs. Shallow (16)	-1.265	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	12.33	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	11.70	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	32.43	Yes	***	0.0004
Marina (15) vs. Industrial/Port (15)	-0.6333	No	ns	>0.9999
Marina (15) vs. Shallow (16)	20.10	No	ns	0.0991
Industrial/Port (15) vs. Shallow (16)	20.74	No	ns	0.0781

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment Mean ER-M Quotient (arcsine square-root transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0015
Exact or approximate P value?	Approximate
P value summary	**
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	17.59

Data summary	
Number of treatments (columns)	5
Number of values (total)	74

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-16.64	No	ns	0.3718
Deep (15) vs. Marina (15)	-22.96	Yes	*	0.0403
Deep (15) vs. Industrial/Port (15)	-25.13	Yes	*	0.0136
Deep (15) vs. Shallow (16)	-2.381	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-6.321	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-8.498	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	14.25	No	ns	0.6982
Marina (15) vs. Industrial/Port (15)	-2.176	No	ns	>0.9999
Marina (15) vs. Shallow (16)	20.58	No	ns	0.0887
Industrial/Port (15) vs. Shallow (16)	22.75	Yes	*	0.0321

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment ∑SEM:AVS (arcsine square-root transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0099
Exact or approximate P value?	Approximate
P value summary	**
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	13.29

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	16.38	No	ns	0.4317
Deep (15) vs. Marina (15)	-10.27	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-1.667	No	ns	>0.9999
Deep (15) vs. Shallow (16)	9.671	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-26.64	Yes	*	0.0100
FW-Influenced (14) vs. Industrial/Port (15)	-18.04	No	ns	0.2589
FW-Influenced (14) vs. Shallow (16)	-6.705	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	8.600	No	ns	>0.9999
Marina (15) vs. Shallow (16)	19.94	No	ns	0.1091
Industrial/Port (15) vs. Shallow (16)	11.34	No	ns	>0.9999

Statistical Comparisons for Sediment Chemistry by Strata (2018 Only)

Sediment % Fines (arcsine square-root transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0014
Exact or approximate P value?	Approximate
P value summary	**
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	17.78

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-13.08	No	ns	>0.9999
Deep (15) vs. Marina (15)	-10.47	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-31.13	Yes	***	0.0009
Deep (15) vs. Shallow (16)	-5.179	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	2.614	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-18.05	No	ns	0.2581
FW-Influenced (14) vs. Shallow (16)	7.902	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	-20.67	No	ns	0.0941
Marina (15) vs. Shallow (16)	5.288	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	25.95	Yes	**	0.0092

SQO Indices, Individual LOEs, and Integrated Scores

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

CA Logistic Regression Model (LRM) Values (untransformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary

F	8.189
P value	<0.0001
P value summary	****
Significant diff. among means (P < 0.05)?	Yes
R squared	0.3188

Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	-0.2138	-0.3636 to -0.06401	Yes	**	0.0014
Deep (15) vs. Marina (15)	-0.2427	-0.3899 to -0.09547	Yes	***	0.0002
Deep (15) vs. Industrial/Port (15)	-0.2667	-0.4139 to -0.1195	Yes	****	<0.0001
Deep (15) vs. Shallow (16)	-0.1598	-0.3047 to -0.01491	Yes	*	0.0234
FW-Influenced (14) vs. Marina (15)	-0.02886	-0.1787 to 0.1209	No	ns	0.9829
FW-Influenced (14) vs. Industrial/Port (15)	-0.05286	-0.2027 to 0.09694	No	ns	0.8598
FW-Influenced (14) vs. Shallow (16)	0.05402	-0.09351 to 0.2015	No	ns	0.8428
Marina (15) vs. Industrial/Port (15)	-0.02400	-0.1712 to 0.1232	No	ns	0.9909
Marina (15) vs. Shallow (16)	0.08287	-0.06200 to 0.2278	No	ns	0.5013
Industrial/Port (15) vs. Shallow (16)	0.1069	-0.03800 to 0.2518	No	ns	0.2466

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Chemical Score Index (CSI) Values (untransformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	30.78

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-23.95	Yes	*	0.0306
Deep (15) vs. Marina (15)	-29.17	Yes	**	0.0024
Deep (15) vs. Industrial/Port (15)	-35.93	Yes	****	<0.0001
Deep (15) vs. Shallow (16)	-5.352	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-5.212	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-11.98	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	18.60	No	ns	0.1951
Marina (15) vs. Industrial/Port (15)	-6.767	No	ns	>0.9999
Marina (15) vs. Shallow (16)	23.81	Yes	*	0.0233
Industrial/Port (15) vs. Shallow (16)	30.58	Yes	***	0.0009

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Integrated Chemistry SQO LOE Category (untransformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	<0.0001
Exact or approximate P value?	Approximate
P value summary	****
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	28.94

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-19.68	No	ns	0.0756
Deep (15) vs. Marina (15)	-28.83	Yes	***	0.0007
Deep (15) vs. Industrial/Port (15)	-33.13	Yes	****	<0.0001
Deep (15) vs. Shallow (16)	-9.063	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-9.155	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	-13.45	No	ns	0.6780
FW-Influenced (14) vs. Shallow (16)	10.62	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	-4.300	No	ns	>0.9999
Marina (15) vs. Shallow (16)	19.77	No	ns	0.0552
Industrial/Port (15) vs. Shallow (16)	24.07	Yes	**	0.0073

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Amphipod % Survival (arcsine square-root transformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.2499
Exact or approximate P value?	Approximate
P value summary	ns
Do the medians vary signif. (P < 0.05)?	No
Number of groups	5
Kruskal-Wallis statistic	5.387

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	4.762	No	ns	>0.9999
Deep (15) vs. Marina (15)	3.733	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	17.13	No	ns	0.2906
Deep (15) vs. Shallow (16)	5.958	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-1.029	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	12.37	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	1.196	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	13.40	No	ns	0.8782
Marina (15) vs. Shallow (16)	2.225	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	-11.18	No	ns	>0.9999

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Bivalve % Normal Development (arcsine square-root transformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary	
F	0.7714
P value	0.5475
P value summary	ns
Significant diff. among means (P < 0.05)?	No
R squared	0.04222

Tukey's multiple comparisons test	**Mean Diff.**	**95.00% CI of diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	0.009827	-0.1111 to 0.1308	No	ns	0.9994
Deep (15) vs. Marina (15)	0.03236	-0.08647 to 0.1512	No	ns	0.9404
Deep (15) vs. Industrial/Port (15)	-0.03714	-0.1560 to 0.08169	No	ns	0.9050
Deep (15) vs. Shallow (16)	0.01893	-0.09803 to 0.1359	No	ns	0.9911
FW-Influenced (14) vs. Marina (15)	0.02253	-0.09840 to 0.1435	No	ns	0.9849
FW-Influenced (14) vs. Industrial/Port (15)	-0.04697	-0.1679 to 0.07396	No	ns	0.8123
FW-Influenced (14) vs. Shallow (16)	0.009103	-0.1100 to 0.1282	No	ns	0.9995
Marina (15) vs. Industrial/Port (15)	-0.06950	-0.1883 to 0.04933	No	ns	0.4788
Marina (15) vs. Shallow (16)	-0.01343	-0.1304 to 0.1035	No	ns	0.9976
Industrial/Port (15) vs. Shallow (16)	0.05607	-0.06089 to 0.1730	No	ns	0.6659

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Integrated Toxicity SQO LOE Category (untransformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.4935
Exact or approximate P value?	Approximate
P value summary	ns
Do the medians vary signif. (P < 0.05)?	No
Number of groups	5
Kruskal-Wallis statistic	3.398

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-2.857	No	ns	>0.9999
Deep (15) vs. Marina (15)	-2.500	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	2.500	No	ns	>0.9999
Deep (15) vs. Shallow (16)	-4.531	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	0.3571	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	5.357	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	-1.674	No	ns	>0.9999
Marina (15) vs. Industrial/Port (15)	5.000	No	ns	>0.9999
Marina (15) vs. Shallow (16)	-2.031	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	-7.031	No	ns	0.9320

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Benthic Infauna Taxa Richness (untransformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary	
F	2.734
P value	0.0356
P value summary	*
Significant diff. among means (P < 0.05)?	Yes
R squared	0.1351

Tukey's multiple comparisons test	**Mean Diff.**	**95.00% CI of diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	10.33	-4.237 to 24.90	No	ns	0.2836
Deep (15) vs. Marina (15)	7.333	-6.984 to 21.65	No	ns	0.6080
Deep (15) vs. Industrial/Port (15)	7.400	-6.917 to 21.72	No	ns	0.5996
Deep (15) vs. Shallow (16)	-3.917	-18.01 to 10.18	No	ns	0.9361
FW-Influenced (14) vs. Marina (15)	-3.000	-17.57 to 11.57	No	ns	0.9781
FW-Influenced (14) vs. Industrial/Port (15)	-2.933	-17.50 to 11.64	No	ns	0.9798
FW-Influenced (14) vs. Shallow (16)	-14.25	-28.60 to 0.09927	No	ns	0.0525
Marina (15) vs. Industrial/Port (15)	0.06667	-14.25 to 14.38	No	ns	>0.9999
Marina (15) vs. Shallow (16)	-11.25	-25.34 to 2.842	No	ns	0.1790
Industrial/Port (15) vs. Shallow (16)	-11.32	-25.41 to 2.775	No	ns	0.1743

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Benthic Infauna Shannon-Wiener Diversity Index (untransformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary	
F	4.765
P value	0.0019
P value summary	**
Significant diff. among means (P < 0.05)?	Yes
R squared	0.2140

Tukey's multiple comparisons test	**Mean Diff.**	**95.00% CI of diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	0.5855	0.05999 to 1.111	Yes	*	0.0214
Deep (15) vs. Marina (15)	0.6933	0.1770 to 1.210	Yes	**	0.0031
Deep (15) vs. Industrial/Port (15)	0.2503	-0.2661 to 0.7667	No	ns	0.6565
Deep (15) vs. Shallow (16)	0.2054	-0.3029 to 0.7136	No	ns	0.7894
FW-Influenced (14) vs. Marina (15)	0.1078	-0.4177 to 0.6334	No	ns	0.9784
FW-Influenced (14) vs. Industrial/Port (15)	-0.3352	-0.8607 to 0.1903	No	ns	0.3899
FW-Influenced (14) vs. Shallow (16)	-0.3801	-0.8977 to 0.1374	No	ns	0.2505
Marina (15) vs. Industrial/Port (15)	-0.4430	-0.9594 to 0.07335	No	ns	0.1268
Marina (15) vs. Shallow (16)	-0.4880	-0.9962 to 0.02026	No	ns	0.0659
Industrial/Port (15) vs. Shallow (16)	-0.04496	-0.5532 to 0.4633	No	ns	0.9991

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Benthic Response Index (BRI) (untransformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary	
F	8.309
P value	<0.0001
P value summary	****
Significant diff. among means (P < 0.05)?	Yes
R squared	0.3219

Tukey's multiple comparisons test	**Mean Diff.**	**95.00% CI of diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-13.55	-21.77 to -5.325	Yes	***	0.0002
Deep (15) vs. Marina (15)	-14.09	-22.17 to -6.011	Yes	****	<0.0001
Deep (15) vs. Industrial/Port (15)	-12.67	-20.75 to -4.589	Yes	***	0.0004
Deep (15) vs. Shallow (16)	-8.214	-16.16 to -0.2628	Yes	*	0.0395
FW-Influenced (14) vs. Marina (15)	-0.5437	-8.765 to 7.678	No	ns	0.9997
FW-Influenced (14) vs. Industrial/Port (15)	0.8785	-7.343 to 9.100	No	ns	0.9982
FW-Influenced (14) vs. Shallow (16)	5.332	-2.764 to 13.43	No	ns	0.3571
Marina (15) vs. Industrial/Port (15)	1.422	-6.656 to 9.501	No	ns	0.9878
Marina (15) vs. Shallow (16)	5.876	-2.075 to 13.83	No	ns	0.2450
Industrial/Port (15) vs. Shallow (16)	4.454	-3.497 to 12.40	No	ns	0.5224

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Index of Biotic Integrity (IBI) (untransformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0854
Exact or approximate P value?	Approximate
P value summary	ns
Do the medians vary signif. (P < 0.05)?	No
Number of groups	5
Kruskal-Wallis statistic	8.173

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-19.79	No	ns	0.0671
Deep (15) vs. Marina (15)	-5.900	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-4.767	No	ns	>0.9999
Deep (15) vs. Shallow (16)	-5.500	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	13.89	No	ns	0.5710
FW-Influenced (14) vs. Industrial/Port (15)	15.02	No	ns	0.3960
FW-Influenced (14) vs. Shallow (16)	14.29	No	ns	0.4686
Marina (15) vs. Industrial/Port (15)	1.133	No	ns	>0.9999
Marina (15) vs. Shallow (16)	0.4000	No	ns	>0.9999
Industrial/Port (15) vs. Shallow (16)	-0.7333	No	ns	>0.9999

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Relative Benthic Index (RBI) (untransformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary

F	1.666
P value	0.1677
P value summary	ns
Significant diff. among means (P < 0.05)?	No
R squared	0.08691

Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	0.1554	-0.03863 to 0.3494	No	ns	0.1764
Deep (15) vs. Marina (15)	0.1183	-0.07234 to 0.3090	No	ns	0.4180
Deep (15) vs. Industrial/Port (15)	0.04360	-0.1471 to 0.2343	No	ns	0.9679
Deep (15) vs. Shallow (16)	0.04421	-0.1434 to 0.2319	No	ns	0.9642
FW-Influenced (14) vs. Marina (15)	-0.03708	-0.2311 to 0.1569	No	ns	0.9834
FW-Influenced (14) vs. Industrial/Port (15)	-0.1118	-0.3058 to 0.08223	No	ns	0.4940
FW-Influenced (14) vs. Shallow (16)	-0.1112	-0.3023 to 0.07989	No	ns	0.4840
Marina (15) vs. Industrial/Port (15)	-0.07471	-0.2654 to 0.1159	No	ns	0.8073
Marina (15) vs. Shallow (16)	-0.07410	-0.2618 to 0.1135	No	ns	0.8029
Industrial/Port (15) vs. Shallow (16)	0.0006081	-0.1870 to 0.1883	No	ns	>0.9999

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

River Invertebrate Prediction and Classification System (RIVPACS) (untransformed) – One-way ANOVA with Tukey's Multiple Comparisons Test

ANOVA summary

F	1.694
P value	0.1611
P value summary	ns
Significant diff. among means (P < 0.05)?	No
R squared	0.08826

Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Significant?	Summary	Adjusted P Value
Deep (15) vs. FW-Influenced (14)	0.05188	-0.1826 to 0.2863	No	ns	0.9715
Deep (15) vs. Marina (15)	-0.006673	-0.2371 to 0.2237	No	ns	>0.9999
Deep (15) vs. Industrial/Port (15)	-0.06864	-0.2990 to 0.1617	No	ns	0.9190
Deep (15) vs. Shallow (16)	-0.1443	-0.3710 to 0.08247	No	ns	0.3923
FW-Influenced (14) vs. Marina (15)	-0.05855	-0.2930 to 0.1759	No	ns	0.9560
FW-Influenced (14) vs. Industrial/Port (15)	-0.1205	-0.3550 to 0.1139	No	ns	0.6047
FW-Influenced (14) vs. Shallow (16)	-0.1962	-0.4271 to 0.03474	No	ns	0.1333
Marina (15) vs. Industrial/Port (15)	-0.06197	-0.2923 to 0.1684	No	ns	0.9429
Marina (15) vs. Shallow (16)	-0.1376	-0.3644 to 0.08915	No	ns	0.4411
Industrial/Port (15) vs. Shallow (16)	-0.07564	-0.3024 to 0.1511	No	ns	0.8827

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Integrated Benthic SQO LOE Category (untransformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0095
Exact or approximate P value?	Approximate
P value summary	**
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	13.40

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-22.88	Yes	*	0.0263
Deep (15) vs. Marina (15)	-16.20	No	ns	0.3020
Deep (15) vs. Industrial/Port (15)	-9.600	No	ns	>0.9999
Deep (15) vs. Shallow (16)	-1.263	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	6.679	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	13.28	No	ns	0.8086
FW-Influenced (14) vs. Shallow (16)	21.62	Yes	*	0.0391
Marina (15) vs. Industrial/Port (15)	6.600	No	ns	>0.9999
Marina (15) vs. Shallow (16)	14.94	No	ns	0.4230
Industrial/Port (15) vs. Shallow (16)	8.338	No	ns	>0.9999

Statistical Comparisons for SQO Indices, Individual LOEs, and Integrated Scores by Strata (2018 Only)

Final Integrated SQO Category (untransformed) – Kruskal-Wallis with Dunn's Multiple Comparisons Test

Kruskal-Wallis test	
P value	0.0247
Exact or approximate P value?	Approximate
P value summary	*
Do the medians vary signif. (P < 0.05)?	Yes
Number of groups	5
Kruskal-Wallis statistic	11.17

Data summary	
Number of treatments (columns)	5
Number of values (total)	75

Dunn's multiple comparisons test	**Mean rank diff.**	**Significant?**	**Summary**	**Adjusted P Value**
Deep (15) vs. FW-Influenced (14)	-18.01	No	ns	0.1532
Deep (15) vs. Marina (15)	-19.77	No	ns	0.0678
Deep (15) vs. Industrial/Port (15)	-13.00	No	ns	0.7496
Deep (15) vs. Shallow (16)	-4.144	No	ns	>0.9999
FW-Influenced (14) vs. Marina (15)	-1.752	No	ns	>0.9999
FW-Influenced (14) vs. Industrial/Port (15)	5.014	No	ns	>0.9999
FW-Influenced (14) vs. Shallow (16)	13.87	No	ns	0.5800
Marina (15) vs. Industrial/Port (15)	6.767	No	ns	>0.9999
Marina (15) vs. Shallow (16)	15.62	No	ns	0.2969
Industrial/Port (15) vs. Shallow (16)	8.856	No	ns	>0.9999

Statistical Comparisons for Chemistry and Indices by Strata Over Time (2008 – 2018)

Water Chemistry

Statistical Comparisons for Water Chemistry by Strata Over Time (2008 – 2018)

Water Column Dissolved Copper (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	3.524	0.2063	ns	No
Row Factor (Year)	1.750	0.0666	ns	No
Column Factor (Stratum)	27.64	<0.0001	****	Yes

Water Column Dissolved Nickel (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	0.7535	0.9643	ns	No
Row Factor (Year)	6.494	<0.0001	****	Yes
Column Factor (Stratum)	27.68	<0.0001	****	Yes

Water Column Dissolved Zinc (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	3.356	0.2406	ns	No
Row Factor (Year)	2.435	0.0240	*	Yes
Column Factor (Stratum)	29.85	<0.0001	****	Yes

Statistical Comparisons for Water Chemistry Over Time (2008 – 2018)

Welch's t-test Results Comparing Water Chemistry Metrics between 2008 and 2018

Assessment Metric	Transformation Prior to Analysis	P-value	Significantly different?	Significant Increase or Decrease since 2008?
Dissolved Copper	log(Y)	0.038	Yes	Decrease
Dissolved Nickel	log(Y)	0.009	Yes	Decrease
Dissolved Zinc	log(Y)	0.767	No	NA
Total PAHs	log(Y)	<0.001	Yes	Decrease

Notes:
NA = not applicable

Sediment Chemistry

Statistical Comparisons for Sediment Chemistry by Strata Over Time (2008 – 2018)

Sediment Copper (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	1.876	0.6106	ns	No
Row Factor (Year)	0.3702	0.5365	ns	No
Column Factor (Stratum)	35.66	<0.0001	****	Yes

Sediment Lead (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	1.269	0.8942	ns	No
Row Factor (Year)	0.5013	0.4977	ns	No
Column Factor (Stratum)	23.12	<0.0001	****	Yes

Sediment Mercury (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	1.042	0.9363	ns	No
Row Factor (Year)	3.380	0.0093	**	Yes
Column Factor (Stratum)	21.35	<0.0001	****	Yes

Statistical Comparisons for Sediment Chemistry by Strata Over Time (2008 – 2018)

Sediment Zinc (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	**% of total variation**	**P value**	**P value summary**	**Significant?**
Interaction	1.921	0.6849	ns	No
Row Factor (Year)	0.07828	0.8912	ns	No
Column Factor (Stratum)	26.91	<0.0001	****	Yes

Sediment Total HPAHs (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	**% of total variation**	**P value**	**P value summary**	**Significant?**
Interaction	1.693	0.7407	ns	No
Row Factor (Year)	9.104	<0.0001	****	Yes
Column Factor (Stratum)	19.63	<0.0001	****	Yes

Sediment Total LPAHs (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	**% of total variation**	**P value**	**P value summary**	**Significant?**
Interaction	1.945	0.7601	ns	No
Row Factor (Year)	3.572	0.0115	*	Yes
Column Factor (Stratum)	12.12	<0.0001	****	Yes

Statistical Comparisons for Sediment Chemistry by Strata Over Time (2008 – 2018)

Sediment Alpha Chlordane (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	2.284	0.2052	ns	No
Row Factor (Year)	44.52	<0.0001	****	Yes
Column Factor (Stratum)	9.649	<0.0001	****	Yes

Sediment Gamma Chlordane (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	1.832	0.4214	ns	No
Row Factor (Year)	43.07	<0.0001	****	Yes
Column Factor (Stratum)	7.742	<0.0001	****	Yes

Sediment Total DDDs (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	1.794	0.0707	ns	No
Row Factor (Year)	70.83	<0.0001	****	Yes
Column Factor (Stratum)	1.845	0.0053	**	Yes

Statistical Comparisons for Sediment Chemistry by Strata Over Time (2008 – 2018)

Sediment Total DDEs (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	3.782	0.0295	*	Yes
Row Factor (Year)	44.32	<0.0001	****	Yes
Column Factor (Stratum)	7.142	<0.0001	****	Yes

Sediment Total DDTs (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	3.678	0.0015	**	Yes
Row Factor (Year)	65.28	<0.0001	****	Yes
Column Factor (Stratum)	1.550	0.0281	*	Yes

Sediment Total PCBs (SQO Congeners Only) (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	0.8768	0.9678	ns	No
Row Factor (Year)	1.897	0.0818	ns	No
Column Factor (Stratum)	18.30	<0.0001	****	Yes

Statistical Comparisons for Sediment Chemistry by Strata Over Time (2008 – 2018)

Sediment Total Pyrethroids (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	14.16	<0.0001	****	Yes
Row Factor (Year)	18.81	<0.0001	****	Yes
Column Factor (Stratum)	13.97	<0.0001	****	Yes

Sediment Total PBDEs (log transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	8.555	0.0057	**	Yes
Row Factor (Year)	2.054	0.0580	ns	No
Column Factor (Stratum)	10.92	0.0011	**	Yes

CA Logistic Regression Model (LRM) Values (untransformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	1.942	0.6735	ns	No
Row Factor (Year)	0.01305	0.9808	ns	No
Column Factor (Stratum)	27.37	<0.0001	****	Yes

Statistical Comparisons for Sediment Chemistry by Strata Over Time (2008 – 2018)

Chemical Score Index (CSI) Values (untransformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	0.8307	0.9575	ns	No
Row Factor (Year)	3.289	0.0070	**	Yes
Column Factor (Stratum)	27.37	<0.0001	****	Yes

Integrated Chemistry SQO LOE Category (untransformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	1.026	0.9268	ns	No
Row Factor (Year)	0.8224	0.2913	ns	No
Column Factor (Stratum)	28.37	<0.0001	****	Yes

Sediment Mean ER-M Quotient (arcsine square-root transformed) – Two-way ANOVA (Year and Stratum)

Two-way ANOVA	Ordinary
Alpha	0.05

Source of Variation	% of total variation	P value	P value summary	Significant?
Interaction	0.5692	0.9912	ns	No
Row Factor (Year)	0.1577	0.8051	ns	No
Column Factor (Stratum)	22.95	<0.0001	****	Yes

Statistical Comparisons for Sediment Chemistry Over Time (2008 – 2018)

Welch's t-test Results Comparing Sediment Chemistry Metrics between 2008 and 2018

Assessment Metric	Transformation Prior to Analysis	P-value	Significantly different?	Significant Increase or Decrease since 2008?
Chemical Score Index (CSI) Components				
Copper	log(Y)	0.311	No	NA
Lead	log(Y)	0.348	No	NA
Mercury	log(Y)	0.006	Yes	Decrease
Zinc	log(Y)	0.622	No	NA
Total HPAHs	log(Y)	0.005	Yes	Decrease
Total LPAHs	log(Y)	0.057	No	NA
Alpha Chlordane	log(Y)	<0.001	Yes	Decrease*
Gamma Chlordane	log(Y)	<0.001	Yes	Decrease*
Total DDDs	log(Y)	0.050	Yes	Increase
Total DDEs	log(Y)	0.893	No	NA
Total DDTs	log(Y)	0.150	No	NA
Total PCBs (SQO Congeners only)	log(Y)	0.153	No	NA
Chemistry SQO LOE				
Chemical Score Index (CSI)	NA	0.014	Yes	Decrease
CA Logistic Regression Model (LRM)	NA	0.882	No	NA
Integrated Chemistry LOE	NA	0.136	No	NA
Other Metrics				
Total Pyrethroids	log(Y)	0.001	Yes	Increase
Total PBDEs	log(Y)	0.093	No	NA
Mean ER-M Quotient	arcsin(sqrt(Y))	0.585	No	NA

Notes:
NA = not applicable

For totals in which all individual components were non-detect, the total was included as ½ MDL for statistical comparisons.

* Significant decreases observed in alpha and gamma chlordane were predominantly a result of decreases in method detection limits (MDLs) in 2018 compared to 2008. In 2008, the MDLs for alpha and gamma chlordane in 2008 were both 1.0 µg/kg dry weight. In 2008, the MDLs for alpha chlordane and gamma chlordane were 0.187 and 0.179 µg/kg dry weight, respectively.

Benthic Infauna

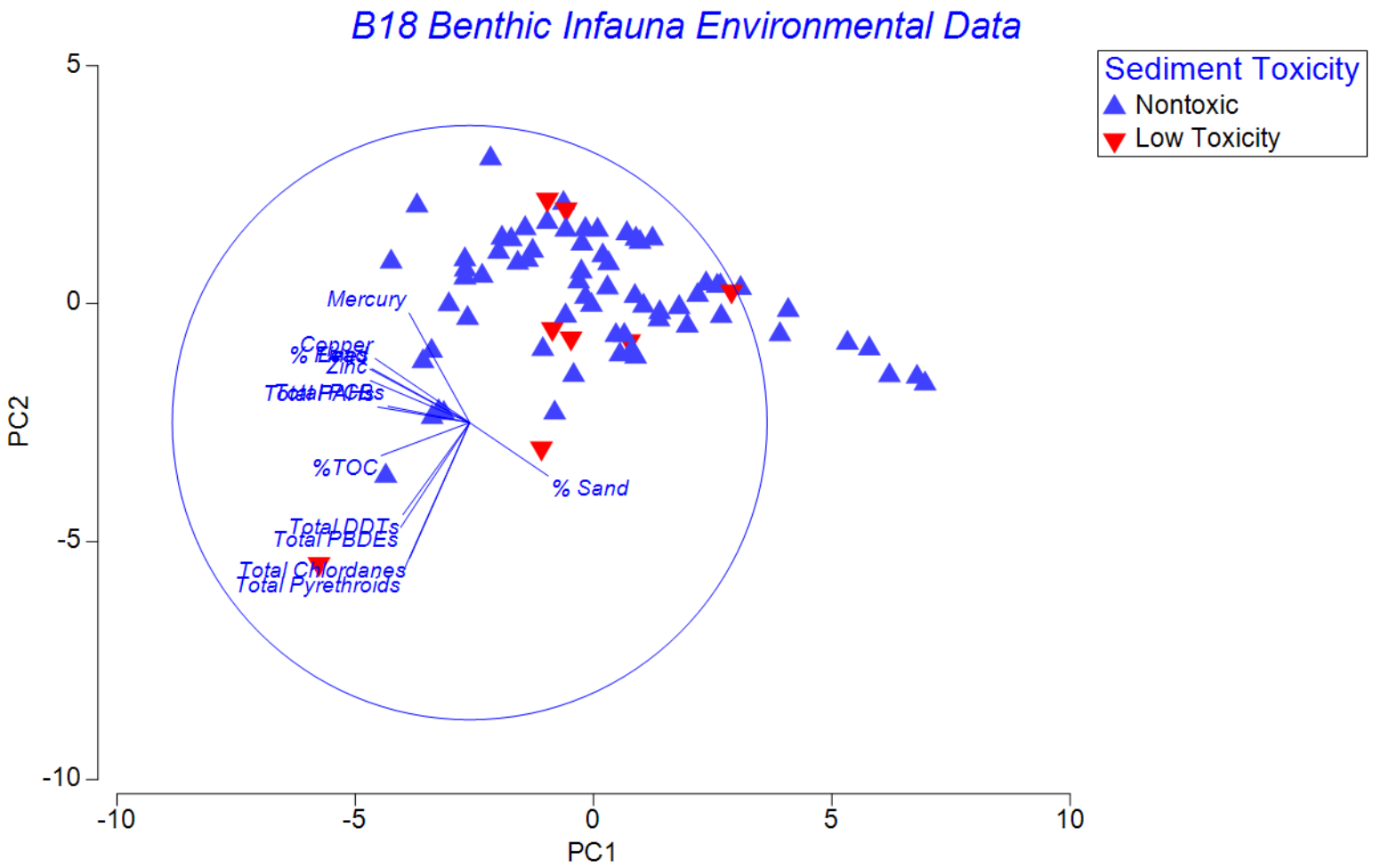
Statistical Comparisons for Benthic Infauna by Strata Over Time (2008 – 2018)

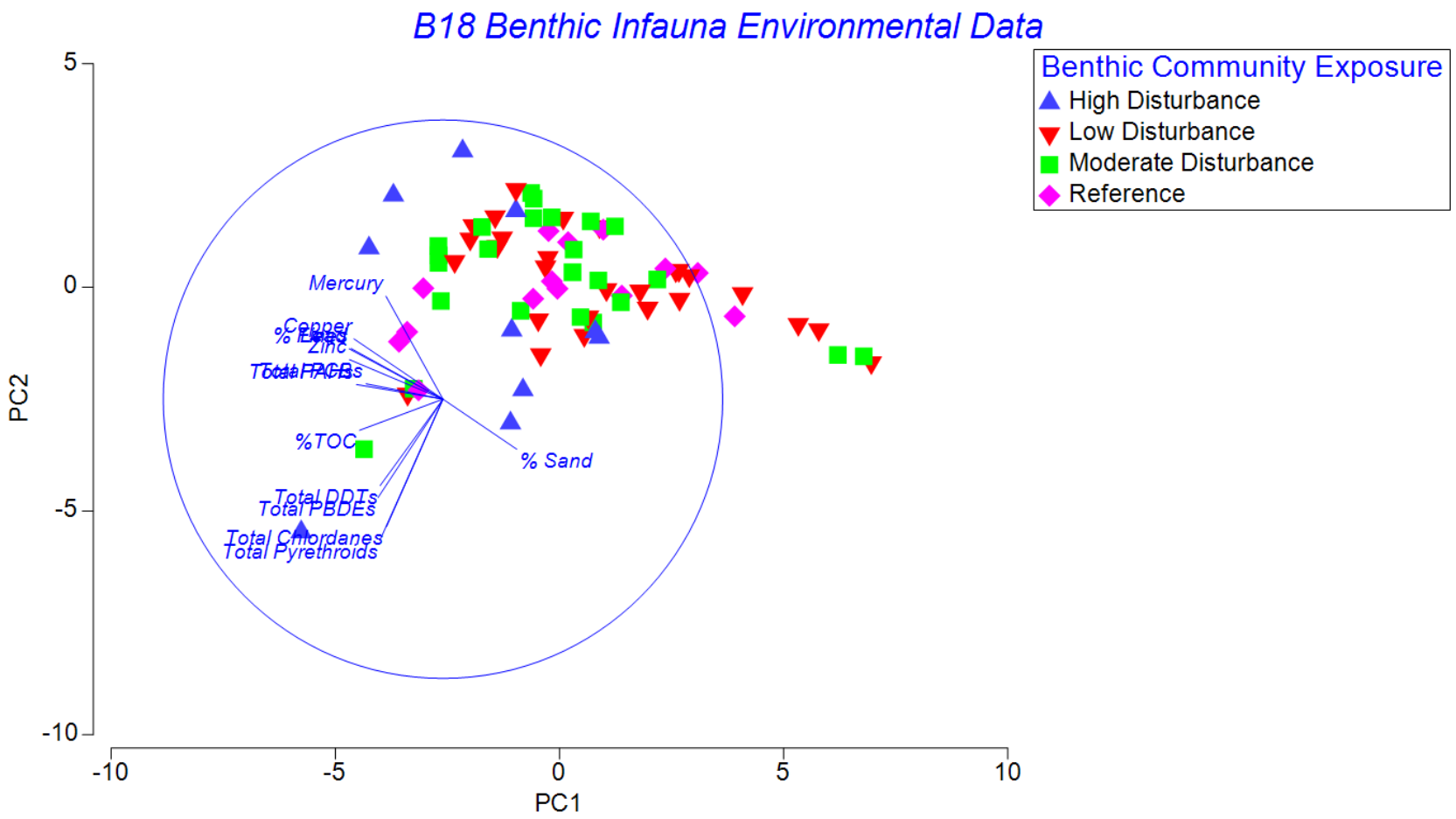
Welch's t-test Results Comparing Benthic Infauna Metrics between 2008 and 2018

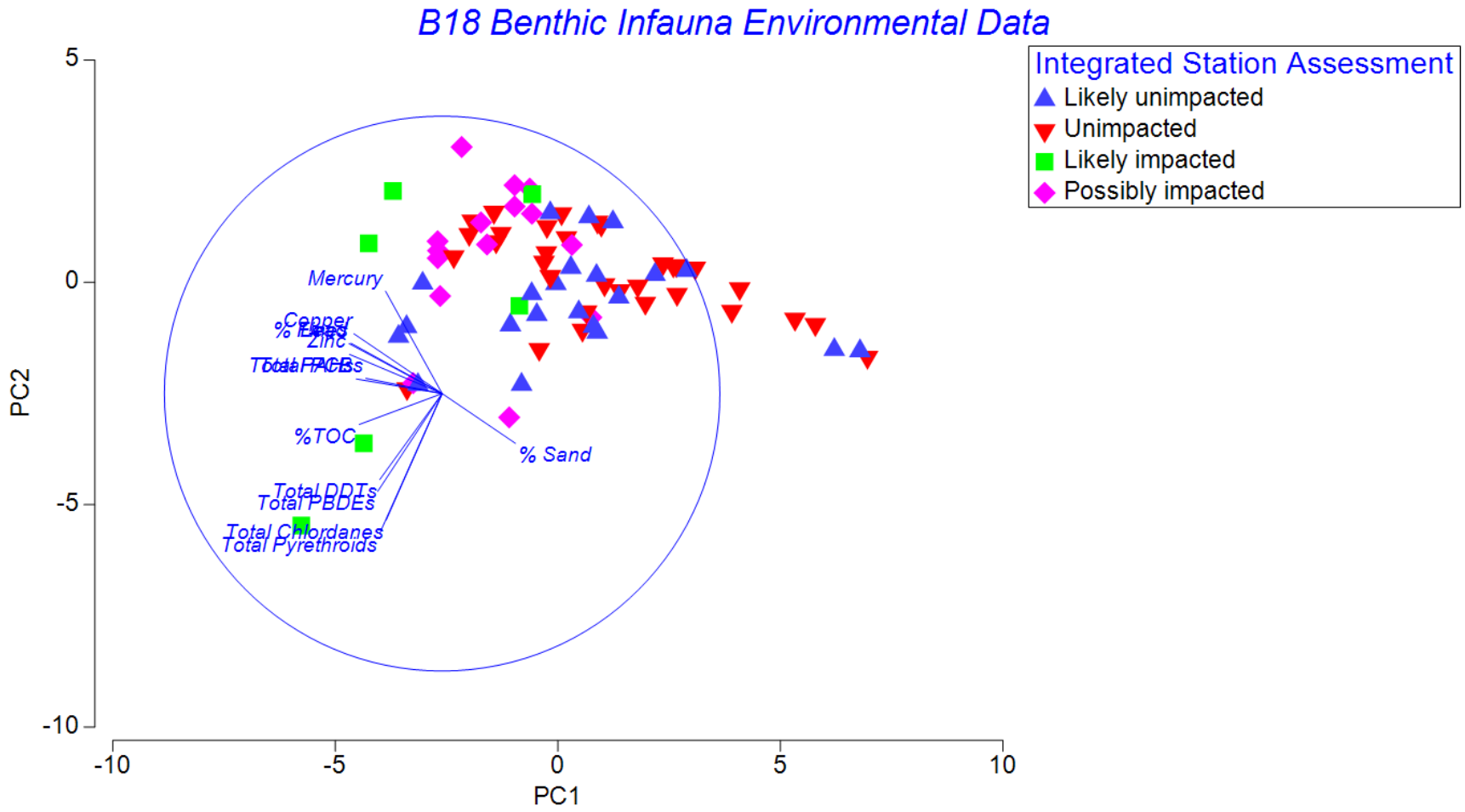
Assessment Metric	Transformation Prior to Analysis	P-value	Significantly different?	Improvement or Decline in Community Condition since 2008?
Benthic Response Index (BRI)	NA	<0.001	Yes	Decline
Index of Biotic Integrity (IBI)	NA	0.818	No	NA
Relative Benthic Index (RBI)	NA	0.016	Yes	Decline
River Invertebrate Prediction and Classification System (RIVPACS)	NA	<0.001	Yes	Decline
Integrated Benthic SQO LOE Category	NA	<0.001	Yes	Decline

Notes:
NA = not applicable

Multivariate Analyses – Sediment Chemistry and Physical Characteristics


B18 Benthic Infauna Environmental Data
Sediment Toxicity
Nontoxic
Low Toxicity
Mercury
Copper
Zinc
%TOC
% Sand
Total DDTs
Total PBDEs
Total Chlordanes
Total Pyrethroids
PC1
PC2
5
0
-5
-10
-10
-5
0
5
10


B18 Benthic Infauna Environmental Data
Benthic Community Exposure
High Disturbance
Low Disturbance
Moderate Disturbance
Reference
Mercury
Copper
Zinc
%TOC
% Sand
Total DDTs
Total PBDEs
Total Chlordanes
Total Pyrethroids
PC1
PC2
5
0
-5
-10
-10
-5
0
5
10


B18 Benthic Infauna Environmental Data
Integrated Station Assessment
Likely unimpacted
Unimpacted
Likely impacted
Possibly impacted
Mercury
Copper
Zinc
%TOC
% Sand
Total DDTs
Total PBDEs
Total Chlordanes
Total Pyrethroids
PC1
PC2
5
0
-5
-10
-10
-5
0
5
10

Analysis of Similarities One-Way – Sediment Chemistry and Physical Characteristics by Region

Factors

Place	Name	Type	Levels
A	Region	Unordered	6

Region levels
Mission Bay
North San Diego Bay
Central San Diego Bay
South San Diego Bay
Dana Point Harbor
Oceanside Harbor

Tests for differences between unordered Region groups
Global Test
Sample statistic (R): 0.107
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Mission Bay, North San Diego Bay	0.179	6.6	10015005	999	65
Mission Bay, Central San Diego Bay	0.178	5.1	20160075	999	50
Mission Bay, South San Diego Bay	0.112	11.5	2042975	999	114
Mission Bay, Dana Point Harbor	0.204	11.9	715	715	85
Mission Bay, Oceanside Harbor	0.138	17.2	715	715	123
North San Diego Bay, Central San Diego Bay	0.014	24.8	Very large	999	247
North San Diego Bay, South San Diego Bay	0.15	0.5	Very large	999	4
North San Diego Bay, Dana Point Harbor	0.197	13.7	10626	999	136
North San Diego Bay, Oceanside Harbor	0.176	15.6	10626	999	155
Central San Diego Bay, South San Diego Bay	0.078	5.3	Very large	999	52
Central San Diego Bay, Dana Point Harbor	0.112	26.4	14950	999	263
Central San Diego Bay, Oceanside Harbor	0.122	20.5	14950	999	204
South San Diego Bay, Dana Point Harbor	0.119	23.4	4845	999	233
South San Diego Bay, Oceanside Harbor	0.12	21.9	4845	999	218
Dana Point Harbor, Oceanside Harbor	-0.063	54.3	35	35	19

Analysis of Similarities One-Way – Sediment Chemistry and Physical Characteristics by Strata

Factors

Place	Name	Type	Levels
A	Strata	Unordered	5

Strata levels
Freshwater-Influenced
Shallow
Deep
Marina
Industrial/Port

Tests for differences between unordered Strata groups
Global Test
Sample statistic (R): 0.24
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Freshwater-Influenced, Shallow	0.309	0.1	145422675	999	0
Freshwater-Influenced, Deep	0.248	0.3	77558760	999	2
Freshwater-Influenced, Marina	0.223	0.1	77558760	999	0
Freshwater-Influenced, Industrial/Port	0.255	0.1	77558760	999	0
Shallow, Deep	0.124	1.4	300540195	999	13
Shallow, Marina	0.187	0.1	300540195	999	0
Shallow, Industrial/Port	0.414	0.1	300540195	999	0
Deep, Marina	0.233	0.1	77558760	999	0
Deep, Industrial/Port	0.321	0.1	77558760	999	0
Marina, Industrial/Port	0.135	0.6	77558760	999	5

Analysis of Similarities One-Way – Sediment Chemistry and Physical Characteristics by Chemistry SQO Category

Factors

Place	Name	Type	Levels
A	Sediment Chemistry Exposure	Unordered	4

Sediment Chemistry Exposure levels
Low Exposure
Minimal Exposure
High Exposure
Moderate Exposure

Tests for differences between unordered Sediment Chemistry Exposure groups
Global Test
Sample statistic (R): 0.587
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Low Exposure, Minimal Exposure	0.809	0.1	6096454	999	0
Low Exposure, High Exposure	0.977	0.1	101270	999	0
Low Exposure, Moderate Exposure	0.424	0.1	Very large	999	0
Minimal Exposure, High Exposure	1	0.5	210	210	1
Minimal Exposure, Moderate Exposure	0.971	0.1	1344904	999	0
High Exposure, Moderate Exposure	0.466	1.1	35960	999	10

Analysis of Similarities One-Way – Sediment Chemistry and Physical Characteristics by Toxicity SQO Category

Factors

Place	Name	Type	Levels
A	Sediment Toxicity	Unordered	2

Sediment Toxicity levels
Nontoxic
Low Toxicity

Tests for differences between unordered Sediment Toxicity groups
Global Test
Sample statistic (R): 0.052
Significance level of sample statistic: 28.8%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 287

Analysis of Similarities One-Way – Sediment Chemistry and Physical Characteristics by Benthic Community SQO Category

Factors

Place	Name	Type	Levels
A	Benthic Community Exposure	Unordered	4

Benthic Community Exposure levels
High Disturbance
Low Disturbance
Moderate Disturbance
Reference

Tests for differences between unordered Benthic Community Exposure groups
Global Test
Sample statistic (R): 0.045
Significance level of sample statistic: 10.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 100

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
High Disturbance, Low Disturbance	0.193	3.8	348330136	999	37
High Disturbance, Moderate Disturbance	0.077	16.5	131128140	999	164
High Disturbance, Reference	0.052	20	1961256	999	199
Low Disturbance, Moderate Disturbance	0.021	15.1	Very large	999	150
Low Disturbance, Reference	-0.006	48.1	Very large	999	480
Moderate Disturbance, Reference	-0.009	51.1	Very large	999	510

Analysis of Similarities One-Way – Sediment Chemistry and Physical Characteristics by Integrated SQO Category

Factors

Place	Name	Type	Levels
A	Integrated Station Assessment	Unordered	4

Integrated Station Assessment levels
Likely unimpacted
Unimpacted
Likely impacted
Possibly impacted

Tests for differences between unordered Integrated Station Assessment groups
Global Test
Sample statistic (R): 0.18
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Likely unimpacted, Unimpacted	0.06	7.3	Very large	999	72
Likely unimpacted, Likely impacted	0.314	2.1	376740	999	20
Likely unimpacted, Possibly impacted	0.092	4.8	Very large	999	47
Unimpacted, Likely impacted	0.497	0.2	2760681	999	1
Unimpacted, Possibly impacted	0.23	0.3	Very large	999	2
Likely impacted, Possibly impacted	0.219	7.5	54264	999	74

Relate Analysis – Sediment Chemistry and Physical Characteristics to Benthic Infauna

Parameters
Correlation method: Spearman rank

Sample statistic (Rho): 0.239
Significance level of sample statistic: 0.5 %
Number of permutations: 999
Number of permuted statistics greater than or equal to Rho: 4

BEST/BIOENV Analysis – Sediment Chemistry and Physical Characteristics to Benthic Infauna

Parameters
Correlation method: Spearman rank
Method: BIOENV
Maximum number of variables: 5
Analyse between: Samples
Resemblance measure: D1 Euclidean distance

Global Test
Sample statistic (Rho): 0.34
Significance level of sample statistic: 0.3%
Number of permutations: 999 (Random sample)
Number of permuted statistics greater than or equal to Rho: 2

Best result for each number of variables

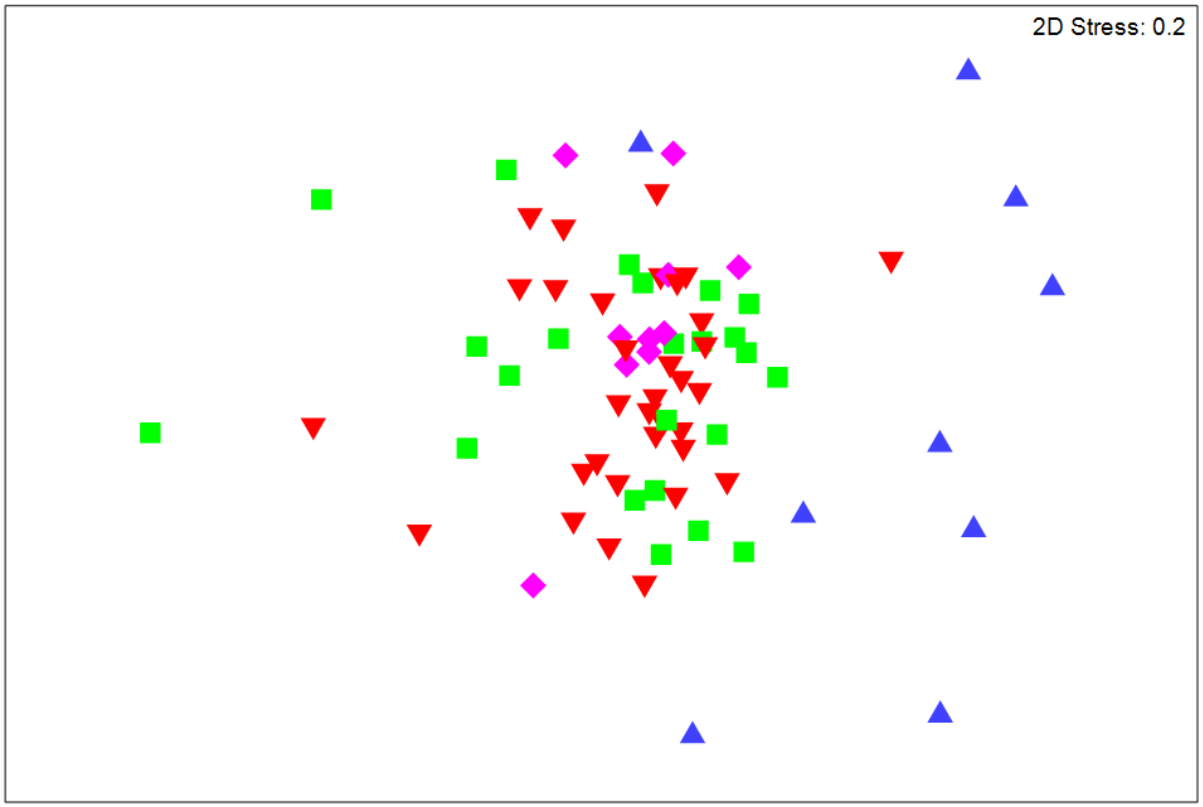
No.Vars	Corr.	Selections
1	0.224	Copper
2	0.289	Copper,Total PBDEs
3	0.333	%TOC,Copper,Lead
4	0.335	%TOC,Copper,Lead,Total Pyrethroids
5	0.340	%TOC,Copper,Lead,Zinc,Total Pyrethroids

Multivariate Analyses – Benthic Infauna

Benthic Infauna Abundances - 2018 RHMP

Non-metric MDS

Transform: Fourth root
Resemblance: S17 Bray-Curtis similarity

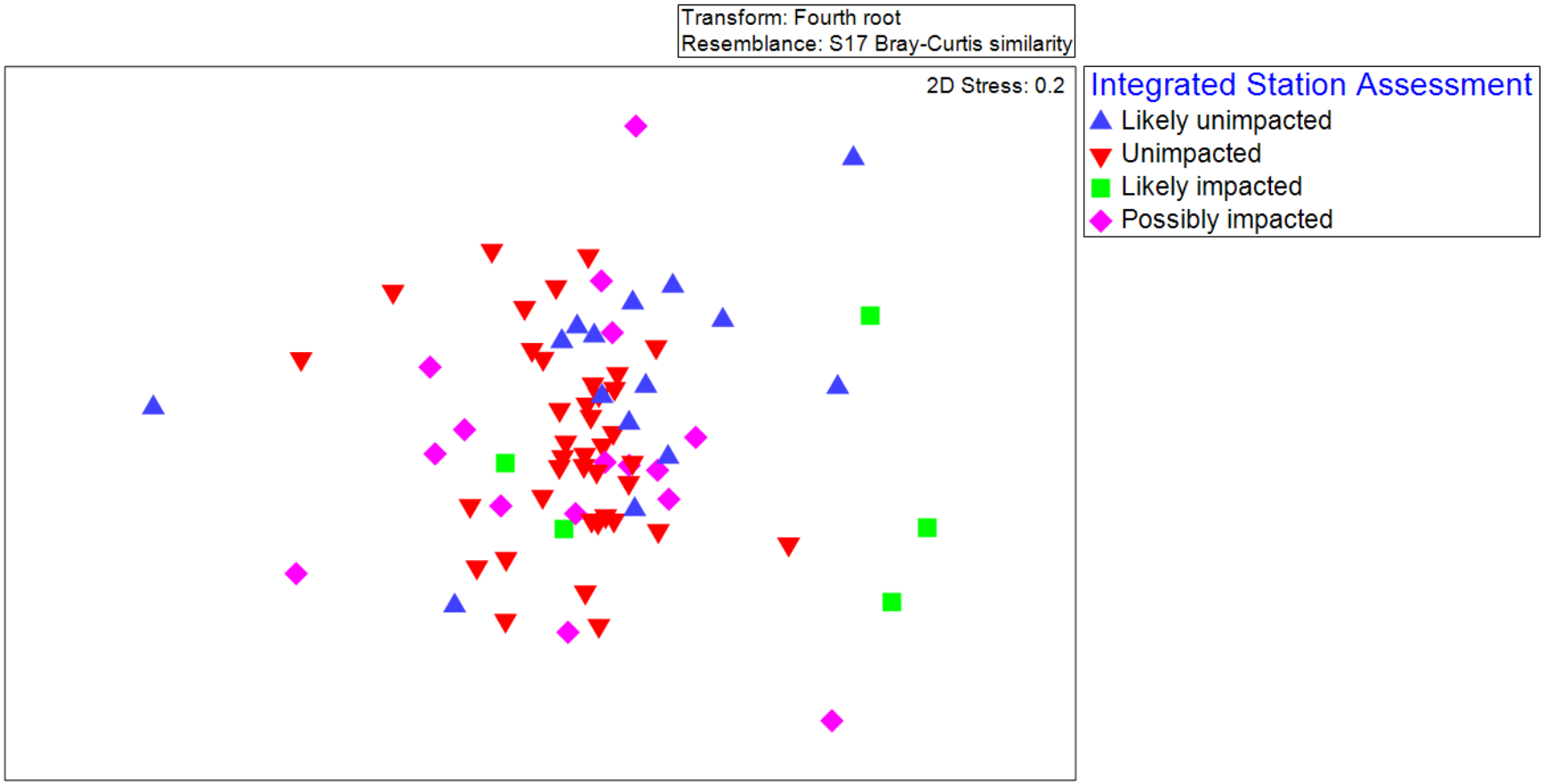


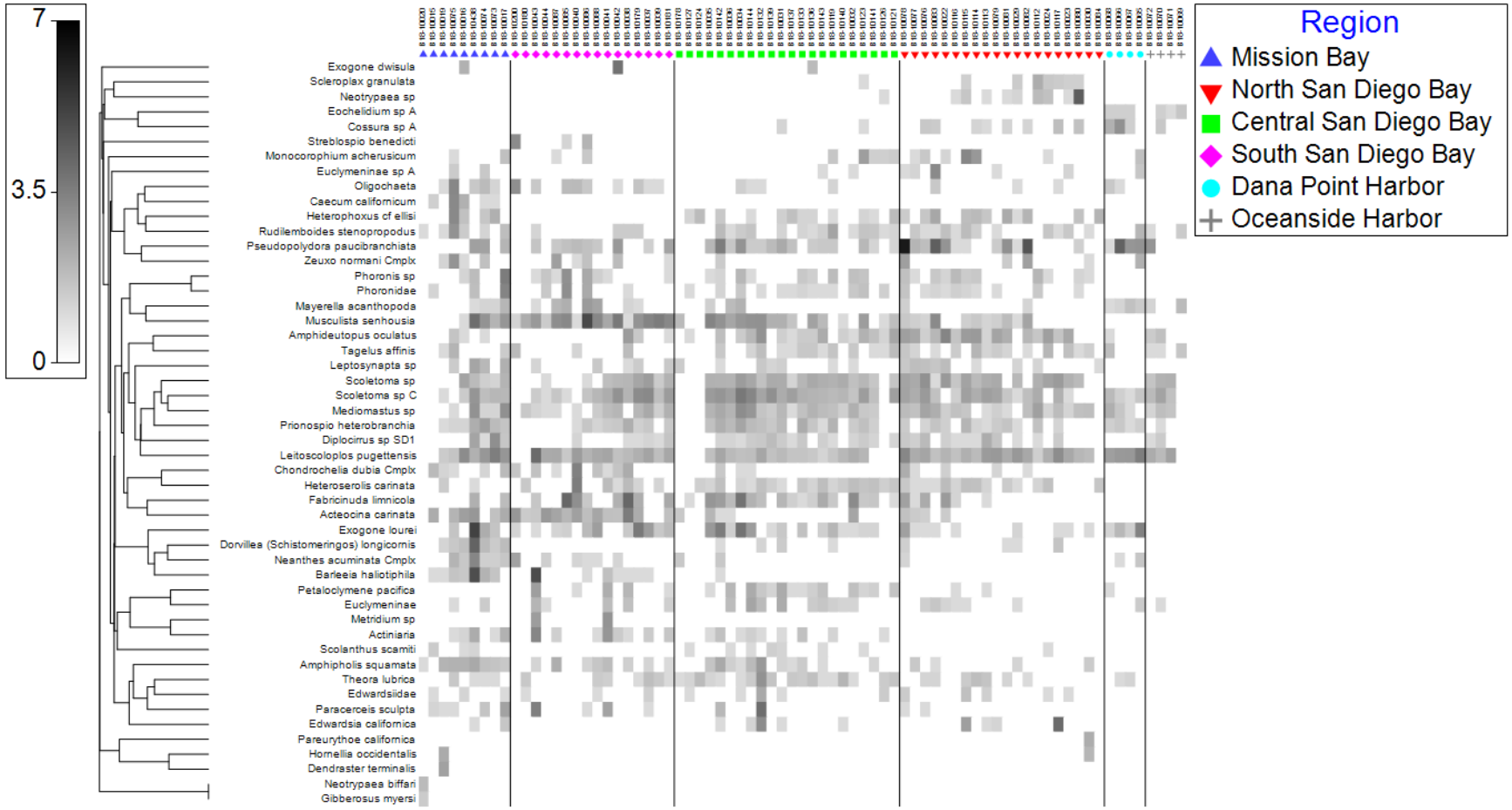
Benthic Community Exposure

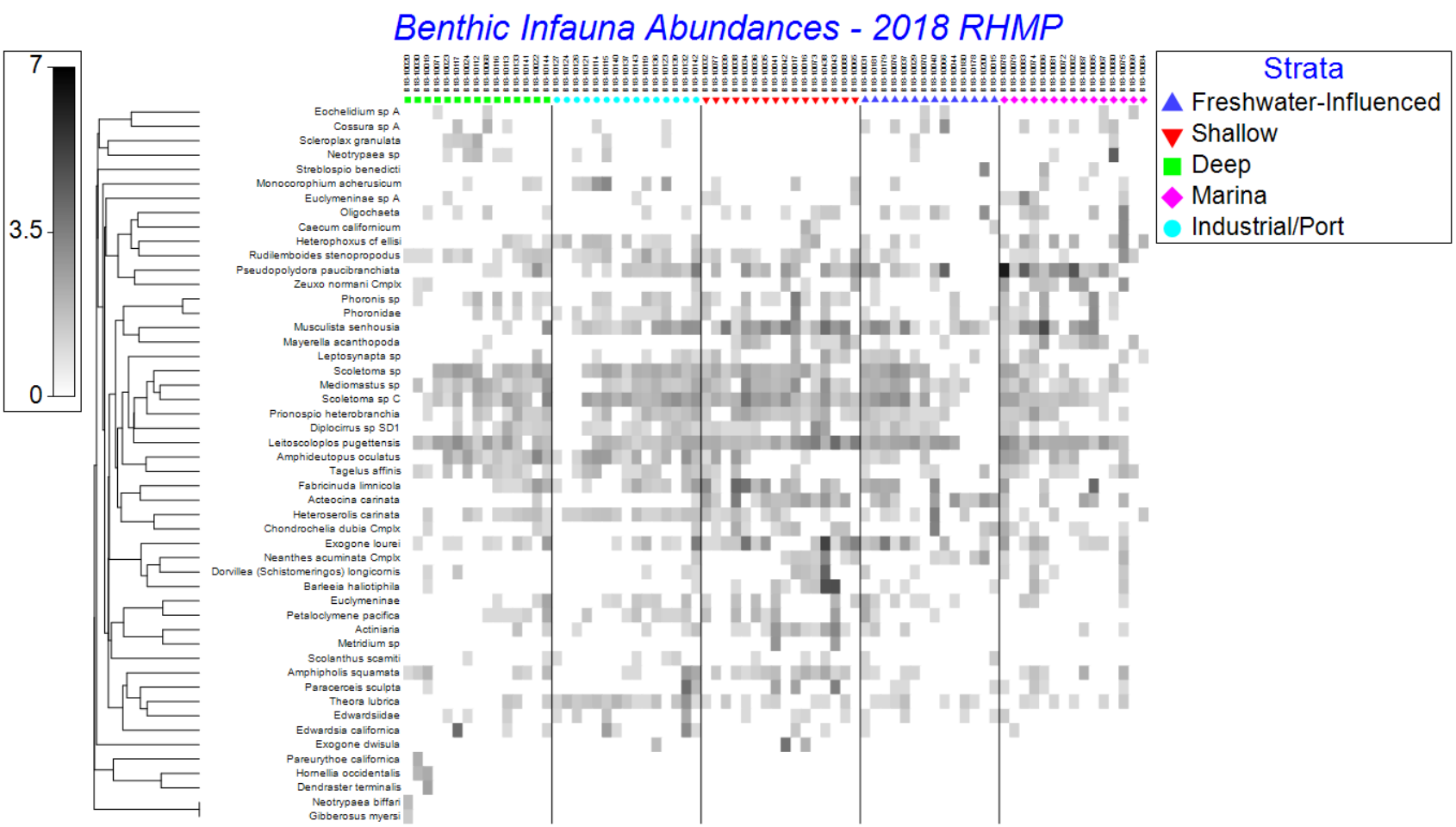
- High Disturbance
- Low Disturbance
- Moderate Disturbance
- Reference

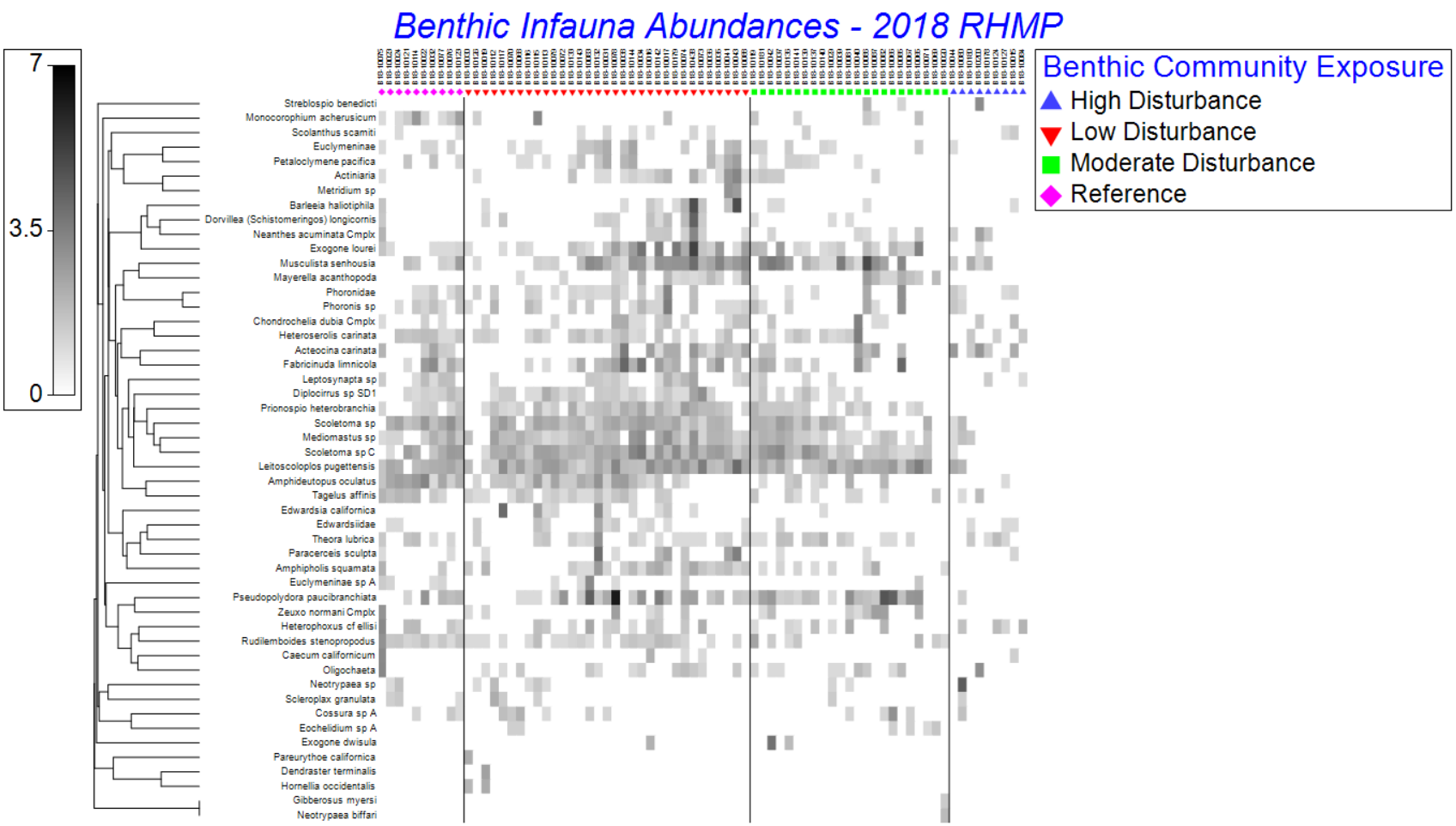
Benthic Infauna Abundances - 2018 RHMP

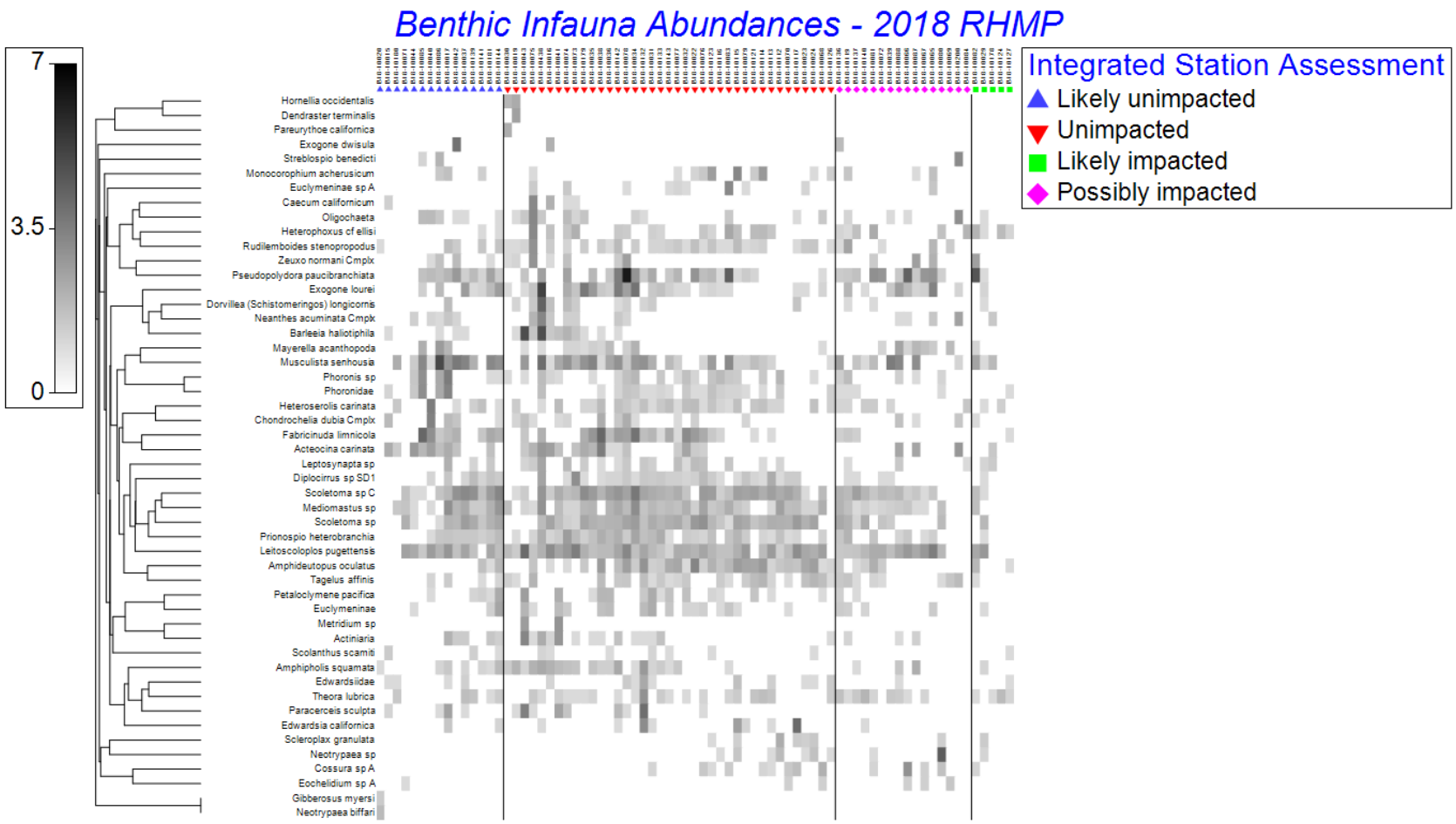
Non-metric MDS




Benthic Infauna Abundances - 2018 RHMP
7
3.5
0
Exogone dwisula
Scleroplax granulata
Neotrypaea sp
Eochelidium sp A
Cossura sp A
Streblospio benedicti
Monocorophium acherusicum
Euclymeninae sp A
Oligochaeta
Caecum californicum
Heterophoxus cf ellisi
Rudilemboides stenopropodus
Pseudopolydora paucibranchiata
Zeuxo normani Cmplx
Phoronis sp
Phoronidae
Mayerella acanthopoda
Musculista senhousia
Amphideutopus oculatus
Tagelus affinis
Leptosynapta sp
Scoletoma sp
Scoletoma sp C
Mediomastus sp
Prionospio heterobranchia
Diplocirrus sp SD1
Leitoscoloplos pugettensis
Chondrochelia dubia Cmplx
Heteroserolis carinata
Fabricinuda limnicola
Acteocina carinata
Exogone lourei
Dorvillea (Schistomeringos) longicornis
Neanthes acuminata Cmplx
Barleeia haliotiphila
Petaloclymene pacifica
Euclymeninae
Metridium sp
Actiniaria
Scolanthus scamiti
Amphipholis squamata
Theora lubrica
Edwardsiidae
Paracerceis sculpta
Edwardsia californica
Pareurythoe californica
Hornellia occidentalis
Dendraster terminalis
Neotrypaea biffari
Gibberosus myersi
Region
Mission Bay
North San Diego Bay
Central San Diego Bay
South San Diego Bay
Dana Point Harbor
Oceanside Harbor


Benthic Infauna Abundances - 2018 RHMP
7
3.5
0
Strata
Freshwater-Influenced
Shallow
Deep
Marina
Industrial/Port
Eochelidium sp A
Cossura sp A
Scleroplax granulata
Neotrypaea sp
Streblospio benedicti
Monocorophium acherusicum
Euclymeninae sp A
Oligochaeta
Caecum californicum
Heterophoxus cf ellisi
Rudilemboides stenopropodus
Pseudopolydora paucibranchiata
Zeuxo normani Cmplx
Phoronis sp
Phoronidae
Musculista senhousia
Mayerella acanthopoda
Leptosynapta sp
Scoletoma sp
Mediomastus sp
Scoletoma sp C
Prionospio heterobranchia
Diplocirrus sp SD1
Leitoscoloplos pugettensis
Amphideutopus oculatus
Tagelus affinis
Fabricinuda limnicola
Acteocina carinata
Heteroserolis carinata
Chondrochelia dubia Cmplx
Exogone lourei
Neanthes acuminata Cmplx
Dorvillea (Schistomeringos) longicornis
Barleeia haliotiphila
Euclymeninae
Petaloclymene pacifica
Actiniaria
Metridium sp
Scolanthus scamiti
Amphipholis squamata
Parasterope sculpta
Theora lubrica
Edwardsiidae
Edwardsia californica
Exogone dwisula
Pareurythoe californica
Hornellia occidentalis
Dendraster terminalis
Neotrypaea biffari
Gibberosus myersi


Benthic Infauna Abundances - 2018 RHMP
7
3.5
0
Streblospio benedicti
Monocorophium acherusicum
Scolanthus scamiti
Euclymeninae
Petaloclymene pacifica
Actiniaria
Metridium sp
Barleeia haliotiphila
Dorvillea (Schistomeringos) longicornis
Neanthes acuminata Cmplx
Exogone lourei
Musculista senhousia
Mayerella acanthopoda
Phoronidae
Phoronis sp
Chondrochelia dubia Cmplx
Heteroserolis carinata
Acteocina carinata
Fabricinuda limnicola
Leptosynapta sp
Diplocirrus sp SD1
Prionospio heterobranchia
Scoletoma sp
Mediomastus sp
Scoletoma sp C
Leitoscoloplos pugettensis
Amphideutopus oculatus
Tagelus affinis
Edwardsia californica
Edwardsiidae
Theora lubrica
Paracerceis sculpta
Amphipholis squamata
Euclymeninae sp A
Pseudopolydora paucibranchiata
Zeuxo normani Cmplx
Heterophoxus cf ellisi
Rudilemboides stenopropodus
Caecum californicum
Oligochaeta
Neotrypaea sp
Scleroplax granulata
Cossura sp A
Eochelidium sp A
Exogone dwisula
Pareurythoe californica
Dendraster terminalis
Hornellia occidentalis
Gibberosus myersi
Neotrypaea biffari
Benthic Community Exposure
High Disturbance
Low Disturbance
Moderate Disturbance
Reference


Benthic Infauna Abundances - 2018 RHMP
7
3.5
0
Integrated Station Assessment
Likely unimpacted
Unimpacted
Likely impacted
Possibly impacted
Hornellia occidentalis
Dendraster terminalis
Pareurythoe californica
Exogone dwisula
Streblospio benedicti
Monocorophium acherusicum
Euclymeninae sp A
Caecum californicum
Oligochaeta
Heterophoxus cf ellisi
Rudilemboides stenopropodus
Zeuxo normani Cmplx
Pseudopolydora paucibranchiata
Exogone lourei
Dorvillea (Schistomeringos) longicornis
Neanthes acuminata Cmplx
Barleeia haliotiphila
Mayerella acanthopoda
Musculista senhousia
Phoronis sp
Phoronidae
Heteroserolis carinata
Chondrochelia dubia Cmplx
Fabricinuda limnicola
Acteocina carinata
Leptosynapta sp
Diplocirrus sp SD1
Scoletoma sp C
Mediomastus sp
Scoletoma sp
Prionospio heterobranchia
Leitoscoloplos pugettensis
Amphideutopus oculatus
Tagelus affinis
Petaloclymene pacifica
Euclymeninae
Metridium sp
Actiniaria
Scolanthus scamiti
Amphipholis squamata
Edwardsiidae
Theora lubrica
Paracerceis sculpta
Edwardsia californica
Scleroplax granulata
Neotrypaea sp
Cossura sp A
Eochelidium sp A
Gibberosus myersi
Neotrypaea biffari

Analysis of Similarities One-Way – Benthic Infauna by Region

Factors

Place	Name	Type	Levels
A	Region	Unordered	6

Region levels
Mission Bay
North San Diego Bay
Central San Diego Bay
South San Diego Bay
Dana Point Harbor
Oceanside Harbor

Tests for differences between unordered Region groups
Global Test
Sample statistic (R): 0.384
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Mission Bay, North San Diego Bay	0.527	0.1	10015005	999	0
Mission Bay, Central San Diego Bay	0.514	0.1	20160075	999	0
Mission Bay, South San Diego Bay	0.322	0.1	2042975	999	0
Mission Bay, Dana Point Harbor	0.323	5	715	715	36
Mission Bay, Oceanside Harbor	0.431	2	715	715	14
North San Diego Bay, Central San Diego Bay	0.192	0.1	Very large	999	0
North San Diego Bay, South San Diego Bay	0.491	0.1	Very large	999	0
North San Diego Bay, Dana Point Harbor	0.413	2.9	10626	999	28
North San Diego Bay, Oceanside Harbor	0.318	7.7	10626	999	76
Central San Diego Bay, South San Diego Bay	0.268	0.1	Very large	999	0
Central San Diego Bay, Dana Point Harbor	0.535	0.5	14950	999	4
Central San Diego Bay, Oceanside Harbor	0.545	0.8	14950	999	7
South San Diego Bay, Dana Point Harbor	0.546	0.2	4845	999	1
South San Diego Bay, Oceanside Harbor	0.778	0.1	4845	999	0
Dana Point Harbor, Oceanside Harbor	0.354	11.4	35	35	4

Analysis of Similarities One-Way – Benthic Infauna by Strata

Factors

Place	Name	Type	Levels
A	Strata	Unordered	5

Strata levels
Freshwater-Influenced
Shallow
Deep
Marina
Industrial/Port

Tests for differences between unordered Strata groups
Global Test
Sample statistic (R): 0.217
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Freshwater-Influenced, Shallow	0.16	0.2	145422675	999	1
Freshwater-Influenced, Deep	0.187	0.1	77558760	999	0
Freshwater-Influenced, Marina	0.111	1	77558760	999	9
Freshwater-Influenced, Industrial/Port	0.218	0.1	77558760	999	0
Shallow, Deep	0.382	0.1	300540195	999	0
Shallow, Marina	0.228	0.3	300540195	999	2
Shallow, Industrial/Port	0.324	0.1	300540195	999	0
Deep, Marina	0.227	0.1	77558760	999	0
Deep, Industrial/Port	0.177	0.2	77558760	999	1
Marina, Industrial/Port	0.228	0.1	77558760	999	0

Analysis of Similarities One-Way – Benthic Infauna by Benthic Community SQO Category

Factors

Place	Name	Type	Levels
A	Benthic Community Exposure	Unordered	4

Benthic Community Exposure levels
High Disturbance
Low Disturbance
Moderate Disturbance
Reference

Tests for differences between unordered Benthic Community Exposure groups
Global Test
Sample statistic (R): 0.276
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
High Disturbance, Low Disturbance	0.772	0.1	445891810	999	0
High Disturbance, Moderate Disturbance	0.552	0.1	28048800	999	0
High Disturbance, Reference	0.516	0.1	92378	999	0
Low Disturbance, Moderate Disturbance	0.119	0.9	Very large	999	8
Low Disturbance, Reference	0.016	40.1	Very large	999	400
Moderate Disturbance, Reference	0.129	8.2	92561040	999	81

Analysis of Similarities One-Way – Benthic Infauna by Integrated SQO Category

Factors

Place	Name	Type	Levels
A	Integrated Station Assessment	Unordered	4

Integrated Station Assessment levels
Likely unimpacted
Unimpacted
Likely impacted
Possibly impacted

Tests for differences between unordered Integrated Station Assessment groups
Global Test
Sample statistic (R): 0.284
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

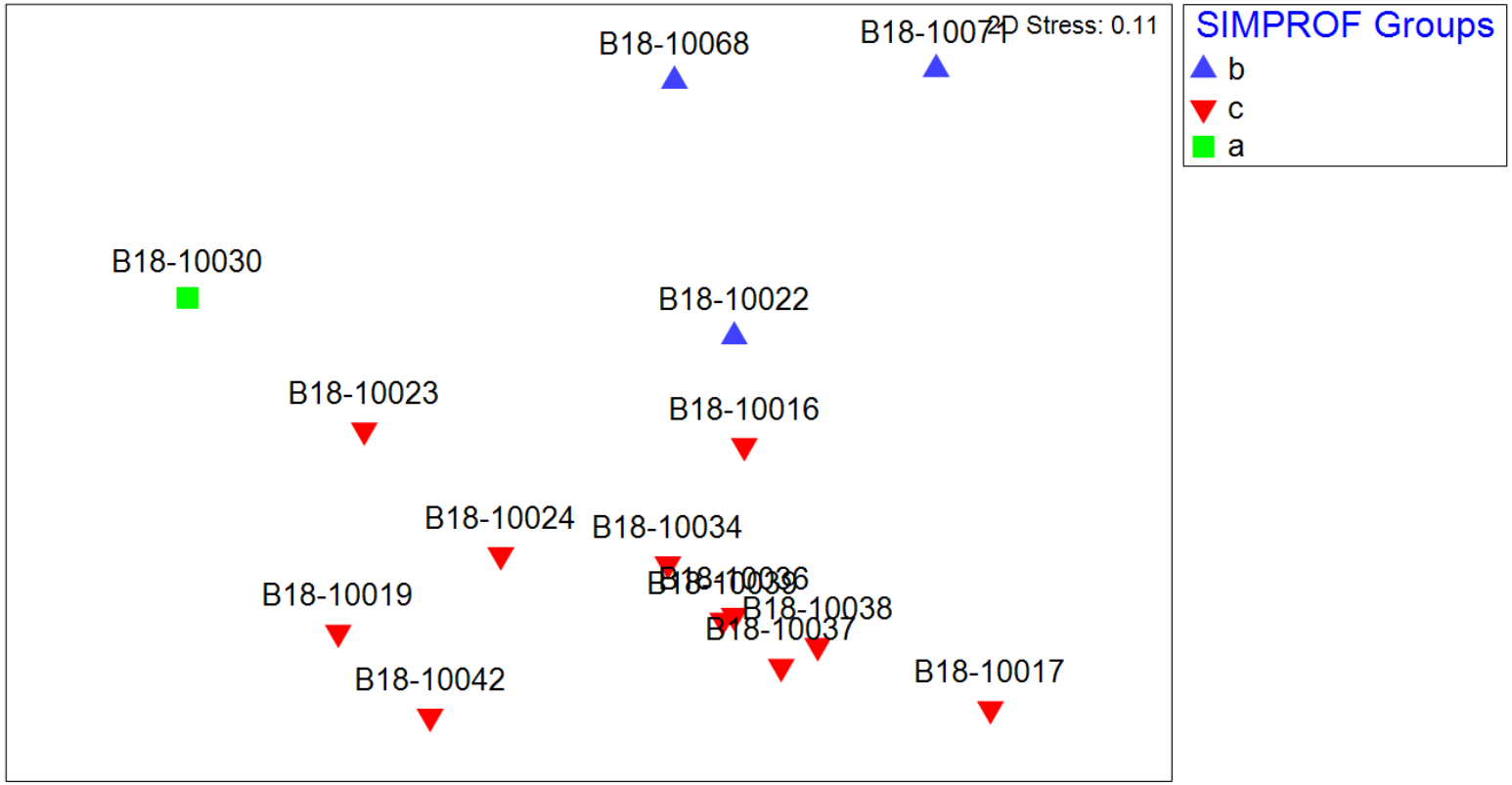
Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Likely unimpacted, Unimpacted	0.229	0.3	Very large	999	2
Likely unimpacted, Likely impacted	0.293	4.3	15504	999	42
Likely unimpacted, Possibly impacted	0.069	3.9	300540195	999	38
Unimpacted, Likely impacted	0.597	0.3	1086008	999	2
Unimpacted, Possibly impacted	0.276	0.1	Very large	999	0
Likely impacted, Possibly impacted	0.206	10.6	20349	999	105

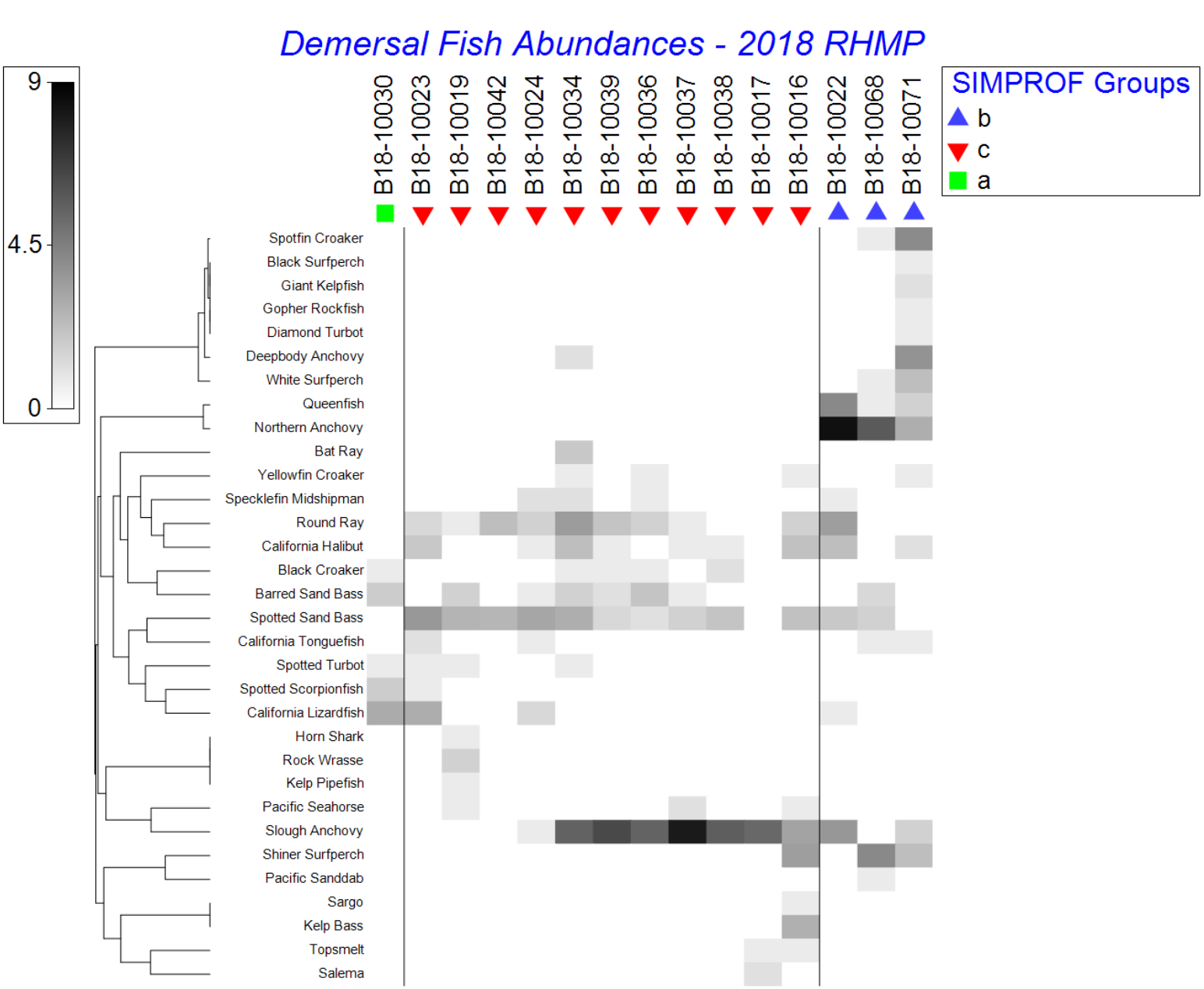
Multivariate Analyses – Trawl Fish Abundance

Demersal Fish Abundances - 2018 RHMP

Non-metric MDS

Transform: Log(X+1)
Resemblance: S17 Bray-Curtis similarity




Demersal Fish Abundances - 2018 RHMP
9
4.5
0
B18-10030
B18-10023
B18-10019
B18-10042
B18-10024
B18-10034
B18-10039
B18-10036
B18-10037
B18-10038
B18-10017
B18-10016
B18-10022
B18-10068
B18-10071
SIMPROF Groups
b
c
a
Spotfin Croaker
Black Surfperch
Giant Kelpfish
Gopher Rockfish
Diamond Turbot
Deepbody Anchovy
White Surfperch
Queenfish
Northern Anchovy
Bat Ray
Yellowfin Croaker
Specklefin Midshipman
Round Ray
California Halibut
Black Croaker
Barred Sand Bass
Spotted Sand Bass
California Tonguefish
Spotted Turbot
Spotted Scorpionfish
California Lizardfish
Horn Shark
Rock Wrasse
Kelp Pipefish
Pacific Seahorse
Slough Anchovy
Shiner Surfperch
Pacific Sanddab
Sargo
Kelp Bass
Topsmelt
Salema

Analysis of Similarities One-Way – Fish Abundance by Region

Factors

Place	Name	Type	Levels
A	Harbor	Unordered	6

Harbor levels
Dana Point Harbor
Oceanside Harbor
Mission Bay
SD Bay North
SD Bay Central
SD Bay South

Tests for differences between unordered Harbor groups
Global Test
Sample statistic (R): 0.242
Significance level of sample statistic: 5.4%
Number of permutations: 999 (Random sample from 47297250)
Number of permuted statistics greater than or equal to R: 53

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Dana Point Harbor, Mission Bay	0.222	75	4	4	3
Dana Point Harbor, SD Bay North	0.417	40	5	5	2
Dana Point Harbor, SD Bay Central	1	33.3	3	3	1
Dana Point Harbor, SD Bay South	1	20	5	5	1
Oceanside Harbor, Mission Bay	0.222	50	4	4	2
Oceanside Harbor, SD Bay North	0.667	20	5	5	1
Oceanside Harbor, SD Bay Central	1	33.3	3	3	1
Oceanside Harbor, SD Bay South	1	20	5	5	1
Mission Bay, SD Bay North	0.139	28.6	35	35	10
Mission Bay, SD Bay Central	-0.5	100	10	10	10
Mission Bay, SD Bay South	-0.065	57.1	35	35	20
SD Bay North, SD Bay Central	0.036	53.3	15	15	8
SD Bay North, SD Bay South	0.313	11.4	35	35	4
SD Bay Central, SD Bay South	0.071	46.7	15	15	7

Analysis of Similarities One-Way – Fish Abundance by Strata

Factors

Place	Name	Type	Levels
A	Bight '18 Stratum	Unordered	2

Bight '18 Stratum levels
Marinas
Bays

Tests for differences between unordered Bight '18 Stratum groups
Global Test
Sample statistic (R): 0.676
Significance level of sample statistic: 1.9%
Number of permutations: 105 (All possible permutations)
Number of permuted statistics greater than or equal to R: 2

Outputs
Plot: Graph12

Analysis of Similarities One-Way – Fish Abundance by Similarity Profile (SIMPROF) Group

Factors

Place	Name	Type	Levels
A	SIMPROF Groups	Unordered	3

SIMPROF Groups levels
b
c
a

Tests for differences between unordered SIMPROF Groups groups
Global Test
Sample statistic (R): 0.699
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from 5460)
Number of permuted statistics greater than or equal to R: 0

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
b, c	0.657	0.5	364	364	2
b, a	1	25	4	4	1
c, a	0.767	8.3	12	12	1