YOUNGS BAY BENTHIC INVERTEBRATE STUDY

2019

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INTRODUCTION

This report is under the National Pollutant Discharge Elimination System (NPDES) permit (#101767) for the Clatsop County Fisheries salmon net-pen sites in Youngs Bay (Figure 1).

This report will include benthic invertebrate, total dissolved solids, core sampling data and analysis, *Beggiatoa* spp (mold) presence/absence, water temperature and pH readings taken from the Tide Point/Bornstein and Yacht Club net-pen sites in Youngs Bay. Clatsop County Fisheries (CCF) personnel were responsible for taking the benthic, water and core samples. This year, they were also responsible for the benthic invertebrate sorting and identification, water temperature, pH and the presence/absence of a mold *Beggiatoa* spp. Analytical Services (ALS) Environmental, in Kelso, Washington completed grain size distribution and total organic carbon testing of the sediment. Alexin Analytical Laboratories, Inc., in Tigard, OR, completed the total dissolved solids testing. All samples were taken in June/July of 2019. Under the new permit, the next sampling period will be in 2021, as long as the fish production level remains the same.

METHODS

A homemade sampler was used in collecting the benthic data. The sampler was attached to a rope that was lowered into the water until it hit bottom. The rope was then pulled up and down several times along with the upper lead weights to help drive the sampler into the sediment. The sampler was then pulled out of the water. The 3-inch diameter aluminum tube was then loosened and a ring near the top of the sampler, which is attached to a small chain and rubber ball, was pulled to release the water pressure that was helping hold the sediment sample in the sampler. The sampler was pulled away from the aluminum tube while the tube was being held down firmly in a plastic tub. The bottom of the tube was then quickly lifted up while putting a hand under the bottom of the sediment to the top of the tube. The sediment core was then pushed five centimeters beyond the top of the tube. The sediment core was then cut by a plastic scraper into the plastic tub along with the water from above the sediment core.

Each benthic replicate was deposited into a labeled small plastic bucket until all replicates were collected from each site. Each replicate was then rinsed through a 0.5-millimeter mesh screen with a small submersible water pump. The remaining debris and invertebrates were then rinsed into a labeled small plastic container. A buffered formalin solution was added to each replicate container. After one week, each replicate was rinsed and preserved in a Kahle's solution (protein stain) and ethanol until analyzed. The benthic invertebrates from each replicate were sorted and identified to the lowest possible taxonomic classification; usually species.

The sediment samples were taken with a 1 1/2-inch diameter aluminum core sampler approximately 5-cm deep for grain size distribution and total organic carbon content.

This sampler was lowered into the water until it hit bottom. The sampler was then brought straight up and out of the water. The sediment was pushed out from the bottom by a plunger that fit firmly inside the aluminum tube. The sediment was cut into a small, labeled plastic container. Each container was placed in a cooler with frozen gel packs to keep cool until analyzed.

The Tide Point/Bornstein site consisted of two impact stations (one at each net-pen area), two perimeter stations, and three reference stations (Figure 2). Perimeter station 18 was moved 2011 to the upstream side of the Bornstein's site due to the difficulty to get one sample grab due to the hardness of the bottom. The 16 net pens at the Tide Pt. site will be used again for the first time since 2008 to rear overwinter spring chinook smolts beginning the fall of 2019 to be released in the spring of 2020. This site was added back into the benthic sampling process. There were three benthic and two sediment grabs taken at each outfall, perimeter and reference station.

The Yacht Club site consisted of one outfall station, one perimeter station and three reference stations (Figure 3). Perimeter station SUBC 005 was difficult to sample due the depth and speed of the current; therefore was not sampled. There were three benthic and two sediment grabs taken at each outfall, perimeter and reference station.

A sedimentation log was established at the three Youngs Bay sites (Tables 1-3). One grab was taken under each net pen with a 1 1/2-inch core sampler. Each tube of sediment was analyzed for presence of sulfur odor, black surface layer and benthic invertebrates. Each grab was deposited back into the water after the observations were completed.

A log that includes water temperature, pH and the presence/absence of the *Beggiatoa* spp. was established for the requirement of our new permit. The water temperature was determined by the use of a daily thermograph reading with the probe hanging 4 feet down in the water column at the Yacht Club site. The pH was measured using an Oakton ecoTestr pH meter stick. The presence/absence of the mold *Beggiatoa* spp. was determined by lowering an underwater HD camera probe with an above the water viewing screen, Marcum Quest HD, to the bottom of each station.

RESULTS

Tables 1-3 show the results of the Bornstein, Tide Pt. and Yacht Club sedimentation observations under each net pen. No hydrogen sulfide odor or black surface layer was present. All samples revealed living organisms present.

Table 4 shows the New Zealand mudsnail, *Potamopyrgus antipodarum*, was the most dominant species in four out of the five stations at the Yacht Club site. The largest concentration of a species occurred at outfall station 001 with the *Potamopyrgus antipodarum* at 43,970 per square meter. The grain size distribution varied at the Yacht Club stations with the highest percent sand of 93.9 at the reference station 001 and the lowest also at reference station 003 with 19.4 percent. The highest percent silt/clay was

found at reference station 003 at 68.9, while the lowest occurred at the reference station 001 with 4.3 percent. The total organic carbon (TOC) was the lowest at reference station 001 at 2.0 mg/L, while the highest occurred at the reference station 003 at 25.4 mg/L.

Table 5 shows the amphipod Americorophium salmonis and the New Zealand mudsnail *Potamopyrgus antipodarum* as sharing the most dominant benthic invertebrate species role in 3 stations each. The highest concentration of a species occurred at the perimeter station 010 with the New Zealand mudsnail *Potamopyrgus antipodarum* at 37,534 per square meter. The grain size distribution varied at each station. The highest percent gravel of 43.4 was at perimeter station 010, while the lowest of 0 was at reference stations 007, 008 and perimeter station 009. The highest percent sand of 59.7 was at reference station 007, and the lowest percent sand of 13.2 was at reference station 008. The highest percent silt/clay of 83.5 was at reference station 008, while the lowest percent silt/clay of 29.6 was at reference station 007. The total organic carbon (TOC) was the highest at perimeter station 010 at 120.9 mg/L, while the lowest was at reference station 007 at 7.3 mg/L.

Table 6 shows the average densities of the five most dominant species per outfall, perimeter and reference stations in the Young's Bay system for 2019. The New Zealand mudsnail *Potamopyrgus antipodarum* had the highest average density of 29,954 per square meter for the outfall stations and the perimeter stations at 34,025 per square meter. The amphipod *Americorophium salmonis* had the highest average density of 12,361 per square meter for the reference stations. The 2019 highest overall average density for the Young's Bay system was the New Zealand mudsnail *P. antipodarum* with 25,356 per square meter.

Table 7 shows the total organic carbon (mg/L) for each station since sampling period 2005. Most stations averaged 20 mg/L or less except outfall station 002 and perimeter station 010.

Tables 8 and 9 show species diversity trends at the three net-pen sites. The outfall station at the Yacht Club site averaged 10 species; the three reference stations averaged 5.6 species, while the perimeter station averaged 6 species. The outfall stations at the Bornstein and Tide Pt. sites averaged 9 and 6 species, respectively, while the reference stations averaged 6.2 species and perimeter stations averaged 6.5 species.

Table 10 shows the average densities of the five most common benthic invertebrate species over the last 8 sampling periods in Young's Bay. The top two benthic invertebrate species over the last 8 sampling periods have been the New Zealand mudsnail *P. antipodarum* and the amphipod *A. salmonis*.

Tables 11 and 12 show the average densities the most dominant benthic invertebrates per outfall, perimeter, and reference stations at both the Yacht Club and Tide Pt./Bornstein's net-pen sites over the past 6 sampling periods.

Table 13 shows the total dissolved solids measurements of the upstream and downstream side of each net pen site in Young's Bay.

Table 14 shows the presence/absence results of the mold *Beggiatoa* spp., water temperature and pH readings of the Young's Bay benthic stations. There was no presence of the mold growing under the net pens where the salmon are reared.

The Yacht Club site overall shows significant differences in dominant species percent of sample between the net pen site (Outfall 001) and reference stations away from the net pens (Table 15). There were also significant differences in species isolation comparisons of the New Zealand mud snail *Potamopyrgus antipodarum* and Oligochaeta between the outfall station 001 and reference stations, with more of these species at the outfall station. The Wilcoxin test also showed significant differences in the aquatic Oligochaeta (aquatic earthworms) between the perimeter station SUBC 004 and reference stations with more invertebrates at the perimeter station SUBC 004 than reference stations (Table 16).

The statistical analysis using the Wilcoxin test shows the Bornstein site in this year's samples (2019) shows significant differences in dominant species percent of sample between perimeter station SUBC 009 and the reference stations (Table 18). The Wilcoxin test also showed that there were no significant differences in species abundance, diversity and species isolation in comparison between perimeter station SUBC 009 and the reference stations and perimeter station SUBC 009 and the reference station. There were significant differences in dominant species percent of sample between the reference stations and perimeter station SUBC 010. There were also significant differences in the isolated species New Zealand mudsnail *Potamopyrgus antipodarum and* amphipod *Eogammarus confervicolis* between reference stations and perimeter station SUBC 010. There were significantly more of these species at the perimeter station SUBC 010 than at the reference stations (Table 19).

The Tide Pt. site overall shows no significant differences in species diversity, abundance and isolated species between the net pen station Outfall 002 and the reference stations.

DISCUSSION

Over the last 8 sampling periods (14 years), the average percent total organic carbon has been below 20 mg/L in 9 of the 11 stations. Total organic carbon is the amount of carbon found in an organic compound and is often used as a non-specific indicator of water quality. Low TOC can confirm the absence of potentially harmful organic chemicals in the water. It seems that the overall low TOC in Young's Bay over the last 14 years indicates good water quality.

Since the net pen areas are located in a tidal zone the total dissolved solids measurements reveal that there is some salt water present. Typically, brackish water ranges between 1000 to 10,000 milligrams per liter. Our readings were between 1100 and 1300 mg/L. It would naturally increase with the incoming tide from the ocean and decrease as the salt water moves out and the more freshwater from the upstream streams take over.

The absence of the mold *Beggiatoa spp.* in and around the Young's Bay net pens is a good indication that the salmon rearing is not affecting the benthic environment below. These sites have been in operation for over 20 years. The tidal movement is very strong in this area, at times, and has a good effect on keeping the extra nutrient waste from the fish being reared swept away from under the net pens.

The overall differences in species abundance and diversity in Young's Bay can be attributed to many factors. The location of each site, tidal flows, daily movements of certain benthic invertebrates, lunar phases, amount of natural debris and sediment within the water column, the extra nutrient load of fish waste (both natural and net pen) and exotic species all influence species abundance and diversity within the Young's Bay system.

This year's (2019) sampling results showed the New Zealand mudsnail *Potamopyrgus antipodarum* being the overall dominant benthic invertebrate in the Young's Bay system. The mudsnail was dominant at seven out of the twelve total stations. The amphipod *Americorophium salmonis* was dominant at four stations and the aquatic earthworms Oligochaeta was dominant at one station.

Since the sampling period in 2005, the New Zealand mud snail *P. antipodarum* and the amphipod *A. salmonis* have both shared the role as being the most dominant benthic invertebrate species in the Young's Bay system. Five out of the last eight sampling periods have shown small differences in the overall densities per station with the exception of 2011, 2013 and 2015 sampling periods (Table 10). These 2 species of invertebrates are both bottom dwellers and it would seem logical that the 2 species would be competing for space on the bottom of the bay. The numbers between the 2 species are going to fluctuate naturally annually.

The amphipod *A. salmonis* is an important food source for young salmon, both wild and hatchery, that are rearing in the estuary and as long as it remains as one of the dominant species in Young's Bay, the overall condition of the bay seems to remain natural even with the existence of the exotic species, New Zealand mud snail.

The New Zealand mud snail is adaptable to a wide variety of environmental conditions. They have been known to be eaten by fish and survive to reproduce after going through the fish's digestive system. These characteristics alone are reasons why this invertebrate species have been prolific in the Young's Bay system. Clatsop County Fisheries staff continues to notice the mud snails attached to the net-pen poles and nets hanging in the water. The overall high densities of this species have seen a decline in the past eight years. Possible reasons could be the dispersal of the snails throughout the Young's Bay system. Evidence of this dispersal comes from the staff with this species of snails observed on net-pen poles and nets temporarily installed for salmon broodstock holding from mid-August to mid-November approximately five miles upstream from the Tide Point/Bornstein site. Dispersal to Young's Bay tributaries (Lewis & Clark, Walluski and upper Young's River) of the New Zealand mud snail has not yet been confirmed but is suspected. This dispersal, along with possible temporary consumption by other species of fish such as sturgeon, peamouth chubs, suckers and carp (all primarily bottom feeders), could have an affect on the overall densities of this exotic species within the net-pen areas. The snails could be consumed in one area and deposited as excrement in another area by any or all of these species of fish.

Overall, the impact of the salmon net pens in Young's Bay seem to stay within the allowable mixing zone of 50 feet surrounding each array of net pens. Species diversity and abundance seems to be slightly greater at the outfall sites at the Yacht Club site while the last four out of five sampling periods (a period of 8 years) the species diversity and abundance were nearly the same between the outfall and reference stations at the Tide Point/Bornstein's sites. Nutrients from fish food and waste, along with a diversity of structures under and around the net pens, are possible reasons for this occurrence at all of the Young's Bay net pens.

The next sampling will occur in the year 2021, unless fish production increases. If this occurs then the samplings will continue annually.



Figure 1. Youngs Bay Net-Pen Sites

YOUNGS BAY - TIDE POINT AND BORNSTEIN SITES



X SUBC 007

Figure 2. Tide Point/Bornstein Site Stations.

YOUNGS BAY - YACHT CLUB SITE





		Black	Living	Depth of	
Bon #	LI S adar	Surface	Organisms	Oxidized	Commonto
Fen #		Layer	Fleseni	Layer	Comments
1	No	No	Yes	~2-3 cm.	Lt. brown top, black near bottom, clam shells, wood chips
2	No	Νο	Yes	~2 – 3 cm.	Soft It. Brown top, black/brown near bottom, gravel, wood chunks
3	No	No	Yes	~2-3 cm.	Lt. brown top, black bottom w/ clam shells, glass pieces
4	No	No	Yes	~2-3 cm.	Lt. brown top, black bottom, clam shells, wood pieces
5	No	No	Yes	~1 – 2 cm.	Lt. brown top, black bottom, plant fibers
6	No	Νο	Yes	~2-3 cm.	Lt. brown top, black bottom
7	No	Νο	Yes	~2-3 cm.	Lt. brown top, black bottom, woody debris
8	No	Νο	Yes	~2 cm.	Lt. brown top, black bottom, mud stone throughout
9	No	No	Yes	~2 cm.	Lt. brown top, black bottom, clam shells
10	No	No	Yes	~2-3 cm.	Lt. brown top, black bottom, sandy mud, clam shells
11	No	No	Yes	~2-3 cm.	Lt. brown top, black bottom, woody debris, clam shells
12	No	No	Yes	~2-3 cm.	Lt. brown top, black bottom
13	No	No	Yes	~2-3 cm.	Lt. brown top, black bottom, wood chunks, clam shells
14	No	No	Yes	~3 cm.	Lt. brown top layer, black bottom
15	No	No	Yes	~2 – 3 cm.	Soft It. brown top, black bottom, wood debris, clam shells
16	No	No	Yes	~2-3 cm.	Soft It. brown top, black bottom, plant & woody debris

Signature: Rod Litton

Date: 7/25/19



Black Living Depth of Surface Organisms Oxidized Pen # Present H₂S odor Layer Laver Comments Lt brown soft top with gravel, wood, gray clay 1 No No Yes 1.5cm Lt brown soft top with wood chunks, clam shell 1.0cm 2 No No Yes Lt brown soft top with gravel, gray clay 3 No No Yes 1.0cm Lt brown soft top with sand stone, gray clay 4 No No Yes 1.5cm Lt brown soft top with gray clay, wood chunks 5 No No Yes 2.0cm Lt brown soft top with gray clay, wood chunks 6 No No Yes 2.5cm Lt brown soft top with gray sandy clay 7 No No Yes 3.0cm Lt brown soft top with gray clay, wood chunks 8 No No Yes 1.5cm Lt brown soft top with gray clay, wood chunks, gravel 9 Yes No No 1.0cm Lt brown soft top with gray clay, gravel, wood chunks 10 1.0cm No No Yes Lt brown soft top with gravel, wood, gray clay Yes 11 No No 1.5cm Lt brown soft top with gravel, wood, gray clay 12 No No Yes 1.5cm Lt brown soft top with gravel, gray clay 13 No No Yes 1.5cm Lt brown soft top with gravel, sand, gray clay 14 No No Yes 1.0cm Lt brown soft top with detritus, gray clay 15 No No 3.0cm Yes Lt brown soft top with dark sandy gray clay 16 No No Yes 1.0cm

Signature: Rod Litton

Date: July 3, 2019



Table 4.	2019	Yacht	Club	Percent	Grain	Size	Distribution	and	Total	Organic	Carbon.

				TOC		Density
STATION	%Gravel	%Sand	%Silt/Clay	mg/L	Most Dominant Species	#/sq.meter
Outfall 001	1.0	35.3	51.1	18.30	Potamopyrgus antipodarum	43,970
SUBC 001	0.0	93.9	4.3	2.00	Potamopyrgus antipodarum	11,007
SUBC 002	0.0	39.6	57.4	12.00	Americorophium salmonis	7,759
SUBC 003	0.0	19.4	77.3	25.40	Potamopyrgus antipodarum	22,195
SUBC 004	0.0	45.1	50.3	11.90	Potamopyrgus antipodarum	42,827
SUBC 005	N/A	N/A	N/A	N/A	N/A	N/A

Table 5. 2019 Tide Point/Bornsteins Percent Grain Size Distribution and Total Organic Carbon.

				TOC		Density
STATION	%Gravel	%Sand	%Silt/Clay	mg/L	Most Dominant Species	#/sq.meter
Outfall 002	6.2	29.0	61.8	18.90	Americorophium salmonis	37,293
SUBC 008	0.0	13.2	83.5	15.30	Potamopyrgus antipodarum	12,692
SUBC 009	0.0	25.9	71.3	19.60	Potamopyrgus antipodarum	21,714
Outfall 003	14.4	28.6	57.8	56.80	Americorophium salmonis	37,293
SUBC 006	12.6	16.6	68.5	15.70	Americorophium salmonis	35,970
SUBC 007	0.0	59.7	29.6	7.30	Oligochaeta	5,053
SUBC 010	43.37	37.66	27.72	120.90	Potamopyrgus antipodarum	37,534

Table 6. 2019 Average densities of Youngs Bay dominant species.

SPECIES	OUTFALL	REFERENCE	PERIMETER	OVERALL
Potamgyrus antipodarum	29,954	12,090	34,025	25,356
Americorophium salmonis	27,187	12,361	19,448	19,665
Oligochaeta	3,047	1,974	2,045	2,355
Eogammarus confervicolis	2,065	491	1,804	1,453
Nereis limnicola	1,143	1,152	1,143	1,146

Table 7. 2005-2019 Youngs Bay Total Organic Carbon Measurements (mg/L).

STATION	2005	2007	2009	2011	2013	2015	2017	2019	AVERAGE
Outfall 001	11.00	23.70	20.40	24.00	17.50	18.20	23.00	18.30	19.51
SUBC 001	11.50	13.70	10.60	14.60	18.20	10.00	9.70	2.00	11.29
SUBC 002	9.10	12.10	16.60	12.90	14.00	9.00	13.90	12.00	12.45
SUBC 003	16.90	12.10	12.80	14.70	14.80	12.30	12.00	25.40	15.13
SUBC 004	13.70	12.60	13.60	13.10	22.70	14.70	14.80	11.90	14.64
Outfall 002	24.70	20.20	21.60	67.50	N/A	N/A	N/A	18.90	30.58
SUBC 006	18.60	18.10	19.10	17.90	22.40	18.20	17.90	15.70	18.49
SUBC 007	14.80	8.30	10.70	7.40	10.30	8.70	9.20	7.30	9.59
SUBC 008	11.40	16.30	19.00	17.80	27.60	14.60	15.60	15.30	17.20
SUBC 009	18.20	16.20	14.90	16.60	16.40	15.40	17.10	19.60	16.80
SUBC 010	12.90	10.10	9.30	53.10	18.60	21.30	53.20	120.90	37.43
Outfall 003	31.1	19.5	44.5	44.90	21.3	27.70	14.50	56.80	32.54

	Outfall 001	SUBC 001	SUBC 002	SUBC003	SUBC 004
TAXON	#/Sq.M	#/Sq.M	#/Sq.M	#/Sq.M	#/Sq.M
Potamopyrgus antipodarum	43970	11007	6436	22195	42827
Hobsonia florida	842	481	120	241	241
Oligochaeta	3308	481	180	120	1143
Americorophium spinicorne	0	0	0	0	0
Eogammarus confervicolus	3910	0	602	962	662
Nereis limnicola	2045	1684	1203	1143	1624
Coullana canadensis	0	0	0	0	120
Nemertinea	0	0	0	0	0
Turbellaria, Rhabdocoela	0	0	0	0	0
Corbicula fluminea	180	60	0	0	0
Marenzelleria viridis	0	0	0	0	0
Gnorimospaeroma insulare	120	0	0	0	0
Hydroida colony	0	0	0	0	0
Macoma balthica	0	0	0	0	0
Nematoda	180	0	0	120	0
Americorophium salmonis	12932	5594	7759	16722	16481
Cyclopoida	0	0	0	0	0
Insecta, terrestrial adult	0	0	0	0	0
Idotea sp.	0	0	0	0	0
Saduria entomon	60	180	0	60	60
Total/Sq.M	67548	19489	16301	41564	63158
Number of Species	10	7	6	8	8
1st Species % of Population	65.1	56.5	47.6	53.4	67.8
1st + 2nd % of Population	84.2	85.2	87.1	93.6	93.9
1st+ 2nd + 3rd % of Population	90.0	93.8	94.5	96.4	96.5

Table 8. 2019 Yacht Club Benthic Invertebrate Denstities and Diversities.

	Outfall 003	SUBC 006	SUBC 007	SUBC 008	SUBC 009	SUBC 010	Outfall 002
TAXON	#/Sq.M	#/Sq.M	#/Sq.M	#/Sq.M	#/Sq.M	#/Sq.M	#/Sq.M
Potamopyrgus antipodarum	17684	17263	2947	12692	21714	37534	28210
Oligochaeta	3248	421	5053	5594	2466	2406	2586
Americorophium salmonis	31338	35970	4211	3910	13774	28090	37293
Eogammarus confervicolis	1383	1263	0	120	60	3850	902
Hobsonia florida	662	60	361	301	180	180	602
Nereis limnicola	241	180	1143	1564	241	662	1143
Cumacea	120	0	902	0	120	0	0
Corbicula fluminea	60	361	0	0	0	120	241
Macoma bathica	0	0	0	0	0	0	0
Americorophium spinicorne	0	0	0	0	0	0	0
C. canadensis	0	0	0	0	0	0	0
Chironomidae larvae	0	0	0	0	0	60	0
Balanus	0	0	0	0	0	0	0
Gnorimosphaeroma insulare	1624	180	0	120	0	481	0
Hydracarina	0	0	0	0	0	0	0
Nematoda	0	0	0	0	0	0	0
Nemertinea	0	0	0	0	0	60	0
Entomobryidae	0	0	0	0	0	0	0
Hemimysis anamola	0	0	0	60	0	0	0
Total/Sq.M	56361	55699	14616	24361	38556	73443	70977
Number of Species	9	8	6	8	7	10	7
1st Species % of Population	55.6	64.6	34.6	52.1	56.3	51.1	52.5
1st + 2nd % of Population	87.0	95.6	63.4	75.1	92.0	89.4	92.3
1st+ 2nd + 3rd % of Population	92.7	97.8	83.5	91.1	98.4	94.6	95.9

Table 9. 2019 Tide Pt./Bornsteins Benthic Invertebrate Densities and Diversities.

Table 10. Young's Bay Benthic Invertebrate Densities Per Station, 2005-19.

Species	2005	2007	2009	2011	2013	2015	2017	2019
Potamopyrgus antipodarum	24941	26721	20601	15699	11325	21223	8186	21214
Americorophium salmonis	15377	20854	22115	8692	18723	35873	5020	17839
Oligochaeta	13160	12969	10471	4426	9662	4969	1039	2260
Eogammarus confervicolis	12929	2698	907	767	60	1704	421	1213
Hobsonia florida	13074	2697	907	767	87	2142	421	360
Nereis limnicola	670	1138	416	1117	661	1897	355	1072

Table 11. Yacht Club Most Dominant Benthic Invertebrate Species Per Station, 2009-19.

	2009		2011		2013		2015		2017		2019	
Station	Species	Density	Species	Density	Species	Density	Species	Density	Species	Density	Species	Density
Outfall 001	Oligochaeta	31880	P. antipodarum	67127	Oligochaeta	84751	P. antipodarum	60872	P. antipodarum	16180	P. antipodarum	43,970
SUBC 001	A. salmonis	15819	A. salmonis	15880	A. salmonis	39278	A. salmonis	25985	A. salmonis	12271	P. antipodarum	11,007
SUBC 002	P. antipodarum	1203	A. salmonis	16782	A. salmonis	56421	A. salmonis	51128	P. antipodarum	962	A. salmonis	7,759
SUBC 003	P. antipodarum	38316	A. salmonis	15398	A. salmonis	12150	A. salmonis	22316	P. antipodarum	8000	P. antipodarum	22,195
SUBC 004	P. antipodarum	35970	P. antipodarum	16962	A. salmonis	20631	A. salmonis	38075	A. salmonis	13594	P. antipodarum	42,827
SUBC 005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 12. Tide Pt./Bornstein's Most Dominant Benthic Invertebrate Species Per Station, 2009-19.

	2009		2011		2013		2015		2017		2019	
Station	Species	Density	Species	Density	Species	Density	Species	Density	Species	Density	Species	Density
Outfall 002	Oligochaeta	8060	P. antipodarum	8000	N/A	N/A	N/A	N/A	N/A	N/A	A. salmonis	37,293
Outfall 003	P. antipodarum	47879	Oligochaeta	11188	A. salmonis	24060	A. salmonis	60872	P. antipodarum	10226	A. salmonis	31,338
SUBC 006	A. salmonis	92210	A. salmonis	2346	A. salmonis	11007	A. salmonis	26105	P. antipodarum	6015	A. salmonis	35,970
SUBC 007	Oligochaeta	15459	N. limnicola	5835	P. antipodarum	14777	A. salmonis	20571	P. antipodarum	3970	Oligochaeta	5,053
SUBC 008	Oligochaeta	9203	P. antipodarum	3429	Oligochaeta	9143	A. salmonis	19428	P. antipodarum	3609	P. antipodarum	12,692
SUBC 009	P. antipodarum	21594	A. salmonis	9564	A. salmonis	5113	A. salmonis	14737	P. antipodarum	6316	P. antipodarum	21,714
SUBC 010	A. salmonis	36631	P. antipodarum	48661	P. antipodarum	34045	A. salmonis	33263	P. antipodarum	13474	P. antipodarum	37,534

Table 13. Total Dissolved Solids Measurements Of Each Net Pen Site in Youngs Bay, 2019.

Net Pen Site	Upstream (mg/L)	Downstream (mg/L)
Tide Pt.	1160	1180
Bornstein's	1190	1230
Yacht Club	1160	1180

				1
	Beggiatoa	Water		
	sp.	Temp		
Station	Present	С	рН	Comments
Outfall 001	no	17.2	7.6	Formerly Impact Station 1
SUBC 001	no	17.2	7.6	Formerly Reference Station 9
SUBC 002	no	17.2	7.6	Formerly Reference Station 10
SUBC 003	no	17.2	7.6	Formerly Reference Station 11
SUBC 004	no	17.2	7.6	Formerly Perimeter Station 12
Outfall 003	no	17.2	7.6	Formerly Impact Station 5
SUBC 007	no	17.2	7.6	Formerly Reference Station 7
SUBC 008	no	17.2	7.6	Formerly Reference Station 8
SUBC 009	no	17.2	7.6	Formerly Perimeter Station 15
SUBC 010	no	17.2	7.6	Formerly Perimeter Station 18
Outfall 002	no	17.2	7.6	Formerly Impact Station 3
SUBC 006	no	17.2	7.6	Formerly Reference Station 6
E	-		-	

Date: June 24, 2019

Table 15 Outfall 001 / Reference Condition Comparisons															
Null Hypothesis: There is no di	fferen	ce betv	ween t	he Refe	erence	Static	ons and	d Outfa	all 001	in the l	Numbe	er of A	nimals	/Samp	ble
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBC0	03	0	utfall 0	01			
Number of Animals/Sample	111	102	111	126	29	116	295	180	216	145	780	198	⊁ =	0.05	
Excel Rank	3	2	3	6	1	5	11	8	10	7	12	9	<i>&</i> ~	8	Tabular Value
Matches	2	1	2	1	1	1	1	1	1	1	1	1	T=	28	
Wilcoxon Rank	3.5	2	3.5	6	1	5	11	8	10	7	12	9	T'=	11	
				T=	50					T=	28				Do Not Reject Null Hypothesis
	-				N=9					-	N=3		-		
Null Hypothesis: There is no di	ifferen	ce betv	veen ti	he Refe	erence	Static	ons and	l Outf	all 001 i	in the l	Numbe	er of Si	pecies	/Samp	le
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBC0	03	0	utfall 0	01		P	
Number of Species/Sample	6	6	6	6	4	4	8	5	5	7	8	4	× =	0.05	
Excel Rank	6	6	6	6	1	1	11	4	4	10	11	1	- 6./	8	Tabular Value
Matches	4	4	4	4	3	3	2	2	2	1	2	3	T=	23.5	
Wilcoxon Rank	7.5	7.5	7.5	7.5	2	2	11.5	4.5	4.5	10	11.5	2	T'=	15.5	
				T=	54.5	_				T=	23.5	_			Do Not Reject Null Hypothesis
	8				N=9				i		N=3		=		
Null Hypothesis: There is no di	ifferen	ce betv	ween t	he Refe	erence	Static	ons and	d Outfa	all 001 i	in the l	Domin	ant Sp	ecies 9	% of S	ample
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBC0	03	0	utfall 0	01			•
Dominant Species % of Sample	42.3	76.5	52.3	29.4	58.6	45.7	50.2	53.3	57.9	71	58.8	85.4	× =	0.05	
Excel Rank	2	11	5	1	8	3	4	6	7	10	9	12	<i>&</i> ~	8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1	T=	31	
Wilcoxon Rank	2	11	5	1	8	3	4	6	7	10	9	12	T'=	8	
				T=	47					T=	31				Reject Null Hypothesis
	=				N=9				:	=	N=3		=		
										The do	ominan	nt speci	ies may	not b	e the same for every station
Null Hypothesis: There is no di	fferen	ce betv	ween t	he Refe	erence	Static	ons and	d Outfa	all 001 i	in the S	Specie	s india	cated		
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBC0	03	0	utfall 0	01			
Potamopyrgus antipodarum	47	78	58	37	17	53	148	96	125	103	459	169	× =	0.05	
Excel Rank	3	6	5	2	1	4	10	7	9	8	12	11	<i>6</i> .⁄	8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1	T=	31	
Wilcoxon Rank	3	6	5	2	1	4	10	7	9	8	12	11	T'=	8	
				T=	47					T=	31				Reject Null Hypothesis
	-				N=9					-	N=3		-		

-.... _ - --. _ _

Null Hypothesis, There is no di	ifforon	na hatu	voon ti	no Bof	oronoo	Statio				in tha (Spacia	o indi	ootod	
Station Designation	S	UBC 0	neen u 01	S S	UBC 0	02	nis and S)3		utfall 00	5 mar)1		
Hobsonia florida	5	2	1	1	0200	1	2	2	0	6	6	2	× = 0.05	
Excel Rank	10	6	3	3	1	3	6	6	1	11	11	6	G-2 8	Tabular Value
Matches	1	4	3	3	2	3	4	4	2	2	2	4	T= 30.5	
Wilcoxon Rank	10	7.5	4	4	1.5	4	7.5	7.5	1.5	11.5	11.5	7.5	T'= 8.5	
				T=	47.5					T=	30.5			Do Not Reject Null Hypothesis
	=				N=9					=	N=3		=	
Null Hypothesis: There is no di	ifferend	ce betv	ween tl	ne Refe	erence	Statio	ons and	d Outfa	ull 001	in the S	Specie	s indi	cated	
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBCO)3	0	utfall 00)1		
Oligochaeta	3	2	3	1	2	0	1	0	1	23	27	5	≫ = 0.05	
Excel Rank	8	6	8	3	6	1	3	1	3	11	12	10	<i>6</i> -⁄ 8	Tabular Value
Matches	2	2	2	3	2	2	3	2	3	1	1	1	T= 33	
Wilcoxon Rank	8.5	6.5	8.5	4	6.5	1.5	4	1.5	4	11	12	10	T'= 6	
				T=	45					T=	33			Reject Null Hypothesis
	-				N=9					-	N=3		-	
Null Hypothesis: There is no di	ifferend	ce betv	ween tl	ne Refe	erence	Statio	ons and	d Outfa	ull 001	in the S	Specie	s indi	cated	
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBCO)3	0	utfall 00)1		
Americorophium spinicorne	0	0	0	0	0	0	0	0	0	0	0	0	>> = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	<i>⊶</i> ∕8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
					N=9						N=3			
Null Hypothesis: There is no di	ifferend	ce betv	ween tl	ne Refe	erence	Statio	ons and	d Outfa	ull 001	in the S	Specie	s indi	cated	
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBCO)3	0	utfall 00)1		
Eogammarus confervicolus	0	0	0	10	0	0	12	1	3	0	65	0	≫ = 0.05	
Excel Rank	1	1	1	10	1	1	11	8	9	1	12	1	<i>⊶</i> ∕8	Tabular Value
Matches	7	7	7	1	7	7	1	1	1	7	1	7	T= 20	
Wilcoxon Rank	4	4	4	10	4	4	11	8	9	4	12	4	T'= 19	
				T=	58					T=	20			Do Not Reject Null Hypothesis
					N=9						N=3			

Null Hypothesis: There is no dif	fferen	ce betv	veen tl	ne Ref	erence	Statio	ns and	l Outfa	ill 001	in the S	Specie	s indio	cated	
Station Designation	S	UBC 00	D1	S	UBC 0	02	S	UBC00)3	Οι	utfall 00	D1		
Nereis limnicola	6	11	11	9	4	7	4	7	8	3	10	21	>< = 0.05	
Excel Rank	4	10	10	8	2	5	2	5	7	1	9	12	<i>&</i> ~ 8	Tabular Value
Matches	1	2	2	1	2	2	2	2	1	1	1	1	T= 22	
Wilcoxon Rank	4	10.5	10.5	8	2.5	5.5	2.5	5.5	7	1	9	12	T'= 17	
				T=	56					T=	22			Do Not Reject Null Hypothesis
					N=9					-	N=3		-	
Null Hypothesis: There is no dif	fferen	ce betv	veen ti	ne Ref	erence	Statio	ns and	l Outfa	ll 001	in the S	Specie	s indio	cated	
Station Designation	S	UBC 00	01	S	UBC 0	02	S	UBCOC)3	O	utfall 00	01		
Coullana canadensis	0	0	0	0	0	0	0	0	0	0	0	0	≫ = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	a~ 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
					N=9						N=3		≣	
Null Hypothesis: There is no dif	fferend	ce betv	veen tl	he Ref	erence	Statio	ns and	l Outfa	ll 001	in the S	Specie	s indio	cated	
Station Designation	S	UBC 00	D1	S	UBC 0	02	S	UBC00)3	Οι	utfall 00	01		
Nemertinea	0	0	0	0	0	0	0	0	0	0	0	0	>< = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	<i>&</i> ~ 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
-					N=9					-	N=3		-	
Null Hypothesis: There is no dif	fferen	ce betv	veen ti	he Ref	erence	Statio	ns and	l Outfa	all 001	in the	Specie	es indi	cated	
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBCOC)3	O	utfall 00)1		
Turbellaria, Rhabdocoela	0	0	0	0	0	0	0	0	0	0	0	0	× = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	G~ 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	I T'= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5 T=	6.5 58.5	6.5	6.5	6.5	6.5	6.5 T=	6.5 19.5	6.5	T'= 19.5	Do Not Reject Null Hypothesis

Null Hypothesis: There is no di	fferen	ce betv	veen tl	ne Refe	erence	Statio	ns anc	l Outfa	II 001	in the S	Species	s indi	cated	
Station Designation	S	UBC 00	D1	S	UBC 00)2	S	UBC00	3	Οι	utfall 00)1		
Corbicula fluminea	0	1	0	0	0	0	0	0	0	2	1	0	>> = 0.05	
Excel Rank	1	10	1	1	1	1	1	1	1	12	10	1	&~ 8	Tabular Value
Matches	9	2	9	9	9	9	9	9	9	1	2	9	T= 27.5	
Wilcoxon Rank	5	10.5	5	5	5	5	5	5	5	12	10.5	5	T'= 11.5	
				T=	50.5					T=	27.5			Do Not Reject Null Hypothesis
					N=9						N=3		-	
Null Hypothesis: There is no di	fferen	ce betv	veen tl	he Refe	erence	Statio	ns and	l Outfa	II 001 i	in the S	Species	s indi	cated	
Station Designation	S)1	S	UBC 0	12	S	UBCOC	3	Oı	utfall 00)1		
Marenzelleria viridis	0	0	0	0	0	0	0	0	0	0	0	0	≫ = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	a~ 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
				-	N=9				1		N=3		Ē	
Null Hypothesis: There is no di	fferen	ce betv	veen tl	ne Refe	erence	Statio	ns and	l Outfa	II 001	in the S	Species	s indi	cated	
Station Designation	S	UBC 00	D1	S	UBC 00)2	S	UBC00	3	Οι	utfall 00)1		
Gnorimospaeroma insulare	0	0	0	0	0	0	0	0	0	0	2	0	>< = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	12	1	<i>&</i> √ 8	Tabular Value
Matches	11	11	11	11	11	11	11	11	11	11	1	11	T= 24	
Wilcoxon Rank	6	6	6	6	6	6	6	6	6	6	12	6	T'= 15	
				T=	54					T=	24			Do Not Reject Null Hypothesis
	-				N=9					-	N=3		-	
Null Ilumethesis. There is no di	"			- Dof		Ctatia		0			`	الم منا م	a a ƙa al	
Station Designation	neren					Statio	ns and			In the a	species			
Station Designation	 		J1	5		JZ	<u> </u>	UBCUL	13			л о	~ 0.05	
Hydroida colony	U	U	0	0	0	0	0	0	U	U	0	0	× = 0.05	Tabular \/alua
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	6-7 8 T 10 F	ladular value
	12	12	12	12	12	12	12	12	12	12	12	12	I = 19.5	
VVIICOXON Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	I'= 19.5	
	1			=	58.5					i =	195		1	DO NOT Reject Null Hypothesis
										. –	10.0		1	

Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Number of Animals/Sample Station Designation SUBC 001 SUBC 002 SUBC 003 SUBC 004 Number of Animals/Sample 111 102 111 126 29 116 295 180 216 291 187 572 \ll = 0.05 Excel Rank 3 2 3 6 1 5 11 7 9 10 8 12 $\nleftrightarrow \otimes$ 8 Tabular Value Matches 2 1 2 1	
Station Designation Number of Animals/SampleSUBC 001SUBC 002SUBC 003SUBC 00411110211112629116295180216291187572 \times = 0.05Excel Rank Matches323615117910812 \swarrow 8Tabular ValueMatches Wilcoxon Rank2121111111111Wilcoxon Rank3.523.5615117910812T= 30Wilcoxon RankT=48 N=9T=48 N=3T=30 N=3T=0Not Reject Null Hypoth	
Number of Animals/Sample11110211112629116295180216291187 $572 \times = 0.05$ Excel Rank323615117910812Matches212111111111Wilcoxon Rank3.523.5615117910812T= 30Wilcoxon RankT=48T=7910812T'= 9T90N=9T=48N=9N=3N=3N=3NNNNN	
Excel Rank 3 2 3 6 1 5 11 7 9 10 8 12 ω 8 Tabular Value Matches 2 1 2 1	
Matches 2 1 2 1 1 1 1 1 1 1 1 1 T = 30 Wilcoxon Rank 3.5 2 3.5 6 1 5 11 7 9 10 8 12 $T'= 9$ $T = 48$ $N=9$ $N=3$ $N=3$ $N=3$ $Do Not Reject Null Hypoth$	
Wilcoxon Rank 3.5 2 3.5 6 1 5 11 7 9 10 8 12 $T'= 9$ Main $T=$ 48 $T=$ 30 $T=$ 30 $N=3$ Main $N=9$ $N=3$ $N=3$ $N=3$ $N=3$ $N=3$	
T = 48 $N = 9$ $T = 30$ $N = 3$	
N=9 N=3	hesis
Null Hypothesis' There is no difference between the Reference Stations and SURC 10/1 in the Number of Species/Sample	
Station Designation	
Number of Species/Sample 6 6 6 6 4 4 8 5 5 7 5 6 \checkmark -0.05	
Excel Pank $6 = 6 = 6 = 6 = 1 = 1 = 12 = 3 = 2 = 11 = 2 = 6 = 0.05$	
Matches 5 5 5 5 5 5 5 5 1 5 5 1 2 Wildowan Dank 9 9 9 15 15 1 3 5 1 = 25	
$\frac{1}{1} = 10$	h a a i a
	nesis
N=9 N=3	
Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Dominant Species % of Sample	
Station Designation SUBC 001 SUBC 002 SUBC 003 SUBC 004	
Dominant Species % of Sample 42.3 76.5 52.3 29.4 58.6 45.7 50.2 53.3 57.9 69.4 42.2 75.3 🔀 = 0.05	
Excel Rank 3 12 6 1 9 4 5 7 8 10 2 11 & 8 Tabular Value	
Matches 1 1 1 1 1 1 1 1 1 1 1 T= 23	
Wilcoxon Rank 3 12 6 1 9 4 5 7 8 10 2 11 T'= 16	
T= 55 T= 23 Do Not Reject Null Hypoth	hesis
N=9 N=3	
The dominant species may not be the same for every station	
Null Hypothesis: There is no difference between the Reference Stations and SUBC 004 in the Species indicated	
Station Designation SUBC 001 SUBC 002 SUBC 003 SUBC 004	
Potamopyrgus antipodarum 47 78 58 37 17 53 148 96 125 202 79 431 🔀 = 0.05	
Excel Rank 3 6 5 2 1 4 10 8 9 11 7 12 & 8 Tabular Value	
Matches 1 1 1 1 1 1 1 1 1 1 1 T= 30	
Wilcoxon Rank 3 6 5 2 1 4 10 8 9 11 7 12 T'= 9	
T= 48 T= 30 Do Not Reject Null Hypoth	

N=3

T= 48 N=9

Table 16 SUBC 004 / Reference Condition Comparisons

						•								
Null Hypothesis: There is no di	itteren		ween t	ne Kete		Statio	ns and		5 004 I	n the S			ated	
Station Designation	_ S	OBC 0	01	1		02	2		13	2		J4 4	°< 0.05	
Hobsonia lionda	5 40	2	1	1	0	1	2	2	0	3	0	1	× = 0.05	
EXCEL RANK	12	8	4	4	1	4	8	8	1	11	1	4	6-7'8 T 195	Tabular Value
Malches Mileeven Denk	10	3	4	4	3	4	3	3	3	1	3	4	1= 10.5	
WIICOXON Rank	12	9	5.5	5.5 T	2	5.5	9	9	2		2 10 F	5.5	1 = 20.5	De Net Deiset Null Ihmethesis
				1=	59.5					=	18.5			Do Not Reject Null Hypothesis
					IN=9						IN=3			
Null Hypothesis: There is no di	ifferen	ce bet	ween t	he Refe	erence	Statio	ons and	I SUBC	C 004 i	n the S	pecies	s indic	ated	
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBC 00	03	SI	JBC 00)4		
Oligochaeta	3	2	3	1	2	0	1	0	1	6	3	10	≫ = 0.05	
Excel Rank	8	6	8	3	6	1	3	1	3	11	8	12	a~ 8	Tabular Value
Matches	3	2	3	3	2	2	3	2	3	1	3	1	T= 32	
Wilcoxon Rank	9	6.5	9	4	6.5	1.5	4	1.5	4	11	9	12	T'= 7	
				T=	46					T=	32			Reject Null Hypothesis
	=				N=9					=	N=3		=	
Null Hypothesis: There is no di	ifferen	ce bet	ween t	he Refe	erence	Statio	ns and	SUBC	C 004 i	n the S	pecies	s indic	ated	
Station Designation	S	UBC 0	01	S	UBC 0	02	S	UBC 00	03	SI	JBC 00)4		
Americorophium spinicorne	0	0	0	0	0	0	0	0	0	0	0	0	>> = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	<i>G</i> -⁄ 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
					N=9						N=3			
Null Hypothesis: There is no di	ifforon	ce het	woon t	ha Rafi	aronco	Statio	ns and		2 004 i	n the S	nocios	indic	ated	
Station Designation	l s		01	S		12	S		י דייט י רצ	si si	IBC 00	אנים היותו 14		
Fogammarus confervicolus	0	0 000	0	10	0000	0	12	1	3	2	0	9 9	$\times - 0.05$	
Excel Rank	1	1	1	10	1	1	12	7	g	8	1	10	ar 8	Tabular Value
Matches	6	6	6	1	6	6	1	1	1	1	6	1	T= 21.5	
Wilcoxon Rank	35	35	35	11	35	35	12	7	9	8	35	10	T'= 17.5	
	0.0	0.0	0.0	 T=	56.5	0.0	14		Ũ		21.5		1 = 17.0	Do Not Reject Null Hypothesis
	=				N=9					1 1-	N=3		8	

Null Hypothesis: There is no di	fferen	ce betv	veen tł	ne Refe	erence	Statio	ns and	SUBC	C 004 ii	n the S	pecies	indic	ated	
Station Designation	S	UBC 00	D1	S	UBC 0	02	S	UBC 00	03	Sl	JBC 00)4		
Nereis limnicola	6	11	11	9	4	7	4	7	8	13	4	10	≫ = 0.05	
Excel Rank	4	10	10	8	1	5	1	5	7	12	1	9	&~ 8	Tabular Value
Matches	1	2	2	1	3	2	3	2	1	1	3	1	T= 23	
Wilcoxon Rank	4	10.5	10.5	8	2	5.5	2	5.5	7	12	2	9	T'= 16	
				T=	55					T=	23			Do Not Reject Null Hypothesis
					N=9						N=3		-	
Null Hypothesis: There is no di	fferen	ce betv	veen th	ne Refe	erence	Statio	ns and	I SUBC	C 004 iı	n the S	pecies	indic	ated	
Station Designation	S	UBC 00	D1	S	UBC 0	02	S	UBC 00	03	SL	JBC 00)4		
Coullana canadensis	0	0	0	0	0	0	0	0	0	0	2	0	>> = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	12	1	<i>&</i> ~ 8	Tabular Value
Matches	11	11	11	11	11	11	11	11	11	11	1	11	T= 24	
Wilcoxon Rank	6	6	6	6	6	6	6	6	6	6	12	6	T'= 15	
				T=	54					T=	24			Do Not Reject Null Hypothesis
	=				N=9				1		N=3		=	
Null Hypothesis: There is no di	fferen	ce betv	veen tł	ne Refe	erence	Statio	ns and	SUBC	C 004 ii	n the S	pecies	indic	ated	
Station Designation	S	UBC 00	D1	S	UBC 0	02	S	UBC 00	03	SL	JBC 00)4		
Nemertinea	0	0	0	0	0	0	0	0	0	0	0	0	≫ = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	ar 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
	=				N=9				-	:	N=3		=	
Null Hypothesis: There is no di	fferen	ce betv	veen tł	ne Refe	erence	Statio	ns and		. 004 ii	n the S	necies	indic	ated	
Station Designation	S		10011 (l	S		02	SI SI		13	SI		11410		
Turbellaria Bhabdocoela	0	02000	0	0	0000	0	0	0	0	0	0	0	× - 0.05	
Excel Bank	1	1	1	1	1	1	1	1	1	1	1	1	ac 8	Tabular Value
Matches	. 12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	65	6.5	6.5	T'- 19.5	
	0.0	0.0	0.0	т–	58.5	0.0	0.0	0.0	0.0	т <u>-</u>	19.5	0.0	1 = 10.0	Do Not Reject Null Hypothesis
	1				N_9				I		N_3		1	
					11-0						=0			

Null I have the size. There is no di	(f					C4++1++			- 004 -				at a d	
Station Designation	nerenc		veen ti			Statio	ns and		2 UU4 II	n the S			ated	
	0			0		02	0		03			J4 0	Q∠ 0.05	
	0	1	0	0	0	0	0	0	0	0	0	0	× = 0.05	TabularValue
Excel Rank	1	12	1	1	1	1	1	1	1		1	1	<i>G</i> -7 8	l adular value
Matches	11	1	11	11	11	11	11	11	11	11	11	11	1= 18	
Wilcoxon Rank	6	12	6	6	6	6	6	6	6	6	6	6	T'= 21	
				T=	60					T=	18			Do Not Reject Null Hypothesis
					N=9						N=3			
Null Hypothesis: There is no di	fferenc	ce betv	veen tl	ne Refe	erence	Statio	ns and		C 004 i	n the S	pecies	s indic	ated	
Station Designation	SI	UBC 00	01	S	UBC 0	02	S	UBC 0	03	SI	JBC 00	04		
Marenzelleria viridis	0	0	0	0	0	0	0	0	0	0	0	0	≻ = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	a~ 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
•					N=9					•	N=3			
Null Hypothesis: There is no di	fferenc	ce betv	veen tl	he Refe	erence	Statio	ns and	I SUBO	C 004 i	n the S	pecies	s indic	ated	
Station Designation	SI	UBC 00	01	S	UBC 0	02	S	UBC 0	03	SI	JBC 00)4		
Gnorimospaeroma insulare	0	0	0	0	0	0	0	0	0	0	0	0	≫ = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	a~ 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
					N=9						N=3		1	
					11-0						11-0			
Null Hypothesis: There is no di	fferenc	ce betv	veen tl	ne Refe	erence	Statio	ns and	I SUBC	C 004 i	n the S	pecies	s indic	ated	
Station Designation	SI	UBC 00	D1	S	UBC 0	02	S	UBC 0	03	SI	JBC 00)4		
Hydroida colony	0	0	0	0	0	0	0	0	0	0	0	0	> = 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	<i>G</i> - ⁄ 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5	
				T=	58.5					T=	19.5			Do Not Reject Null Hypothesis
	•				N=9					-	N=3		-	

Table 17 Outfall 003 / Reference Condition Comparisons

Null Hypothesis: There is no di	ifferer	nce bet	ween t	he Refe	erence	e Statio	ons and	d Outfa	all 003	in the	Numb	er of A	nimals/Samp	le
Station Designation	5	SUBC 0	06	SI	JBC 0	07	S	UBC 0	08	0	utfall 0	03		
Number of Animals/Sample	247	309	370	69	71	103	231	53	121	273	252	412	< ◙ 0.05	
Excel Rank	7	10	11	2	3	4	6	1	5	9	8	12	a~ 8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1	T= 29	
Wilcoxon Rank	7	10	11	2	3	4	6	1	5	9	8	12	T'= 10	
				T=	49					T=	29			Do Not Reject Null Hypothesis
					N=9						N=3			
Null Hypothesis: There is no di	fferer	ice bet	ween t	he Refe	erence	Statio	ons and	d Outfa	all 003	in the	Numbe	er of S	pecies/Samp	le
Station Designation	_ `	SOBC 0	06	_ 51	JRC 0	07	S	OBC 0	08 -	_ 0	utfall 0	03		
Number of Species/Sample	5	6	8	5	6	6	6	4	1	7	6	9 10		Tabular)/alua
Excel Rank	2	4	11	2	4	4	4	1	9	9	4	12	6-7 8 T 07 F	l'abular value
Matches	2	5	1	2	5	5	5	1	2	2	5	1	I = 27.5	
WIICOXON RANK	2.5	6	11	2.5	6	6	6	1	9.5	9.5 T	б 07 Г	12	1 = 11.5	De Net Deiset Null Livrethesis
				1=	50.5					1=	27.5		1	Do Not Reject Null Hypothesis
					N=9						IN=3			
Null Hypothosis: Thoro is no di	fforor	a hot	woon t	ha Pofe	ronce	Statio	ne and	1 011464	-II 003	in tha	Domin	ant Sr	oncios % of S	amplo
Station Designation							ample							
Dominant Species % of Sample	27 5	25.6	37.8	17 /										
Excel Rank	27.5	23.0	11	3	12.7	6	12	2	21.5	92.0	10	27.4 7	< ■ 0.05	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1	T= 26	
Wilcoxon Bank	8	5	11	3	1	6	12	2	4	q	10	7	T'= 13	
Whooxoff Runk	Ŭ	0		T=	52	0	12	~	-	Т=	26	'	1 - 10	Do Not Reject Null Hypothesis
				•	N=9					•	N=3			
										The do	ominar	nt spec	ies mav not be	e the same for every station
Null Hypothesis: There is no di	ifferer	nce bet	ween t	he Refe	erence	e Statio	ons and	d Outfa	all 003	in the	Specie	es indi	cated	<u> </u>
Station Designation	5	SUBC 0	06	SI	JBC 0	07	S	UBC 0	08	0	utfall 0	03	1	
Potamopyrgus antipodarum	68	79	140	12	9	28	176	9	26	89	92	113	< ■ 0.05	
Excel Rank	6	7	11	3	1	5	12	1	4	8	9	10	G- 8	Tabular Value
Matches	1	1	1	1	2	1	1	2	1	1	1	1	T= 27	
Wilcoxon Rank	6	7	11	3	1.5	5	12	1.5	4	8	9	10	T'= 12	
				T=	51					T=	27			Do Not Reject Null Hypothesis
					N=9						N=3			
Null Hypothesis: There is no di	fferer	ice bet	ween t	he Refe	erence	e Statio	ons and	d Outfa	all 003	in the	Specie	es indi	cated	
Station Designation	5	SUBC 0	06	SI	JBC 0	07	S	UBC 0	08	0	utfall 0	03		
Oligochaeta	1	3	3	23	26	35	39	26	28	4	18	32	< ■ 0.05	
Excel Rank	1	2	2	6	7	11	12	7	9	4	5	10	ar 8	Tabular Value
Matches	1	2	2	1	2	1	1	2	1	1	1	1	T= 19	
Wilcoxon Rank	1	2.5	2.5	6	7.5	11	12	7.5	9	4	5	10	T'= 20	
				T=	59					T=	19			Do Not Reject Null Hypothesis

					N=9						N=3				
Null Hypothesis [.] There is no di	fferen	ce heti	veen th	ne Ref	erence	Static	ons and	l Outfa	all 003	in the S	Snecie	s indi	cate	Ч	
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08		utfall 00	73 73	l		
Americorophium salmonis	175	217	206	26	21	23	10	12	43	138	135	248	~	0.05	
Excel Rank	9	11	10	5	3	4	1	2	6	8	7	12		■ 0.00 2⁄2 8	Tabular Value
Matches	1	1	10	1	1	1	1	1	1	1	1	1	D	⊎ 0 T_ 27	
Wilcovon Bonk	0	11	10	5	י 2	1	1	י ר	с С	0	7	12	Ι.,	1 - 27 F'- 10	
	9		10	J Т_	5	4	1	2	0	о Т_	27	12	'	= 12	Do Not Point Null Hypothesis
				1=						1=	2/		1		Do Not Reject Null Hypothesis
					IN=9						IN=3				
Null Hypothesis: There is no di	fferen	ce betv	ween th	ne Refe	erence	Static	ons and	d Outfa	all 003	in the	Specie	s indi	cate	d	
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	Οι	utfall 00	03			
Eogammarus confervicolis	1	7	13	0	0	0	0	0	2	14	4	5	<	0.05	
Excel Rank	6	10	11	1	1	1	1	1	7	12	8	9	6	⊳ 8	Tabular Value
Matches	1	1	1	5	5	5	5	5	1	1	1	1		T= 29	
Wilcoxon Rank	6	10	11	3	3	3	3	3	7	12	8	9	1 1	⁻ = 10	
	Ŭ				49	Ũ	Ũ	0	-		29	Ū			Do Not Reject Null Hypothesis
	8			•	N=9					•	N=3		•		
					11-0						11-0				
Null Hypothesis: There is no di	fferen	ce betv	ween tł	ne Refe	erence	Static	ons and	d Outfa	all 003	in the	Specie	s indi	cate	d	
Station Designation	ifference between the Reference Stations and Outfall 003 in the Species indicated SUBC 006 SUBC 007 SUBC 008 Outfall 003														
Hobsonia florida	0	0	1	1	3	2	1	0	4	0	2	9	<	0.05	
Excel Rank	1	1	5	5	10	8	5	1	11	1	8	12	6	⊮∕8	Tabular Value
Matches	4	4	3	3	1	2	3	4	1	4	2	1		T= 23	
Wilcoxon Rank	25	25	6	6	10	85	6	25	11	25	85	12	1 1	0 ['= 16	
	2.0	2.0	0	т_	55	0.0	Ũ	2.0		 T=	23			- 10	Do Not Reject Null Hypothesis
					N_9						N_3		:		Do Not Reject Run Hypothesis
					11-5						N=5				
Null Hypothesis: There is no di	fferen	ce betv	ween tł	ne Refe	erence	Static	ons and	d Outfa	all 003	in the S	Specie	s indi	cate	d	
Station Designation	S	UBC 0	06	S	UBC 0	07	S		08	0	utfall 00	13	1	-	
Nereis limnicola	0	1	2	7	9 02 0	3	4	6	16	2	1	1	<	0 05	
Excel Rank	1	2	5	, 10	11	7	8	à	12	5	2	2	ſ,	a 8	Tabular Value
Matches	1	2	2	10	1	1	1	1	1	2	2	2	D	⊎ 0 T_ 11 5	
Wilcovon Bonk	1	2	2 5 5	10	11	7	0	0	10	2 5 5	2	2	Ι.,	- 11.5	
	1	3	5.5		ы СС Б	'	0	9	12	5.5 T	3 11 E	3	'	= 27.5	De Net Reject Null Hymethesis
				1=	00.0					1=	11.5		1		Do Not Reject Null Hypothesis
					IN=9						IN=3				
Null Hypothesis, There is no di	4	aa hati	waan ti			Ctatio		10		in the (Smaala	a indi		لم	
Null Hypothesis: There IS NO di	neren		ween tr			oz	ns and				specie	s indi	cate	u	
	<u>,</u> ,		00	0		10	0		00			JS 4			
	0	0	0	0	3	12	0	0	0	1	0	1	ĸ	0.05	Tabular)/alua
	1	1	1	1	11	12	1	1	1	9	1	9	6	∀'ŏ T 00 -	rapular value
Matches	8	8	8	8	1	1	8	8	8	2	8	2		1= 23.5	
Wilcoxon Rank	4.5	4.5	4.5	4.5	11	12	4.5	4.5	4.5	9.5	4.5	9.5	ר ו	'= 15.5	
				T=	54.5					T=	23.5		1		Do Not Reject Null Hypothesis
					N=9						N=3				

ull Hypothesis: There is no difference between the Reference Stations and Outfall 003 in the Species indicated ation Designation SUBC 006 SUBC 007 SUBC 008 Outfall 003														
Station Designation	S	UBC 0	06	SL	JBC 00)7	SI	JBC 00	8	Ou	utfall 00	3		
Corbicula fluminea	0	2	4	0	0	0	0	0	0	0	0	1	< ∎ 0.05	
Excel Rank	1	11	12	1	1	1	1	1	1	1	1	10	a~ 8	Tabular Value
Matches	9	1	1	9	9	9	9	9	9	9	9	1	T= 20	
Wilcoxon Rank	5	11	12	5	5	5	5	5	5	5	5	10	T'= 19	
				T=	58					T=	20			Do Not Reject Null Hypothesis
	-				N=9				-		N=3		-	
Null Hypothesis: There is no di	ifferen	ce betv	veen tl	ne Refe	erence	Statio	ns and	l Outfa	II 003 i	in the S	Species	s indi	cated	
Null Hypothesis: There is no di Station Designation	ifferen S	ce bet v UBC 0	veen tl 06	h e Refe Sl	erence JBC 00	Statio	ns anc ຣເ	l Outfa JBC 00	II 003 i 08	i n the ໃ Oເ	Species utfall 00	s indi 3	cated	
Null Hypothesis: There is no di Station Designation Macoma bathica	ifferen S 0	ce bet UBC 00 0	veen tl D6 0	h e Refe Sl	erence JBC 00 0	Statio	ns and Sl 0	I Outfa JBC 00 0	II 003 i 08 0	in the \$ Oເ 0	Specie utfall 00 0	s indi 03 0	cated < ∎ 0.05	
Null Hypothesis: There is no di Station Designation Macoma bathica Excel Rank	ifferen S 0 1	ce bet v UBC 04 0 1	veen tl 06 0 1	n e Refe Sl 0 1	JBC 00 0 1	Statio)7 0 1	ns and Sl 0 1	I Outfa JBC 00 0 1	1 1 003 i 08 0 1	i n the ໃ Oເ 0 1	Species utfall 00 0 1	s indi 03 0 1	cated < ∎ 0.05 ⊕ 8	Tabular Value
Null Hypothesis: There is no di Station Designation Macoma bathica Excel Rank Matches	ifferen S 0 1 12	ce betv UBC 04 0 1 12	ween tl 06 0 1 12	ne Refe Sl 0 1 12	BC 00 0 1 12	Statio)7 0 1 12	ns and Sl 0 1 12	I Outfa JBC 00 0 1 12	11 003 08 0 1 12	in the S Ou 0 1 12	Species utfall 00 0 1 12	s indi 03 0 1 12	cated < ■ 0.05 <i>A</i> 8 T= 19.5	Tabular Value
Null Hypothesis: There is no di Station Designation Macoma bathica Excel Rank Matches Wilcoxon Rank	ifferen S 0 1 12 6.5	ce betv UBC 0 0 1 12 6.5	ween tl 06 0 1 12 6.5	he Refe Sl 0 1 12 6.5	Brence JBC 00 0 1 12 6.5	Statio)7 0 1 12 6.5	ns and Sl 0 1 12 6.5	I Outfa JBC 00 0 1 12 6.5	II 003)8 0 1 12 6.5	in the \$ Ou 0 1 12 6.5	Species utfall 00 0 1 12 6.5	s indi 03 0 1 12 6.5	cated < ■ 0.05 <i>G</i> 8 T= 19.5 T'= 19.5	Tabular Value
Null Hypothesis: There is no di Station Designation Macoma bathica Excel Rank Matches Wilcoxon Rank	ifferend S 0 1 12 6.5	ce betv UBC 0 0 1 12 6.5	ween tl 06 1 12 6.5	he Refe Sl 0 1 12 6.5 T=	erence JBC 00 0 1 12 6.5 58.5	Statio 07 1 12 6.5	ns and SI 0 1 12 6.5	Dutfa JBC 00 0 1 12 6.5	II 003 08 0 1 12 6.5	in the S Ou 1 12 6.5 T=	Species utfall 00 0 1 12 6.5 19.5	s indi 3 0 1 12 6.5	cated ← ■ 0.05 ← 8 T= 19.5 T'= 19.5	Tabular Value Do Not Reject Null Hypothesis

		7	Table	18 SL	JBC 0	09 / R	Refere	nce (Condi	tion C	ompa	ariso	ns			
Null Hypothesis: There is no di	fferen	ce betv	ween tl	he Refe	erence	Statio	ons and		C 009 i	n the N	lumbe	r of Ar	im	als/	Sampl	e
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	SI	JBC 00	09				
Number of Animals/Sample	247	309	370	69	71	103	231	53	121	221	240	180	<	•	0.05	
Excel Rank	10	11	12	2	3	4	8	1	5	7	9	6		G	8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1		T=	22	
Wilcoxon Rank	10	11	12	2	3	4	8	1	5	7	9	6		T'=	17	
				T=	56					T=	22					Do Not Reject Null Hypothesis
	-				N=9						N=3		-			
								_	_					_		
Null Hypothesis: There is no di	fferen	ce bet	ween t	he Refe	erence	e Statio	ons and	SUB	C 009 i	n the N	lumbe	r of Sp	eci	es/	Sampl	e
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	SI	JBC 00	09				
Number of Species/Sample	5	6	8	5	6	6	6	4	7	7	5	4	<	ŗ	0.05	
Excel Rank	3	6	12	3	6	6	6	1	10	10	3	1		G	8	Tabular Value
Matches	3	4	1	3	4	4	4	2	2	2	3	2		T=	16	
Wilcoxon Rank	4	7.5	12	4	7.5	7.5	7.5	1.5	10.5	10.5	4	1.5		T'=	23	
				T=	62					T=	16					Do Not Reject Null Hypothesis
					N=9						N=3					
			4			•			.							
Null Hypothesis: There is no di	tteren	ce bet	ween ti	he Refe	erence	Statio	ons and		C 009 II	n the S	pecies	s indic	ate	d		
Station Designation	S	OBC 0	06	S	OBC 0	07	S	OBC 0	80	SI	JBC 00	J9 		_		
Dominant Species % of Sample	27.5	25.6	37.8	17.4	12.7	27.2	76.2	17	21.5	55.2	57.1	56.7	×	9	0.05	
Excel Rank	7	5	8	3	1	6	12	2	4	9	11	10		æ	8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1		T=	30	
Wilcoxon Rank	7	5	8	3	1	6	12	2	4	9	11	10		T'=	9	
				T=	48					T=	30					Do Not Reject Null Hypothesis
					N=9						N=3					
									_	The do	ominan	t spec	ies	may	not be	e the same for every station
Null Hypothesis: There is no di	fferen	ce bet	ween t	he Refe	erence	e Statio	ons and	SUB	C 009 i	n the S	pecies	s indic	ate	d		
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	SI	JBC 00	09				
Potamopyrgus antipodarum	68	79	140	12	9	28	176	9	26	122	137	102	<	ŗ	0.05	
Excel Rank	6	7	11	3	1	5	12	1	4	9	10	8		GS/	8	Tabular Value
Matches	1	1	1	1	2	1	1	2	1	1	1	1		T=	27	
Wilcoxon Rank	6	7	11	3	1.5	5	12	1.5	4	9	10	8		T'=	12	
				T=	51					T=	27					Do Not Reject Null Hypothesis
					N=9						N=3					

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Null Hypothesis: There is no di	fferen	ce bet	ween th	ne Refe	erence	Statio	ons and		C 009 i	n the S	pecies	indic	ate	d	
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	Sl	JBC 00)9			
Oligochaeta	1	3	3	23	26	35	39	26	28	9	11	21	~	0.05	
Excel Rank	1	2	2	7	8	11	12	8	10	4	5	6		Ger 8	Tabular Value
Matches	1	2	2	1	2	1	1	2	1	1	1	1		T= 15	
Wilcoxon Rank	1	2.5	2.5	7	8.5	11	12	8.5	10	4	5	6		T'= 24	
				T=	63					T=	15				Do Not Reject Null Hypothesis
					N=9						N=3				
Null Hypothesis: There is no di	ifferen	ce betv	ween tl	ne Refe	erence	Statio	ons and	I SUBO	C 009 i	n the S	pecies	indic	ate	d	
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	SI	JBC 00)9			
Americorophium salmonis	175	217	206	26	21	23	10	12	43	84	89	56	$\boldsymbol{<}$	0.05	
Excel Rank	10	12	11	5	3	4	1	2	6	8	9	7		GN 8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1		T= 24	
Wilcoxon Rank	10	12	11	5	3	4	1	2	6	8	9	7		T'= 15	
				T=	54					T=	24			-	Do Not Reject Null Hypothesis
	Ξ				N=9					8	N=3		Ξ		, ,,
Null Hypothesis: There is no di	ifferen	ce betv	ween tl	ne Refe	erence	Statio	ons and	I SUBO	C 009 i	n the S	pecies	indic	ate	d	
Station Designation	l s	UBC 0	06	S	UBC 0	07	S	UBC 0	08	SI	JBC 00)9			
Eogammarus confervicolis	1	7	13	0	0	0	0	0	2	1	0	0	×	0.05	
Excel Rank	8	11	12	1	1	1	1	1	10	8	1	1		GN 8	Tabular Value
Matches	2	1	1	7	7	7	7	7	1	2	7	7		T= 16.5	
Wilcoxon Rank	8.5	11	12	4	4	4	4	4	10	8.5	4	4		T'= 22.5	
				T=	61.5				-	Т=	16.5			•	Do Not Reject Null Hypothesis
	=				N=9					=	N=3		=		
Null Hypothesis: There is no di	ifferen	ce bet	ween tl	ne Refe	erence	Statio	ons and		C 009 i	n the S	pecies	indic	ate	d	
Station Designation	l s	UBC 0	06	S	UBC 0	07	S	UBC 0	08	SI	JBC 00)9			
Hobsonia florida	0	0	1	1	3	2	1	0	4	1	2	0	×	0.05	
Excel Rank	1	1	5	5	11	9	5	1	12	5	9	1		a 8	Tabular Value
Matches	4	4	4	4	1	2	4	4	1	4	2	4		T= 18.5	
Wilcoxon Rank	2.5	2.5	6.5	6.5	11	9.5	6.5	2.5	12	6.5	9.5	2.5		T' = 20.5	
				T=	59.5					T=	18.5				Do Not Reject Null Hypothesis
	=			•	N=9						N=3		=		

Null Hypothesis: There is no di	ifferenc	e betv	ween t	he Refe	erence	Statio	ons and	SUBC	C 009 i	n the S	pecies	indic	ated	
Station Designation	ડા	JBC 0	06	S	UBC 00	07	S	UBC 00	08	Sl	JBC 00)9		
Nereis limnicola	0	1	2	7	9	3	4	6	16	2	1	1	< ∎ 0.05	
Excel Rank	1	2	5	10	11	7	8	9	12	5	2	2	<i>⊶</i> ∕8	Tabular Value
Matches	1	3	2	1	1	1	1	1	1	2	3	3	T= 11.5	
Wilcoxon Rank	1	3	5.5	10	11	7	8	9	12	5.5	3	3	T'= 27.5	
				T=	66.5					T=	11.5			Do Not Reject Null Hypothesis
	-				N=9					-	N=3		-	
Null Ilumethesis. There is no di		h . t		ha Daf		C4++1++			- 000 :	C		م الم ما	atad	
Null Hypothesis: There is no di			Neen ti	ne Refe		Statio	ons and		2 009 II	n the S			ated	
Station Designation	50	JRC 0	06	5		57	5		78	51		9		
Cumacea	0	0	0	0	3	12	0	0	0	2	0	0	< ∎ 0.05	
Excel Rank	1	1	1	1	11	12	1	1	1	10	1	1	<i>G</i> - <i>C</i> 8	l abular Value
Matches	9	9	9	9	1	1	9	9	9	1	9	9	T= 20	
Wilcoxon Rank	5	5	5	5	11	12	5	5	5	10	5	5	T'= 19	
				T=	58					T=	20			Do Not Reject Null Hypothesis
					N=9						N=3			
Null Hypothesis: There is no di	ifferenc	e betv	veen ti	he Refe	erence	Statio	ons and		C 009 ii	n the S	pecies	indic	ated	
Station Designation	SI	JBC 0	06	S	UBC 0)7	S		78	SI	JBC 00)9		
Corbicula fluminea	0	2	4	0	0	0	0	0	0	0	0	0		
Excel Rank	1	11	12	1	1	1	1	1	1	1	1	1	a. 8	Tabular Value
Matches	10	1	1	10	10	10	10	10	10	10	10	10	T= 16.5	
Wilcovon Bank	55	11	12	55	55	55	55	55	55	55	55	55	T'- 22.5	
	0.0		12	0.0 T_	61 5	0.0	0.0	0.0	0.0	0.0 Т_	16.5	0.0	1 - 22.0	Do Not Pajact Null Hypothesis
				1-	N_0					1-	N_3			Do Not Reject Null Hypothesis
					11=9						IN=3			
Null Hypothesis: There is no di	ifferenc	e betv	ween ti	he Refe	erence	Statio	ons and		C 009 ii	n the S	pecies	indic	ated	
Station Designation	SI	JBC 0	06	S	UBC 00	07	S	UBC 00	08	SI	JBC 00)9		
Macoma bathica	0	0	0	0	0	0	0	0	0	0	0	0	< ■ 0.05	
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	GS 8	Tabular Value
Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5	
Wilcoxon Rank	65	65	65	6.5	65	65	6.5	65	65	6.5	6.5	65	T'= 19.5	
	0.0	0.0	0.0	T=	58.5	0.0	0.0	0.0	0.0	T=	19.5	0.0	1 = 10.0	Do Not Reject Null Hypothesis
	1				N-9				1		N=3		1	
					11-5						=0			

			able	19 SU	JBC 0	10 / F	Refere	nce (Condi	tion C	omp	arisor	าร	
Null Hypothesis: There is no di	ifferen	ce betv	ween tl	he Refe	erence	Statio	ons and	SUB	C 010 i	n the N	lumbe	r of An	imals/Sampl	e
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	Sl	JBC 0	10		
Number of Animals/Sample	247	309	370	69	71	103	231	53	121	491	198	532	< 🖬 0.05	
Excel Rank	8	9	10	2	3	4	7	1	5	11	6	12	a 🖓	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1	T= 29	
Wilcoxon Rank	8	9	10	2	3	4	7	1	5	11	6	12	T'= 10	
				T=	49					T=	29			Do Not Reject Null Hypothesis
	-				N=9					-	N=3	-	-	
Null Hypothesis: There is no di	ifferen	ce betv	ween tl	he Refe	erence	Statio	ons and		C 010 ii	n the N	umbe	r of Sp	ecies/Sampl	e
Station Designation	l s	UBC 0	06	S	UBC 0	07	S	UBC 0	08	SL	JBC 0	10		-
Number of Species/Sample	5	6	8	5	6	6	6	4	7	8	7	8	< 🖬 0.05	
Excel Rank	2	4	10	2	4	4	4	1	8	10	8	10	a~ 8	Tabular Value
Matches	2	4	3	2	4	4	4	1	2	3	2	3	T= 30.5	
Wilcoxon Rank	2.5	5.5	11	2.5	5.5	5.5	5.5	1	8.5	11	8.5	11	T'= 8.5	
				T=	47.5					T=	30.5			Do Not Reject Null Hypothesis
	1				N=9				i		N=3	1	1	, , , , , , , , , , , , , , , , , , ,
Null Hypothesis: There is no di	ifferen	ce betv	ween tl	he Refe	erence	Statio	ons and	I SUBO	C 010 i	n the D	omina	int Spe	ecies % of Sa	Imple
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	รเ	JBC 0	10		•
Dominant Species % of Sample	27.5	25.6	37.8	17.4	12.7	27.2	76.2	17	21.5	52.5	41.4	53.4	< 🖬 0.05	
Excel Rank	7	5	8	3	1	6	12	2	4	10	9	11	<i>G</i> ~ 8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1	T= 30	
Wilcoxon Rank	7	5	8	3	1	6	12	2	4	10	9	11	T'= 9	
				T=	48					T=	30			Do Not Reject Null Hypothesis
	=				N=9				:	=	N=3	=	=	
										The do	ominan	t speci	es may not b	e the same for every station
Null Hypothesis: There is no di	ifferen	ce betv	ween tl	he Refe	erence	Statio	ons and	I SUBO	C 010 i	n the S	pecies	s indica	ated	
Station Designation	S	UBC 0	06	S	UBC 0	07	S	UBC 0	08	รเ	JBC 0 ⁻	10		
Potamopyrgus antipodarum	68	79	140	12	9	28	176	9	26	258	82	284	< 🖬 0.05	
Excel Rank	6	7	9	3	1	5	10	1	4	11	8	12	& 8	Tabular Value
Matches	1	1	1	1	2	1	1	2	1	1	1	1	T= 31	
Wilcoxon Rank	6	7	9	3	1.5	5	10	1.5	4	11	8	12	T'= 8	
				T=	47					T=	31			Reject Null Hypothesis
	-				N=9				:	-	N=3	=	-	

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Null Hypothesis: There is no di	ifferen	ce betv	ween tl	ne Refe	erence	Statio	ons and	SUBC	C 010 ii	n the S	pecies	s indic	ate	d	
Station Designation	S	UBC 0	06	SI	JBC 0	07	SI	JBC 00)8	Sl	JBC 01	10			
Oligochaeta	1	3	3	23	26	35	39	26	28	20	12	8	<	0.05	
Excel Rank	1	2	2	7	8	11	12	8	10	6	5	4		GD 8	Tabular Value
Matches	1	2	2	1	2	1	1	2	1	1	1	1		T= 15	
Wilcoxon Rank	1	2.5	2.5	7	8.5	11	12	8.5	10	6	5	4		T'= 24	
				T=	63					T=	15				Do Not Reject Null Hypothesis
					N=9						N=3				
Null Hypothesis: There is no di	ifferen	ce betv	ween tl	ne Refe	erence	Statio	ons and	SUBC	C 010 ii	n the S	pecies	indic	ate	d	
Station Designation	S	UBC 0	06	SI	JBC 0	07	SI	JBC 00	08	SI	JBC 01	10			
Americorophium salmonis	175	217	206	26	21	23	10	12	43	174	91	202	<	0.05	
Excel Rank	9	12	11	5	3	4	1	2	6	8	7	10		GD 8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1		T= 25	
Wilcoxon Rank	9	12	11	5	3	4	1	2	6	8	7	10		T'= 14	
				T=	53					T=	25				Do Not Reject Null Hypothesis
	=				N=9				1	1	N=3		=		, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Null Hypothesis: There is no di	ifferen	ce betv	ween tl	ne Refe	erence	Statio	ns and	SUBC	C 010 ii	n the S	pecies	indic	ate	d	
Station Designation	S	UBC 0	06	SI	JBC 0	07	SI	JBC 00	08	SI	JBC 01	10			
Eogammarus confervicolis	1	7	13	0	0	0	0	0	2	31	9	24	<	0.05	
Excel Rank	6	8	10	1	1	1	1	1	7	12	9	11		GSA 8	Tabular Value
Matches	1	1	1	5	5	5	5	5	1	1	1	1		T= 32	
Wilcoxon Rank	6	8	10	3	3	3	3	3	7	12	9	11		T'= 7	
				T=	46					T=	32				Reject Null Hypothesis
	-				N=9				-	-	N=3		=		
Null Hypothesis: There is no di	fforon	co hoti	voon ti	no Pofe	ronco	Statio	ne and		• 010 ii	n tha S	nacios	india	ato	d	
Station Designation	lineren:					318110	nis anu ci		וו טוט פר סר				ale	u	
			1	1	2000	21	1		ر ۸	2		10	_		
	1	1	1 5	I E	3 11	2	I E	1	4	2	1	1 5			Tabular Valua
EXCEL RAIK		1	Э 4	Э 4	1	9	D ⊿	1	12	9	1	S ⊿		6€/'O T 10E	
Wilcoven Denk	4	4	4	4	1	∠ 0.5	4	4	10	2 0.5	4	4 6 5		1 = 10.0	
	2.5	2.5	0.0	с.о т		9.5	0.D	2.5	12	9.5 T	∠.⊃ 10 E	0.0		1 = 20.5	De Net Deiget Null Hymethesis
	l			1=	59.5					1=					Do Not Reject Null hypothesis
					IN=9						IN=3				

Null Hypothesis: There is no difference between the Reference Stations and SUBC 000 SuBC 001 SuBC 010 Curracea 0 0 0 1 <th></th> <th></th> <th>_</th> <th>_</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>_</th> <th></th>			_	_										_		
Station Designation brevis limitolaSUBC 006 0SUBC 007 0SUBC 008 0SUBC 007 0SUBC 007 0SUBC 007 0SUBC 007 0SUBC 010 0SUBC 010 0SUB	Null Hypothesis: There is no di	ifferen		veen ti	ne Refe	erence	Statio	ons and		C 010 ii	n the S	pecies	indic	cated		
Nerest limition 0 1 2 7 9 3 4 6 16 4 2 5 K 0.05 K 0.05 Excel Rank Matches 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1<	Station Designation	2		06	_ 5		07	5	OBC 0	08	5	JRC 01	10 _			
Excel Rank123101156912638 $A^{\circ} B$ Tabular ValueWilcoxon Rank123.5101156.59126.53.58T=13Wilcoxon Rank123.5101156.59126.53.58T=21Null Hypothesis: There is no difference between the Reference Stations and SUBC 010the Species indicatedSUBC 010SUBC 010SUBC 010CCTabular ValueCumacea0003120000CCTabular ValueMatches10101011111111T=16.5Tabular ValueWilcoxon Rank5.55.55.55.55.55.55.55.55.55.55.55.55.55.5Null Hypothesis: There is no difference between the Reference Stations and SUBC 010the Species indicatedT=22.5 <td>Nereis limnicola</td> <td>0</td> <td>1</td> <td>2</td> <td>1</td> <td>9</td> <td>3</td> <td>4</td> <td>6</td> <td>16</td> <td>4</td> <td>2</td> <td>5</td> <td>< ∎ 0.05</td> <td></td>	Nereis limnicola	0	1	2	1	9	3	4	6	16	4	2	5	< ∎ 0.05		
Matches112111211121112111211121112111211121112111211121112111211121112111211121112111 </td <td>Excel Rank</td> <td>1</td> <td>2</td> <td>3</td> <td>10</td> <td>11</td> <td>5</td> <td>6</td> <td>9</td> <td>12</td> <td>6</td> <td>3</td> <td>8</td> <td><i>&</i>∕ 8</td> <td>l abular Value</td>	Excel Rank	1	2	3	10	11	5	6	9	12	6	3	8	<i>&</i> ∕ 8	l abular Value	
Wilcoxon Rank123.5101156.59126.53.58T= 21Do Not Reject Null HypothesisNull Hypothesis: There is no difference between the Reference Stations and SUBC 007SUBC 008SUBC 001SUBC 000SUBC 000O000 <td>Matches</td> <td>1</td> <td>1</td> <td>2</td> <td>1</td> <td>1</td> <td>1</td> <td>2</td> <td>1</td> <td>1</td> <td>2</td> <td>2</td> <td>1</td> <td>T= 18</td> <td></td>	Matches	1	1	2	1	1	1	2	1	1	2	2	1	T= 18		
Null Hypothesis: There is no difference between the Reference Stations and SUBC 008 T = 18 N=3 Do Not Reject Null Hypothesis Null Hypothesis: There is no difference between the Reference Stations and SUBC 008 SUBC 000 SUBC 000 SUBC 000 0 0	Wilcoxon Rank	1	2	3.5	10	11	5	6.5	9	12	6.5	3.5	8	T'= 21		
Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated SUBC 0010 Curacea 0 0 0 3 12 0 <td></td> <td></td> <td></td> <td></td> <td>T=</td> <td>60</td> <td></td> <td></td> <td></td> <td></td> <td>T=</td> <td>18</td> <td></td> <td></td> <td>Do Not Reject Null Hypothesis</td>					T=	60					T=	18			Do Not Reject Null Hypothesis	
Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated Station Designation SUBC 006 SUBC 007 SUBC 008 SUBC 010 < E 0.05 σ 8 Tabular Value Cumacea 10 10 10 10 1<						N=9						N=3				
Station Designation Cumacea SUBC 006 SUBC 007 SUBC 008 SUBC 010 Cumacea SUBC 006 SUBC 010 Cumacea SUBC 006 SUBC 010 Cumacea SUBC 006 SUBC 010 Cumacea SuBC 010 SuBC 010 SuBC 010 SuBC 010 Tabular Value Tabular Value Wilcoxon Rank 5.5 <td< td=""><td>Null Hypothesis: There is no di</td><td>ifferen</td><td>ce betv</td><td>veen tl</td><td>ne Refe</td><td>erence</td><td>Statio</td><td>ons and</td><td>SUBO</td><td>C 010 iı</td><td>n the S</td><td>pecies</td><td>indic</td><td>cated</td><td></td></td<>	Null Hypothesis: There is no di	ifferen	ce betv	veen tl	ne Refe	erence	Statio	ons and	SUBO	C 010 iı	n the S	pecies	indic	cated		
Cumacea000031200<	Station Designation	S	UBC 0	06	S	UBC 00	07	S	UBC 0	08	SI	JBC 01	0			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Cumacea	0	0	0	0	3	12	0	0	0	0	0	0	< 🖬 0.05		
Matches1010101110111010101010101010101010101110	Excel Rank	1	1	1	1	11	12	1	1	1	1	1	1	<i>&</i> ∕ 8	Tabular Value	
Wilcoxon Rank5.55.55.55.511125.55.55.55.55.55.5T'= 22.5Do Not Reject Null HypothesisNull Hypothesis: There is no difference between the Reference Stations and SUBC 010SUBC 010SUBC 010SUBC 010Colspan="5">Colspan="5"Colspan="5">Colspan="5"Colspan="5"Colspan="5"Colspan="5"Colspan="5">Colspan="5"Col	Matches	10	10	10	10	1	1	10	10	10	10	10	10	T= 16.5		
T= 61.5 N=9 T= 16.5 N=3 Do Not Reject Null Hypothesis Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 Corbicula fluminea O 2 4 O	Wilcoxon Rank	5.5	5.5	5.5	5.5	11	12	5.5	5.5	5.5	5.5	5.5	5.5	T'= 22.5		
N=9 N=3 Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated SUBC 006 SUBC 007 SUBC 010 of the species indicated Subc 006 SUBC 007 SUBC 010 of the species indicated Subc 006 SUBC 007 SUBC 010 of the species indicated Corbicula fluminea 0 2 4 0 0 2 4 0 0 2 A Tabular Value SUBC 006 SUBC 010 In the Species indicated Subc 010 1 <th col<="" td=""><td></td><td></td><td></td><td></td><td>T=</td><td>61.5</td><td></td><td></td><td></td><td></td><td>T=</td><td>16.5</td><td></td><td></td><td>Do Not Reject Null Hypothesis</td></th>	<td></td> <td></td> <td></td> <td></td> <td>T=</td> <td>61.5</td> <td></td> <td></td> <td></td> <td></td> <td>T=</td> <td>16.5</td> <td></td> <td></td> <td>Do Not Reject Null Hypothesis</td>					T=	61.5					T=	16.5			Do Not Reject Null Hypothesis
Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated Station Designation SUBC 006 SUBC 007 SUBC 008 SUBC 010 Corbicula fluminea 0 2 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 Image: Correct Corr		E				N=9				=	1	N=3		Ξ	, ,,	
Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated Station Designation SUBC 006 SUBC 007 SUBC 008 SUBC 010 Current of the species indicated Corbicula fluminea 0 2 4 0																
Station Designation Corbicula flumineaSUBC 006SUBC 007SUBC 008SUBC 010SUBC 010SUBC 005SUBC 010SUBC 0	Null Hypothesis: There is no di	ifferen	ce betv	veen tl	ne Refe	erence	Statio	ons and	I SUBO	C 010 iı	n the S	pecies	indic	cated		
Corbicula fluminea0240000000002 I 11	Station Designation	S	UBC 0	06	S	UBC 00	07	S	UBC 0	08	SI	JBC 01	0			
Excel Rank Matches11012111	Corbicula fluminea	0	2	4	0	0	0	0	0	0	0	0	2	< 🖬 0.05		
Matches9219999999992T= 20.5T= 20.5T= 18.5Do Not Reject Null HypothesisWilcoxon Rank510.51255555555510.5T= 20.5T= 18.5Do Not Reject Null HypothesisNull Hypothesis: There is no difference between the Reference Stations and SUBC 010T= 20.5N=3N=3Do Not Reject Null HypothesisStation DesignationSUBC 006SUBC 007SUBC 008SUBC 010SUBC 010SUBC 010Macoma bathica0000000000Matches11111111111Matches1212121212121212121212Wilcoxon Rank6.5 </td <td>Excel Rank</td> <td>1</td> <td>10</td> <td>12</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>10</td> <td><i>&</i>√ 8</td> <td>Tabular Value</td>	Excel Rank	1	10	12	1	1	1	1	1	1	1	1	10	<i>&</i> √ 8	Tabular Value	
Wilcoxon Rank510.5125555555555510.5T'= 18.5Do Not Reject Null HypothesisNull Hypothesis: There is no difference between the Reference Stations and SUBC 010TSUBC 010T'= 18.5Do Not Reject Null HypothesisStation Designation Macoma bathicaSUBC 006SUBC 007SUBC 008SUBC 010SUBC 010CE0.05Excel Rank Matches111	Matches	9	2	1	9	9	9	9	9	9	9	9	2	T= 20.5		
T= 57.5 N=9T= 20.5 N=3Do Not Reject Null HypothesisNull Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicatedStation Designation Macoma bathicaSUBC 006SUBC 007SUBC 008SUBC 010 0OOOOOMacoma bathica Excel Rank000000000000Tabular ValueMatches Wilcoxon Rank12	Wilcoxon Rank	5	10.5	12	5	5	5	5	5	5	5	5	10.5	T'= 18.5		
N=9 N=3 Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicated Station Designation SUBC 006 SUBC 007 SUBC 008 SUBC 010 Macoma bathica 0<					T=	57.5					T=	20.5			Do Not Reject Null Hypothesis	
Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicatedStation DesignationSUBC 006SUBC 007SUBC 008SUBC 010Macoma bathica00000000Maches111111111Matches12121212121212121212Wilcoxon Rank6.56.56.56.56.56.56.56.56.56.56.56.5N=0N=2N=2N=2N=2N=2N=2N=2N=2		Ξ				N=9				Ξ	E	N=3		Ξ		
Null Hypothesis: There is no difference between the Reference Stations and SUBC 010 in the Species indicatedStation Designation $SUBC 006$ $SUBC 007$ $SUBC 008$ $SUBC 010$ Macoma bathica 0 0 0 0 0 0 0 0 Matches 1 1 1 1 1 1 1 1 1 1 Wilcoxon Rank 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 N=0 $N=2$ $N=2$ $N=2$ $N=2$ $N=2$ $N=2$ $N=2$ $N=2$																
Station Designation Macoma bathicaSUBC 006SUBC 007SUBC 008SUBC 010Macoma bathica000000000Excel Rank Matches1111111111Matches121212121212121212121212Wilcoxon Rank6.56.56.56.56.56.56.56.56.56.56.56.56.56.5N=0N=0N=2N=2N=2N=2N=2N=2N=2N=2N=2	Null Hypothesis: There is no di	ifferen	ce betv	ween tl	ne Refe	erence	Statio	ons and	SUB	C 010 iı	n the S	pecies	indic	cated		
Macoma bathica000	Station Designation	S	UBC 0	06	S	UBC 00	07	S	UBC 0	08	SI	JBC 01	0			
Excel Rank111	Macoma bathica	0	0	0	0	0	0	0	0	0	0	0	0	< 🖬 0.05		
Matches12	Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	<i>&</i> 8	Tabular Value	
Wilcoxon Rank 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5	Matches	12	12	12	12	12	12	12	12	12	12	12	12	T= 19.5		
T= 58.5 T= 19.5 Do Not Reject Null Hypothesis	Wilcoxon Rank	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	T'= 19.5		
					T=	58.5					T=	19.5			Do Not Reject Null Hypothesis	
C=N C=N		-				N=9				=	-	N=3		-		

		Т	able 2	20 Ou	tfall ()02 / F	Refere	ence	Condi	ition C	Comp	ariso	ns	i	
											-				
Null Hypothesis: There is no di	fferen	ce bet	ween t	he Refe	erence	Statio	ons and	d Outfa	all 002	in the N	Numbe	er of A	nin	nals/Samp	ble
Station Designation	ຮ	SUBC 0	06	S	UBC 0	07	S	UBC 0	08	Οι	utfall 0	02			
Number of Animals/Sample	247	309	370	69	71	103	231	53	121	809	84	287	<	0.05	
Excel Rank	8	10	11	2	3	5	7	1	6	12	4	9		GS 8	Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	1		T= 25	
Wilcoxon Rank	8	10	11	2	3	5	7	1	6	12	4	9		T'= 14	
				T=	53					T=	25				Do Not Reject Null Hypothesis
	-				N=9						N=3				
		_													_
Null Hypothesis: There is no di	fferen	ce bet	ween t	he Refe	erence	Statio	ons and	d Outfa	all 002	in the l	Numbe	er of S	pec	cies/Samp	le
Station Designation	S	SUBC 0	06	_ S	UBC 0	07	S	UBC 0	08	_ 0	utfall 0	02			
Number of Species/Sample	5	6	8	5	6	6	6	4	7	7	5	6	~	1 0.05	
Excel Rank	2	5	12	2	5	5	5	1	10	10	2	5		&∽ 8 —	l abular Value
Matches	3	5	1	3	5	5	5	1	2	2	3	5		T = 20.5	
Wilcoxon Rank	3	7	12	3	7	7	7	1	10.5	10.5	3	7		T'= 18.5	
				T=	57.5					T=	20.5				Do Not Reject Null Hypothesis
					N=9						N=3				
Null Hypothosis: Thoro is no di	ifforon	co hot	woon t	ha Daf	ronoc	Statio	ne and	1 01146	002	in tha [Jomin	ant Sr		ios % of S	amplo
Station Designation	c					07	0115 and C					ant Sp			ampie
Dominant Species % of Sample	27.5	25.6	37.8	17 /	127	27.2	76.2	17	21.5	60	12 12	11	~		
Evcel Rank	27.J Q	23.0	07.0 Q	17.4	2	7	12	3	5	11	1	10	\mathbf{i}		Tabular Value
Matches	1	1	1	1	1	1	1	1	1	1	1	10		ee 0 T- 22	
Wilcoxon Rank	ı ع	6	a a	1	2	7	12	י ג	5	11	1	10		T'_ 17	
Wilcoxoff Rank	U	0	5	- T=	56	'	12	0	0	т <u>–</u>	22	10		1 - 17	Do Not Reject Null Hypothesis
	1				N=9						N=3		I		
										The do	ominar	nt spec	ies	may not b	e the same for every station
Null Hypothesis: There is no di	ifferen	ce bet	ween t	he Refe	erence	Statio	ons and	d Outfa	all 002	in the S	Specie	es indi	cate	ed	
Station Designation	S	SUBC 0	06	S	UBC 0	07	S	UBC 0	08	Οι	utfall 0	02			
Potamopyrgus antipodarum	68	79	140	12	9	28	176	9	26	274	62	133	×	0.05	
Excel Rank	7	8	10	3	1	5	11	1	4	12	6	9		GS 8	Tabular Value
Matches	1	1	1	1	2	1	1	2	1	1	1	1		T= 27	
Wilcoxon Rank	7	8	10	3	1.5	5	11	1.5	4	12	6	9		T'= 12	
				T=	51					T=	27				Do Not Reject Null Hypothesis
	-				N=9					-	N=3		-		

	Ault Hunothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated														
Null Hypothesis: There is no di	ifferen	ce betv	ween th	ne Refe	erence	Statio	ons and	Outfa	II 002	in the S	Specie	s indio	cate	ed	
Station Designation	S	UBC 0	06	Sl	JBC 00	07	SI	JBC 00	28	Οι	utfall 00)2			
Oligochaeta	1	3	3	23	26	35	39	26	28	20	9	14	×	0.05	
Excel Rank	1	2	2	7	8	11	12	8	10	6	4	5		GL 8	Tabular Value
Matches	1	2	2	1	2	1	1	2	1	1	1	1		T= 15	
Wilcoxon Rank	1	2.5	2.5	7	8.5	11	12	8.5	10	6	4	5		T'= 24	
				T=	63					T=	15				Do Not Reject Null Hypothesis
					N=9						N=3				
Null Hypothesis: There is no di	ifferen	ce betv	veen th	ne Refe	erence	Statio	ons and	l Outfa	II 002	in the S	Specie	s indio	cate	ed	
Station Designation	S	UBC 0	06	รเ	JBC 00	07	SI	JBC 00	08	Οι	utfall 00)2			
Americorophium salmonis	175	217	206	26	21	23	10	12	43	484	10	126	×	0.05	
Excel Rank	9	11	10	6	4	5	1	3	7	12	1	8		GS 8	Tabular Value
Matches	1	1	1	1	1	1	2	1	1	1	2	1		T= 21.5	
Wilcoxon Rank	9	11	10	6	4	5	1.5	3	7	12	1.5	8		T'= 17.5	
				T=	56.5					T=	21.5				Do Not Reject Null Hypothesis
	=				N=9					8	N=3		Ξ		
Null Hypothesis: There is no di	ifferen	ce betv	ween th	ne Refe	rence	Statio	ns and	Outfa	II 002	in the S	Specie	s indio	cate	ed	
Station Designation	S	UBC 0	06	SI	JBC 00	07	SI	JBC 00	28	Οι	utfall 00)2			
Eogammarus confervicolis	1	7	13	0	0	0	0	0	2	15	0	0	<	0.05	
Excel Rank	8	10	11	1	1	1	1	1	9	12	1	1		a 8	Tabular Value
Matches	1	1	1	7	7	7	7	7	1	1	7	7		T= 20	
Wilcoxon Rank	8	10	11	4	4	4	4	4	9	12	4	4		T'= 19	
				T=	58					T=	20				Do Not Reject Null Hypothesis
	-				N=9					=	N=3		-		
Null Hypothesis: There is no di	ifferen	ce betv	ween th	ne Refe	rence	Statio	ns and	Outfa	II 002	in the S	Specie	s indio	cate	ed	
Station Designation	S	UBC 0	06	SI	JBC 00	07	SI	JBC 00	28	Οι	utfall 00)2			
Hobsonia florida	0	0	1	1	3	2	1	0	4	7	1	2	<	0.05	
Excel Rank	1	1	4	4	10	8	4	1	11	12	4	8		GS 8	Tabular Value
Matches	3	3	4	4	1	2	4	3	1	1	4	2		T= 26	
Wilcoxon Rank	2	2	5.5	5.5	10	8.5	5.5	2	11	12	5.5	8.5		T'= 13	
				T=	52					T=	26				Do Not Reject Null Hypothesis
	-				N=9					-	N=3		-		

Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated															
Station Designation	S	UBC 0	06	SUBC 007			SUBC 008			Outfall 002					
Nereis limnicola	0	1	2	7	9	3	4	6	16	7	2	10	<	0.05	
Excel Rank	1	2	3	8	10	5	6	7	12	8	3	11		GD 8	Tabular Value
Matches	1	1	2	2	1	1	1	1	1	2	2	1		T= 23	
Wilcoxon Rank	1	2	3.5	8.5	10	5	6	7	12	8.5	3.5	11		T'= 16	
				T=	55					T=	23				Do Not Reject Null Hypothesis
	-				N=9					-	N=3		-		
Null Hypothesis: There is no difference between the Reference Stations and Outfall 002 in the Species indicated															
Station Designation															
Cumacea	0	0 000	00	0	3	12	0	0000	0	0		0	~		
Excel Rank	1	1	1	1	11	12	1	1	1	1	1	1	ì	ac 8	Tabular Value
Matches	10	10	10	10	1	1	10	10	10	10	10	10		55 U T= 16 5	
Wilcoxon Rank	55	55	55	55	11	12	55	55	55	55	55	55		T' = 22.5	
WIICOXOFF RAFIK	5.5	0.0	5.5	5.5 Т-	61 5	12	5.5	5.5	5.5	5.5 Т_	16.5	0.0		1 - 22.5	Do Not Reject Null Hypothesis
															Do Not Reject Null Hypothesis
					11-3						IN=5				
Null Hypothesis: There is no di	ifferend	e bet	ween t	he Refe	erence	Statio	ons and	l Outfa	ill 002	in the S	Specie	s indio	cate	ed	
Station Designation	S	UBC 0	06	SUBC 007			SI	SUBC 008			Outfall 002				
Corbicula fluminea	0	2	4	0	0	0	0	0	0	2	0	2	<	0.05	
Excel Rank	1	9	12	1	1	1	1	1	1	9	1	9		GD 8	Tabular Value
Matches	8	3	1	8	8	8	8	8	8	3	8	3		T= 24.5	
Wilcoxon Rank	4.5	10	12	4.5	4.5	4.5	4.5	4.5	4.5	10	4.5	10		T'= 14.5	
				T=	53.5					T=	24.5				Do Not Reject Null Hypothesis
	-				N=9					-	N=3		-		
Null Hypothesis: There is no difference between the Peference Stations and Outfall 002 in the Species indicated															
Station Designation	S		06	S)7	SI		08		utfall 00)2	l	, a	
Macoma bathica	0	0 000	0	0	0000	0	0	0000	0	0	0	0	~		
Excel Rank	1	1	1	1	1	1	1	1	1	1	1	1	Ì	0.00 a∠ 8	Tabular Value
Matches	12	12	' 12	12	' 12	' 12	' 12	12	' 12	12	' 12	12		T= 195	
Wilcoxon Rank	65	65	65	65	65	65	65	65	65	65	65	65		T'_ 10.0	
	0.0	0.0	0.0	0.0 T_	58 5	0.0	0.0	0.0	0.0	0.0 T_	19.5	0.0		1 - 10.0	Do Not Reject Null Hypothesis
	1			- 1	N_Q					1-	N-3		1		De not Reject null Hypothesis
					11-3						11-0				