

***A Review of Historic Chesapeake Bay Program Zooplankton  
Data and Analysis of Recounted Archived Sample***

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## ***Current Data Usage Recommendation***

After extensive examination of historic Chesapeake Bay Program (CBP) mesozooplankton monitoring data, and in consideration of the known methodological and data quality issues, the Chesapeake Bay Program is issuing the following data usage recommendation: Only mesozooplankton samples enumerated with Hensen-Stempel methodologies are recommended for use in quantitative analyses. These data have method codes MZ101A, MZ101B, MZ101C, and MZ103. Data quality issues have been identified for portions of the Virginia record. Virginia samples collected prior to 1993 and enumerated with method MZ102, as well as those samples collected between 1993 and 2000 and enumerated with method MZ102 or MZ102B, should only be used for qualitative purposes. Species-specific correction factors have been developed for samples collected between 1993 and 1997 and enumerated with MZ102. Data adjusted by these factors have method code MZ102\_C and can be used with discretion in quantitative analysis on a bay wide basis.

## ***Background***

The Chesapeake Bay Water Quality Monitoring Program included a zooplankton monitoring component from 1984-2002. Mesozooplankton samples were collected and enumerated by Versar, Inc. for Maryland and by Old Dominion University (ODU) for Virginia. Samples were collected with a towed, 202 $\mu$  mesh plankton nets at up to 36 fixed monitoring stations in the mainstem and tidal tributaries. Split sample comparisons conducted between 1998 and 2000 demonstrated that numerous differences in field collection and laboratory enumeration procedures which resulted in biases that significantly affected data quality and both taxonomic and numeric comparability. These differences between and within laboratory methods have compromised the ability to combine data sets on a bay-wide basis for development of zooplankton community health indicators, reporting of bay-wide status and trends and support food web modeling efforts.

In the Maryland program, mesozooplankton were collected in the field, with stepped oblique bongo net tows at each station. Bongo nets were deployed 0.5 meters above the bottom and nets were raised in 1-4 meter increments (usually 0.5 to 1 .5 minutes/step) depending on station depth with a minimum of 5 steps per station. In the laboratory, samples were enumerated using a standard subsampling technique with a Hensen-Stempel pipette (HS) (Harris et.al. 2000). The technique was modified slightly three times over the 18 year history of the program. The standard Hensen-Stempel (HS) count and a whole sample scan for macrozooplankton (amphipods, shrimp, fish eggs, fish larvae and juvenile fish, etc.) was performed on each sample between 1984 and 1989 (denoted as method MZ101A). The macrozooplankton sample scan was temporarily discontinued from 1990 to 1996 (MZ101B). In 1996 the macro-zooplankton scan was reinstated and large bodied mesozooplankton species occurring in small

numbers in the initial count were enumerated in special 850-micron sieve counts were again reported (MZ101C).

In the Virginia program, field samples were collected by taking five minute double-oblique pattern bongo net tows from bottom to surface. From 1985 to 1992, it is unclear whether or not the bongo nets used for field sampling were equipped with flow meters to accurately estimate the volume of water filtered through the nets during a tow. The volume of water filtered during a tow may have been estimated using the length of the tow and area of the net's opening. In 1993, a flow meter was mounted on the nets. In the laboratory, the Virginia program used several different enumeration techniques. From 1985 to 1997 a Controlled Variability Sampling (CVS) method (method MZ102) described by Alden et al. 1982 was used. The CVS technique used a connected series of five wet sieves (200, 300, 600, 850, and 2000 microns) and a mechanized shaking apparatus to separate and count zooplankton by size fraction. Split sampling tests in early 1998 revealed that smaller zooplankton slipped through the last 200 micron sieve and CVS enumerated samples consistently reported lower plankton densities than the HS enumerated samples (ICPRB, 2000). Furthermore, the sieving process appeared to break off fragile plankton appendages making taxa identifications more difficult. In March 1998 a 75 micron sieve was added to the sieve stack in hopes of capturing the smaller plankton lost by the original CVS method (method MZ102B). This modification to the CVS method was found to be ineffective (ICPRB 2000) and abandoned in favor of the Hensen-Stempel pipette method which included a macrozooplankton scan and a 850-micron sieve counts in 2000 (method MZ103). Data enumerated during this period was given a unique method code until its comparability to other HS enumerated data could be assessed.

Fortunately, as standard practice in the Virginia program, all original field samples were split into halves, one was enumerated and the other was archived. This presented an opportunity to recount archive samples using Hensen-Stempel methodology. Counts from archive samples could fill data gaps in the historic record created by CVS enumerated samples and allow for the development of correction factors to make CVS data comparable with HS enumerated data, thus expanding the historic data record. In 2002, Old Dominion University went into the archives and counted 189 archive samples using HS technique (Carpenter et. al. 2003). These samples served as the basis to develop the first correction factors for summer mesohaline and polyhaline CVS (MZ102) enumerated samples (Carpenter et. al 2006). No correction factors have been developed for samples enumerated with method MZ102B.

When all zooplankton sampling terminated in October 2002, approximately 1,000 archived samples dating from 1996 to 2002 were in storage at Old Dominion University. In 2005, the CBP took formal custody of these samples with the intent to enumerate them with the HS pipette sub-sampling technique. Funding for recounting a portion of the archive samples became available from CBP in early 2006. Seventy-two archived Virginia mesozooplankton samples were counted by Versar, Inc. Samples collected during the summer (July- September) in mesohaline and polyhaline waters were targeted for counting because the results could be used as validation samples for the Zooplankton Indexes of Biotic Integrity (ZIBI) which were in various stages of development. These counts also allowed for additional

method comparisons, namely comparisons of HS method counts performed by the Maryland and Virginia laboratories, and comparisons of HS and CVS counts to further refine correction factors for method MZ102 counts originally published in Carpenter et al. 2006. The remainder of this report will address the validation of the proposed zooplankton IBI's, various between and within method/ laboratory comparisons, refinement of the current CVS correction factors and provide guidance on proper utility of the available zooplankton record.

**Table 1. Composite list of mesozooplankton enumeration method used in the historic Chesapeake Bay zooplankton monitoring programs.**

METHOD CODE	DESCRIPTION	USAGE PERIOD	STATE/ LABORATORY
MZ101A	Hensen-Stempel Count with macrozooplankton scan	July 1984 through December 1998	MD\VERSAR
MZ101B	Hensen-Stempel Count with out macrozooplankton scan	January 1999 through December 2001	MD\VERSAR
MZ101C	Hensen-Stempel Count with macrozooplankton scan and special 850-micron sieve count  Note both MZ101B and MZ101C counts were reported from July 1996-December 2001	July 1996 through October 2002	MD\VERSAR
MZ102	Controlled Variability Sampling Method	July 1985 through December 1997	VA\ ODU
MZ102B	Controlled Variability Sampling Method with 75 µ sieve modification	January 1998 through April 2000	VA\ ODU
MZ103	Hensen-Stempel Count with macrozooplankton scan and special 850-micron sieve count	January 2000 through October 2002	VA\ ODU

## ***Methods Comparisons***

A major benefit of having the archived Virginia mesozooplankton samples enumerated with the Hensen-Stempel technique was that it allowed for two method comparisons to be made. First, it allowed for a statistical comparison of Versar vs. ODU enumerated samples under identical enumeration techniques to better assess data comparability of the data between laboratories. Second, it allowed for the evaluation of the performance of correction factors developed for MZ102 (1993 – 1997 data). For both of these analyses sixteen commonly caclulated zooplankton metrics were calculated using protocol described in (Carpenter et. al., 2006). The resulting data was first graphically assessed using log-log plots (Appendix A) to detect any obvious trends or biases over a variety of commonly calculated zooplankton metrics (Table 2). Note that the units for all data are in number of organism\* M<sup>-3</sup>. The dot color denotes the methods of enumeration being compared. CVS corrected data is denoted as method MZ102\_C.

Three basic comparisons are shown: comparisons of Versar HS counts vs. corrected ODU CVS counts (MZ101C/MZ102\_C), Versar HS counts vs. ODU HS counts (MZ101C/MZ103) and ODU HS counts vs. corrected ODU CVS counts (MZ103/MZ102\_C). Note that in the MZ101C/MZ102\_C and MZ101C/MZ103 comparisons, the MZ101C counts data are represented on the y-axis. The red one to one line indicates where data points should fall if there were no significant differences between labs and counting methods. Differences in the various methods were evaluated using the Wilcoxon Matched- Pairs Signed-Ranks Test on untransformed abundance values (Appendix B- Statistical Comparison of Versar Hensen-Stempel counts and ODU Corrected Controlled Variability Sampling Method Counts by Parameter, Appendix C- Statistical Comparisons of Versar and ODU Hensen-Stempel Counts By Parameter).

**Table 2. Commonly computed mesozooplankton metrics used for method comparison. Parameters in the zooplankton index of biotic integrity are denoted by \* for polyhaline and # for mesohaline.**

ACARTIA_ABUNDANCE #	BALANIDAE_ABUNDANCE **
BLUE_CRAB_ABUNDANCE	BOSMINA_ABUNDANCE
CALANOIDA_ABUNDANCE	CLADOCERA_ABUNDANCE*
COPEPODA_ABUNDANCE *	CYCLOPOIDA_ABUNDANCE #
EURYTEMORA_ABUNDANCE	HARPACTICOIDA_ABUNDANCE
MARGALEFS_INDEX	PREDATOR_ABUNDANCE*
SIMPSON'S_DIVERSITY_INDEX *	SHANNON-WEINER_DIVERSITY_INDEX
TAXA_RICHNESS	TOTAL_ABUNDANCE **

Through all comparisons Blue Crab abundance, *Bosmina* abundance, *Eurytemora* abundance, and Harpacticoida abundance show significant variability. This variability is likely a function of low organisms encounter rates in the target season and/or salinity regimes rather than any method or laboratory biases.

### **Versar HS vs. Corrected ODU CVS counts (MZ101C/MZ102\_C) Comparisons**

The comparisons are based on 28 of the 78 recount samples and data are denoted as blue dots in all graphs in Appendix A with accompanying statistics in Appendix B. In zooplankton groups which are prevalent in summer (July- September) mesohaline and polyhaline waters (*Acartia* abundance, Balanidae abundance, Calanoida abundance, Cladocera abundance, Copepoda abundance, Predator abundance, Total Abundance) when density dropped below 1000 organisms\*m<sup>-3</sup> Versar was finding higher abundances. Above the 1000 organism per meter cubed threshold densities for all MZ102\_C counts between the labs converged. This seemed to be consistent with previous split sample findings (ICPRB 2000). There was clear bias in *Cyclopoida* abundance, Versar counts were generally higher than ODU (Wilcoxon Signed Rank Test, S=113, P=<.0001). Over all the CVS correction factors developed for the polyhaline Zooplankton Index of Biotic Intergerty (ZIBI) (Carpenter et al. 2006) appear to be effective in equilibrating abundance measurement to HS enumerated values in summer mesohaline and polyhaline region.

Examination of the four measures of species diversity (Margalef's index, Simpson's diversity index, Shannon Weiner index, and taxa richness) provided mixed signals. Simple taxa richness (number



of species counted) and Margalef's index both graphically and statistically shows a clear bias toward HS method consistently identifying more taxa than corrected CVS method counts (MZ101C/MZ102\_C and MZ103/MZ102\_C comparisons). This trend is consistent with previous split sample finding (ICPRB 2000) and contrary to the belief that the strength of the CVS method was that it allowed for rare and common abundant species to be enumerated with equal precision (Alden et al 1982). These analyses also showed that Simpson's diversity index and Shannon-Weiner index do not have the same bias. This was not unexpected because both Simpson's and Shannon Weiner indexes are based on species proportion as part of total abundance, which itself did not show any method biases (ICES, 2000).

### ***Versar HS vs. ODU HS Count (MZ101C/MZ103) Comparisons***

MZ101C/MZ103 comparisons were based 28 of the 78 recount samples, are denoted as green dots in all graphs in Appendix A with accompanying statistics in Appendix C. Overall mesozooplankton data enumerated by Old Dominion University using Hensen-Stempel methodology are reasonably compatible with Versar results. Just like the MZ101C/MZ102\_C data, MZ101C/MZ103 also showed density decline in common groups below 1000 organisms\*m<sup>-3</sup> with the same Versar bias. In regards to species diversity Versar consistently found more taxa per sample than ODU (Wilcoxon Signed Rank Test, S=173.5, P= <.0001). However it may be possible to partly accommodate this gap by collapsing taxa to Genus or other larger taxonomic levels before calculating diversity metrics.

### ***Refinement of CVS correction Factors***

One short coming of the CVS correction factors developed for the ZIBI (Carpenter et al, 2006) was that genus specific correction factors could not be calculated for all major groups due a low number of organism occurrences in the original 189 ODU Hensen Stempel recount samples. With the addition of the 72 Versar recounts samples it is possible to refine existing correction factors and calculate taxa specific correction factors for *Evadne sp.*, *Labidocera sp.*, *Leptodora sp.*, *Podon sp.*, and *Penilia sp.*. Previously these taxa had been lumped into group correction factors. Updated correction factors were calculated using the same procedure used in Carpenter et.al. 2006. First, all "exclusion" taxa were removed from the data set (Table 2). Exclusion taxa are defined as those taxa appearing in the data set not considered to be true mesozooplankton or plankton not well sampled by bongo net protocols. Counts of all taxa identified to species were group to genus and summed. CVS and HS data were then matched by station, date and taxa. Since zooplankton population usually have an underlying log normal distribution, correction factors were estimated using a log normalized geometric mean procedure (Gilbert,1987). The updated and ZIBI correction factors can be found in Table 3. For taxa groups where sample size was less than 5 in most cases, groups were pooled to calculate order or other higher level taxonomic level conversion factor.

**Equation 1) Log normal geometric mean calculation for zooplankton method MZ102 correction factors.**

$$\text{anti log} \left( \frac{\sum \log(\text{HS\_count}) - \log(\text{CVS\_count})}{N} \right)$$

Where

HS\_Count = Taxa\_Henson\_Stemple\_Count

CVS\_Count = Uncorrected\_Taxa\_CVS\_Count

N = Total\_Number\_of\_samples\_with\_taxa

**Table 3. Current list of mesozooplankton exclusion species**

<i>Acarina</i>	<i>Gammarus fasciatus</i>	<i>Micropogonias undulatus</i>
<i>Actinopterygii</i>	<i>Gasterosteus aculeatus</i>	<i>Mnemiopsis brachei</i>
<i>Aegathoa medialis</i>	<i>Globorotalia</i>	<i>Mnemiopsis leidyi</i>
<i>Alosa</i>	<i>Gnathostomata</i>	<i>Mollusca</i>
<i>Alosa mediocris</i>	<i>Gobiosox strumosus</i>	<i>Monoculodes</i>
<i>Ammodytes americanus</i>	<i>Gobiidae</i>	<i>Morone</i>
<i>Ampelisca abdita</i>	<i>Gobiosoma</i>	<i>Morone americana</i>
<i>Amphioxus</i>	<i>Gobiosoma bosc</i>	<i>Morone saxatilis</i>
<i>Anchoa</i>	<i>Gobiosoma ginsburgi</i>	<i>Myrophis punctatus</i>
<i>Anchoa hepsetus</i>	<i>Haustoriidae</i>	<i>Mysidacea</i>
<i>Anchoa mitchelli</i>	<i>Heteromysis formosa</i>	<i>Mytilus edulis</i>
<i>Anthomedusae</i>	<i>Hexarthra</i>	<i>Nemertea</i>
<i>Appendicularia</i>	<i>Hippocampus erectus</i>	<i>Nemopsis bachei</i>
<i>Arachnida</i>	<i>Hydra carnea</i>	<i>Nudibranchia</i>
<i>Arcidae</i>	<i>Hydrachnidae</i>	<i>Obelia</i>
<i>Asciacea</i>	<i>Hydridae</i>	<i>Oxyurostylis smithi</i>
<i>Atherinidae</i>	<i>Hydroida</i>	<i>Paracaprella tenuis</i>
<i>Aurelia aurita</i>	<i>Hydrozoa</i>	<i>Paralichthys dentatus</i>
<i>Bairdiella chrysoira</i>	<i>Hyperia</i>	<i>Parathemisto compressa</i>
<i>Beroe ovata</i>	<i>Hyperiididae</i>	<i>Peprilus paru</i>
<i>Bothidae</i>	<i>Hyporhamphus unifasciatus</i>	<i>Perca flavescens</i>
<i>Bougainvillia rugosa</i>	<i>Hypsoblennius hentzi</i>	<i>Piscicolidae</i>
<i>Brachionus</i>	<i>Leiostomus xanthurus</i>	<i>Platyhelminthes</i>
<i>Brachionus calyciflorus</i>	<i>Lepomis macrochirus</i>	<i>Pleuronectes americanus</i>
<i>Brachionus havanaensis</i>	<i>Leptocheirus</i>	<i>Pogonias cromis</i>
<i>Branchiostoma caribaeum</i>	<i>Leptocheirus plumulosus</i>	<i>Rotifera</i>
<i>Brevoortia tyrannus</i>	<i>Leptomedusae</i>	<i>Sciaenidae</i>
<i>Caprella</i>	<i>Leucon americanus</i>	<i>Scophthalmus aquosus</i>
<i>Caprella geometrica</i>	<i>Linvillea agassizi</i>	<i>Scyphozoa</i>
<i>Chasmodes bosquianus</i>	<i>Lironeca redmanii</i>	<i>Semaeostomeae</i>
<i>Chrysaora quinquecirrha</i>	<i>Loligo</i>	<i>Siphonophora</i>
<i>Clupea harengus</i>	<i>Loligo pealeii</i>	<i>Solenidae</i>
<i>Clupeidae</i>	<i>Lolliguncula brevis</i>	<i>Sphoeroides maculatus</i>
<i>Cnidaria</i>	<i>Lucifer faxoni</i>	<i>Stenothoidae</i>
<i>Crassostrea virginica</i>	<i>Melita</i>	<i>Symphurus plagiusa</i>
<i>Ctenophora</i>	<i>Melita nitida</i>	<i>Syngnathus</i>
<i>Cyanea capillata</i>	<i>Membras</i>	<i>Syngnathus fuscus</i>
<i>Cyathura</i>	<i>Membras martinica</i>	<i>Thaliacea</i>
<i>Cyathura polita</i>	<i>Menidia</i>	<i>Trinectes maculatus</i>
<i>Cymothoidae</i>	<i>Menidia beryllina</i>	<i>Turbellaria</i>
<i>Cynoscion Nebulosus</i>	<i>Menidia menidia</i>	Unidentified Beads
<i>Cynoscion Regalis</i>	<i>Menticirrhus</i>	Unidentified Invertebrate
<i>Cyprinidae</i>	<i>Menticirrhus saxatilis</i>	Unidentified Larvae
<i>Dipurena strangulata</i>	<i>Mercenaria mercenaria</i>	Unidentified Shrimp Zoea
<i>Eucheilota ventricularis</i>	<i>Metamysidopsis</i>	<i>Yoldia limatula</i>
<i>Foraminiferida</i>	<i>Microgobius thalassinus</i>	

**Table 4. Updated and Original ZIBI CVS Correction Factors.**

TAXA	UPDATED CORRECTION FACTORS	UPDATED N SIZE	ZIBI CORRECTION FACTORS	ZIBI N SIZE	APPLICATION ORDER	NOTES	DIFFERERECE BETWEEN FACTORS
ACARTIA	2.1596	89	1.9497	61	PRIMARY		0.2099
ANNELIDA	3.1561	38	2.0008	31	SECONDARY		1.1553
BALANIDAE CYPRIS	1.9517	46	1.3929	33	PRIMARY		0.5588
BALANIDAE NAUPLII	3.8881	48	3.0553	40	PRIMARY		0.8328
BIVALVIA	8.7725	18	8.3030	13	SECONDARY		0.4695
BOSMINA	1.4911	33	1.8562	26	PRIMARY		-0.3651
CENTROPAGES	3.2681	27	3.0151	26	PRIMARY		0.2530
CHAETOGNATHA	7.2056	13	9.4861	12	SECONDARY		-2.2805
CLADOCERA	0.6083	11	0.7905	11	SECONDARY	NO BOSMINA,DIAPHANOSOMA, PENILIA, PODONIDAE (EVADNE & PODON) OR LEPTODORA	-0.1822
COPEPODA	4.5430	84			TERTIARY		
CALANOIDA	1.3814	10	2.8256	6	SECONDARY	NO ACARTIA, EURYTEMORA, PARACLANUS, TEMORA, CENTROPAGES, PSEUDODIAPTOMUS, LABIDOCERA	-1.4442
CYCLOPOIDA	1.0664	24	1.9579	21	SECONDARY	NO OTHONIA, MESOCYCLOPS	-0.8915
DIAPHANOSOMA	0.6168	12	0.5869	11	PRIMARY		0.0299
EURYTEMORA	1.8202	35	1.8559	32	PRIMARY		-0.0357
EVADNE	3.7729	10		NA	PRIMARY	PREVIOUSLY PODONIDAE	
GASTROPODA	2.5601	28	1.7694	13	PRIMARY		0.7907
HARPACTICOIDA	3.3654	21	2.6200	20	SECONDARY		0.7454
INSECTA	9.1724	8	9.1724	8	SECONDARY		0.0000
LABIDOCERA	1.8641	13		NA	PRIMARY	PREVIOUSLY PART OF CALANOID	
LEPTODORA	4.5303	6		NA	PRIMARY	PREVIOUSLY PART OF CLADOCERA	
MACROCRUSTACEAN	2.1909	66	1.9883	48	SECONDARY	INCLUDES ALL MALACOSTRACA - EXCEPT NEOMYSIS	0.2026
MESOCYCLOPS	3.7734	19	3.3957	16	PRIMARY		0.3777
NEOMYSIS	0.9711	20	1.1587	17	PRIMARY		-0.1876
OITHONA	9.0220	24	5.6269	21	PRIMARY		3.3951
OSTRACODA	5.0500	2	5.0500	2	PRIMARY		0.0000
PARACALANUS	3.1415	14	2.5148	12	PRIMARY		0.6267
PENILIA	3.3571	8		NA	PRIMARY	PREVIOUSLY PART OF CLADOCERA	
PHORONIDAE	3.0104	5	7.4087	2	PRIMARY		-4.3983
PODON	1.0567	12		NA	PRIMARY	PREVIOUSLY PART OF PODONIDAE	
POLYCHAETA	1.0150	2	1.7975	1	PRIMARY		-0.7825
PSEUDODIAPTOMUS	10.9016	12	8.4097	10	PRIMARY		2.4919
SAGITTA	8.7535	14	9.4610	13	PRIMARY		-0.7075
TEMORA	2.7523	14	2.7523	14	PRIMARY		0.0000

## ***Validation of Zooplankton Indices of Biotic Integrity***

Independent validations of the published polyhaline ZIBI (Carpenter et al., 2006) and the mesohaline ZIBI (Sillett et al. 2005) still under development were performed using counts of the archive samples. Of the 72 archive samples counted by Versar with Hensen-Stempel method (MZ101C), 32 were from polyhaline regions and 31 were from mesohaline regions of the Bay (Appendix E). Another 9 samples were from areas of known salinity but had no acceptably matching water quality data based on the protocol used in the development of both ZIBI's (Carpenter et al., 2006, Sillett et al., 2005). These 9 samples were not used for validation purposes. Of the 87 archived samples enumerated by ODU with the Hensen-Stempel method (MZ103), 38 samples were of the correct season and salinity zones (11 mesohaline, 27 polyhaline) to be used in the IBI validation. Rotifer data for the IBI calculations were drawn from the separate Virginia and Maryland microzooplankton data sets.

The overall mesohaline ZIBI validated well, correctly identifying all the BAD (degraded) sites and the one GOOD (least-impaired) site, and identifying approximately half (57.9%) of the MIXED sites as impaired. These results validate the draft mesohaline ZIBI as a potential management tool. Discrimination efficiencies of most of the component metrics also performed well. However, the balanidae larvae discrimination efficiency was low (<50%). Barnacle larvae discrimination efficiency in the calibration data set used to develop the mesohaline ZIBI was only 63.2%. The combined calibration and validation results put into question the usefulness of balanidae larvae as a metric sensitive to habitat conditions as they were defined for purposes of building an IBI. The rotifer discrimination efficiency was borderline (45.5%) in BAD habitats in the validation data set; it was high (80%) in GOOD habitats and relatively low (57.6%) in BAD habitats in the calibration data set. These results suggest that, barring any taxonomic identification differences between the states, rotifer abundance may be a robust indicator of least-impaired (GOOD) conditions but not of degraded (BAD) conditions.

The validation results for the polyhaline ZIBI suggest the original metric scoring thresholds should be recalculated. The polyhaline ZIBI scoring thresholds were developed from a combination of MZ102 data adjusted with the original correction factors (1993 – 1997) and MZ103 data (2000 – 2002). The addition of the Versar Hensen-Stempel counts of archived polyhaline samples (MZ101C) to the ODU Hensen-Stempel counts of archived samples (MZ103) produced updated correction factors (Table 2), with differences ranging from -146% to +38%. These new correction factors will further adjust the original MZ102 data values in the calibration data set. They can be expected to change the original metric scoring thresholds of the polyhaline ZIBI. Despite this, the original polyhaline ZIBI thresholds correctly classified 72.7% of the BAD sites in the validation data set, as compared to 93.6% in the original, calibration data set. Discrimination efficiencies for the copepod (sum of all copepod taxa), rotifer, and total mesozooplankton abundance metrics were poor, however.

The current ZIBI validation efforts suggest that more counts of archived samples from reference conditions are required for a thorough evaluation of indices. The original development process for the

polyhaline ZIBI should be repeated and new metric scoring thresholds calculated. The new calibration data set should include the MZ102 data adjusted with the latest correction factors and all the Versar and ODU counts of archived samples be used in the development and validation of the new scoring thresholds.

**Classification efficiencies for the mesohaline ZIBI and discrimination efficiencies of the individual ZIBI metrics.** The numbers and percentages of samples whose metrics or IBI score correctly identify BAD (impaired) and GOOD (least-impaired) habitat conditions are shown. The numbers and percentages of MIXED habitat conditions identified by the IBI as impaired (~50% expected) are also shown.

MESOHALINE_WQ CATEGORY	ACARTIA_ABUNDANCE	BALANIDAE_ABUNDANCE	CYCLOPOIDA_ABUNDANCE	ROTIFERS_ABUNDANCE	TOTAL_ABUNDANCE	ZIBI_SCORE
Score <3	21	2	17	10	20	22
Total n of BAD habitats	22	22	22	22	22	22
Percent	95.5%	9.1%	77.3%	45.5%	91.0%	100.00%
Score >=3	1	0	1	1	1	1
Total n of GOOD habitats	1	1	1	1	1	1
Percent	100.0%	0.0%	100.0%	100.0%	100.0%	100.0%
Score <3	8	7	16	5	9	11
Total n of MIXED habitats	19	19	19	19	19	19
Percent	42.1%	36.8%	84.2%	26.3%	47.4%	57.9%

**Table 5. Classification efficiencies for the polyhaline ZIBI and discrimination efficiencies of the individual ZIBI metrics.** The numbers and percentages of samples whose metrics or IBI score correctly identify BAD (impaired) habitat conditions are shown. The numbers and percentages of MIXED habitat conditions identified by the IBI as impaired (~50% expected) are also shown.

POLYHALINE_WQ CATEGORY	BALANIDAE_ABUNDANCE	CLADOCERA_ABUNDANCE	COPEPODA_ABUNDANCE	PREDITOR_ABUNDANCE	ROTIFERS_ABUNDANCE	SIMPSON_DIVERSITY	TOTAL_ABUNDANCE	ZIBI_SCORE
Score <3	16	27	25	33	21	29	29	37
Total n of MIXED habitats	48	48	48	48	48	48	48	48
Percent	33.3%	56.3%	52.1%	68.8%	43.8%	60.4%	60.4%	77.1%
Score <3	8	8	3	10	4	11	3	8
Total n of BAD habitats	11	11	11	11	11	11	11	11
Percent	72.7%	72.7%	27.3%	90.1%	36.4%	100.0%	27.3%	72.7%

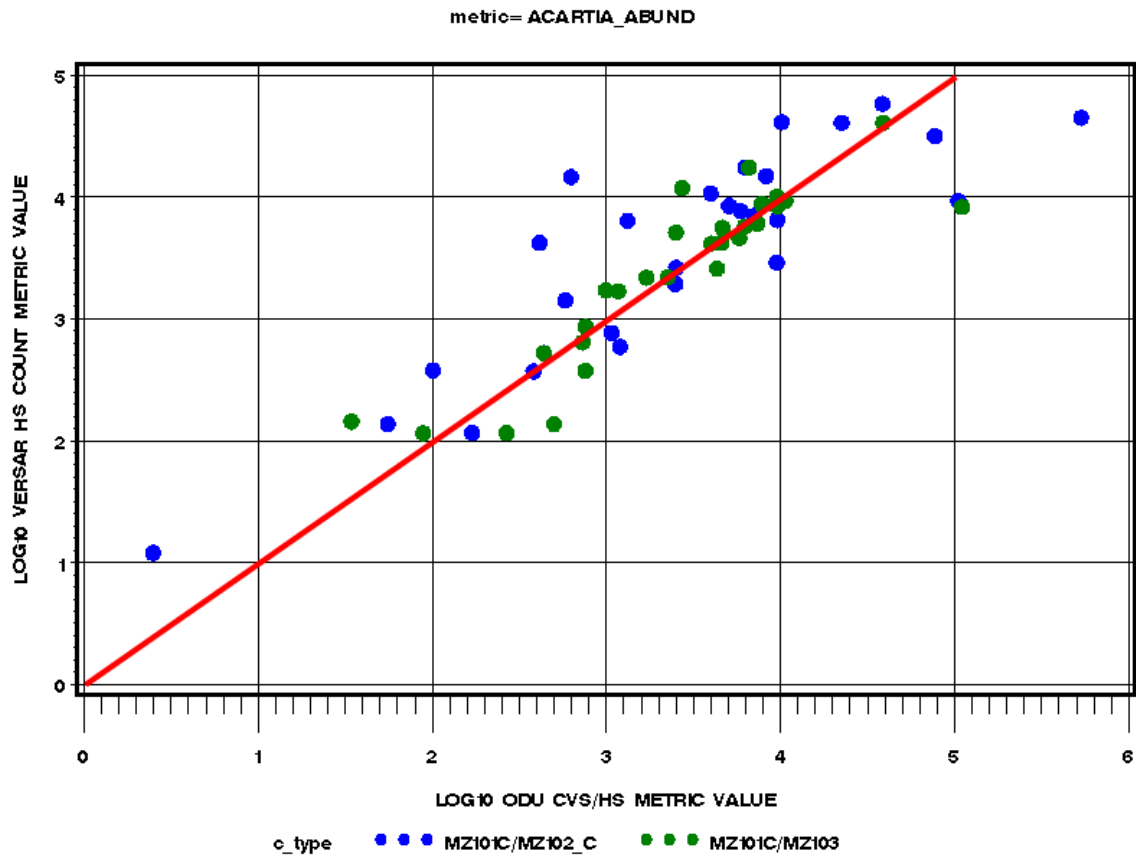
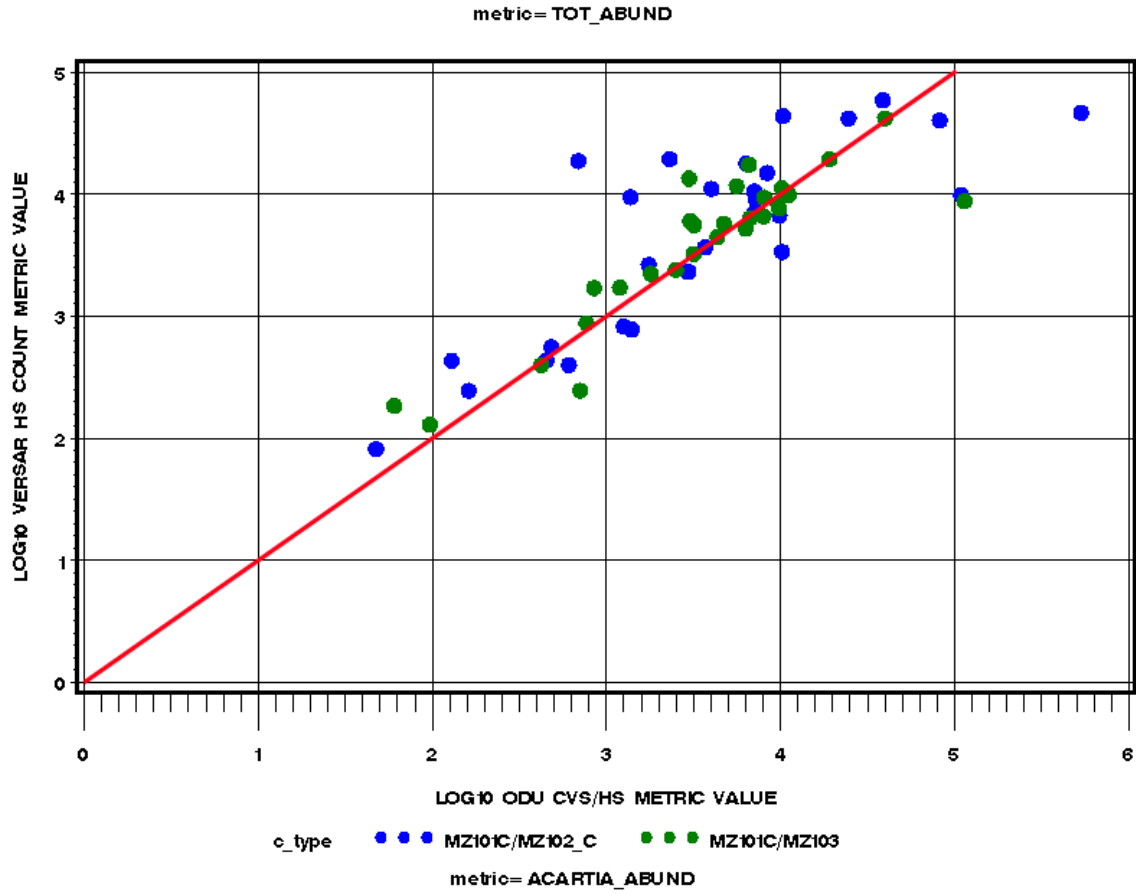
## **References**

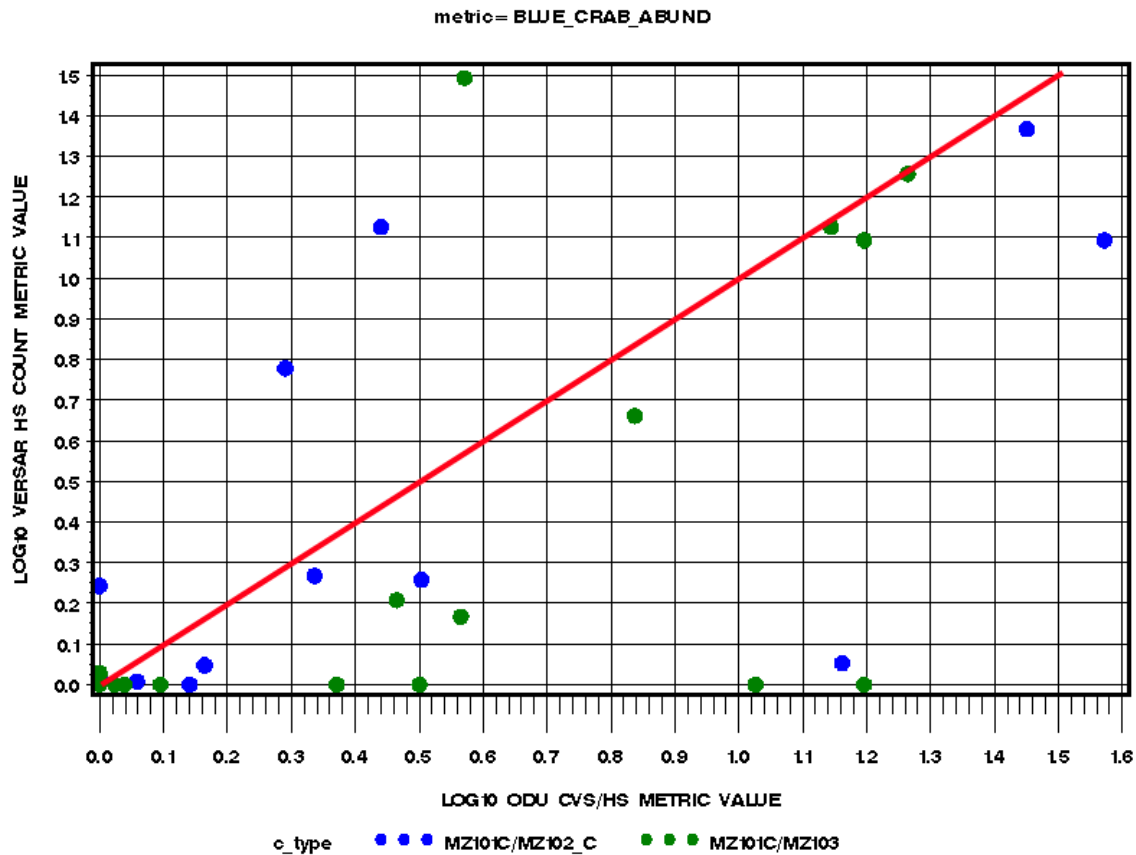
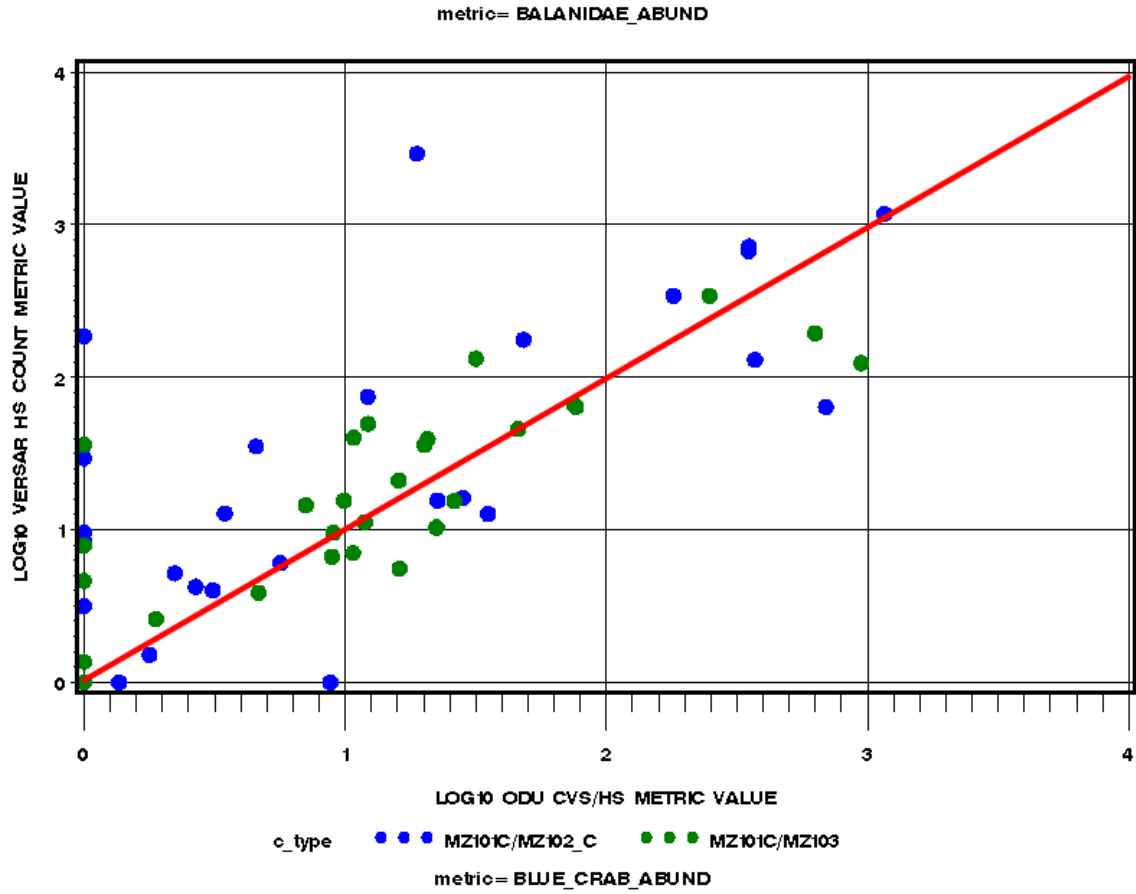
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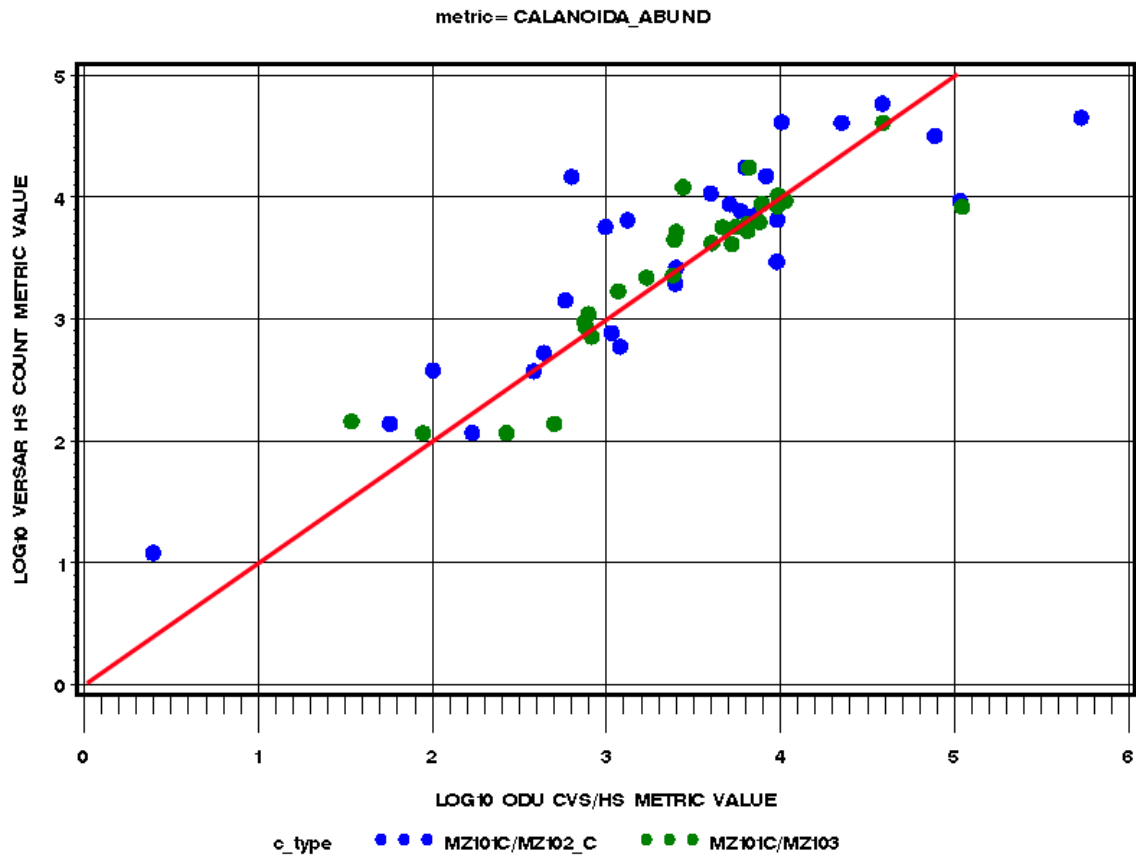
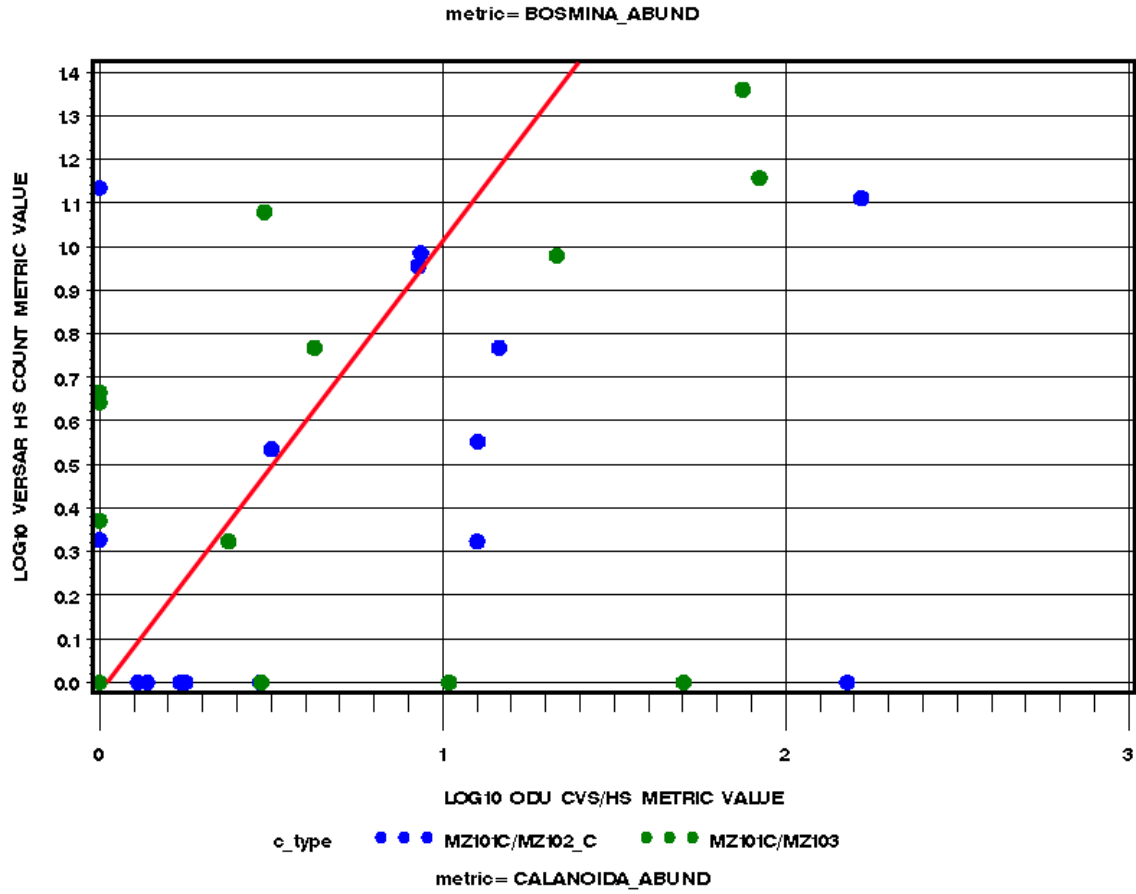




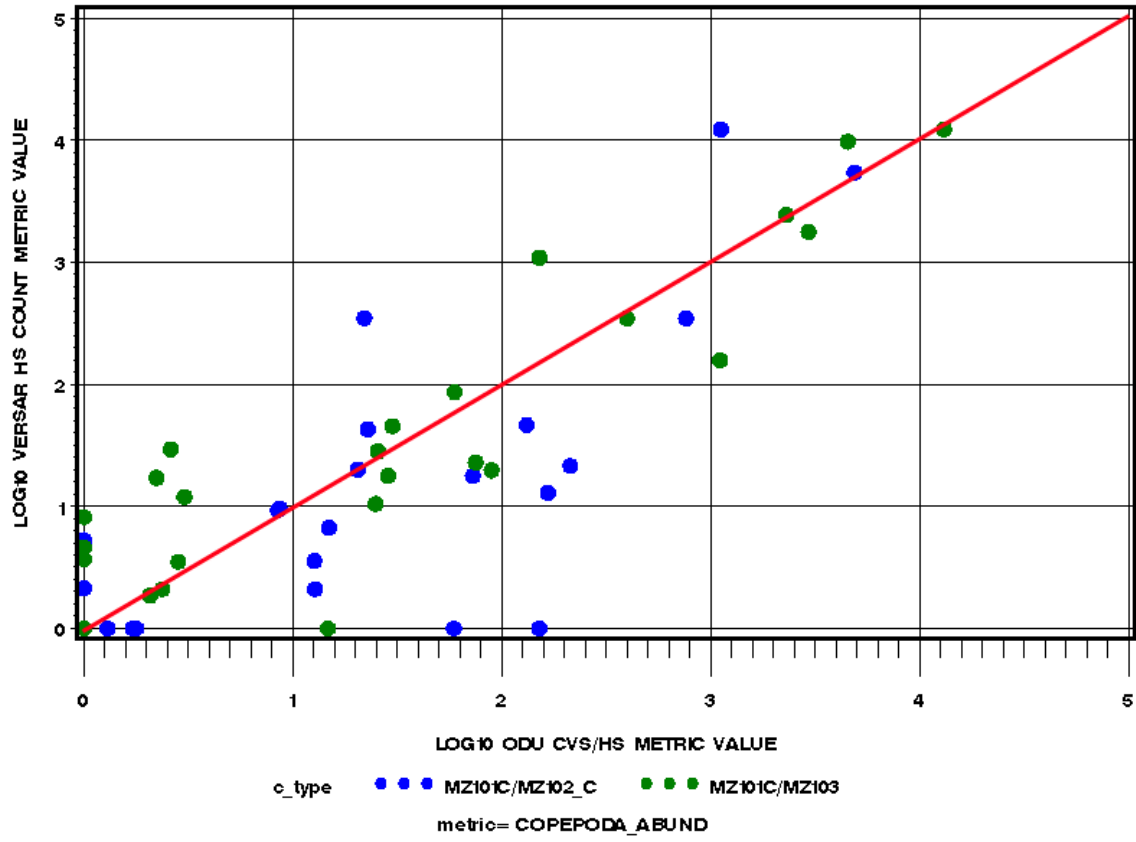
***APPENDIX A. Graphical Comparison of Recount Parameters by Enumeration Method***



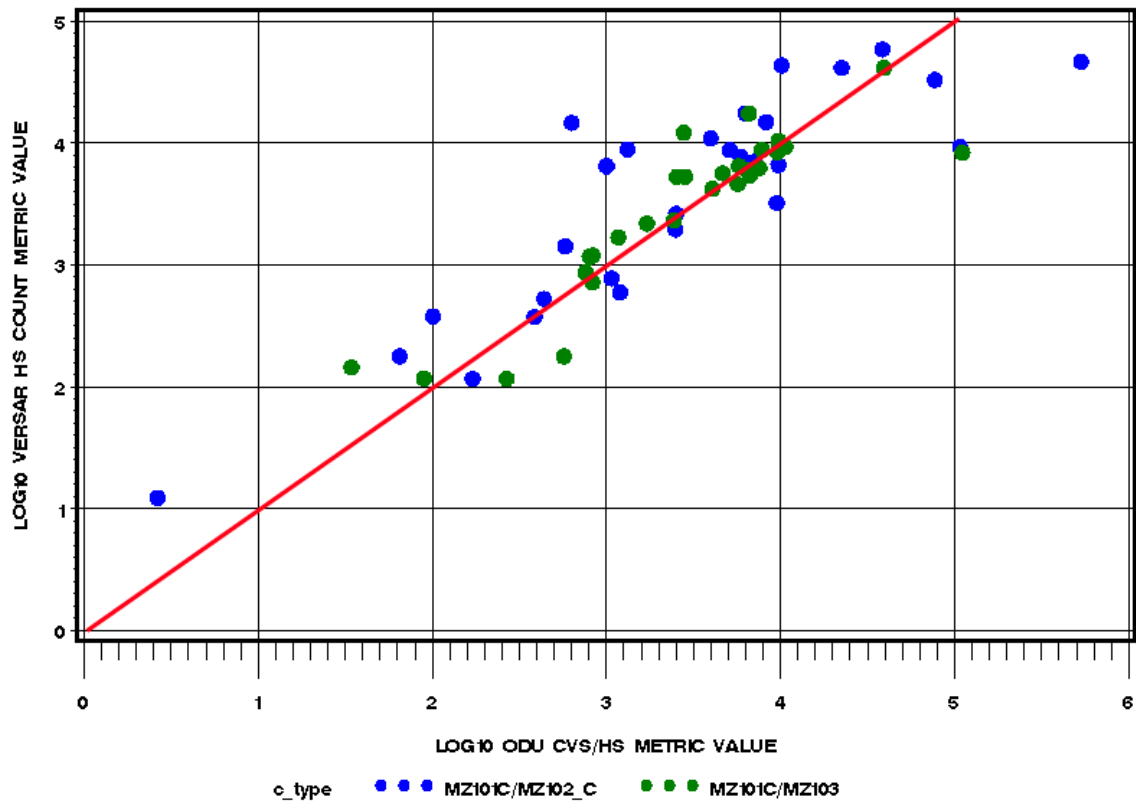


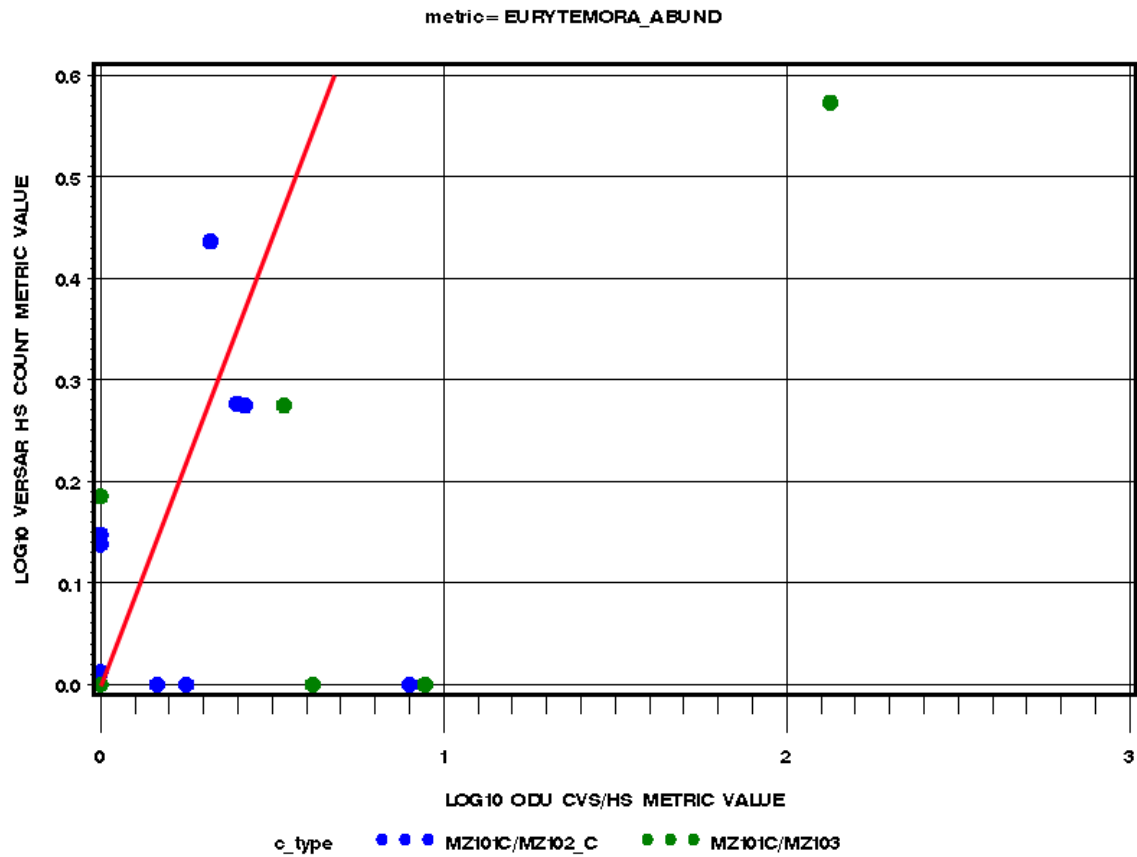
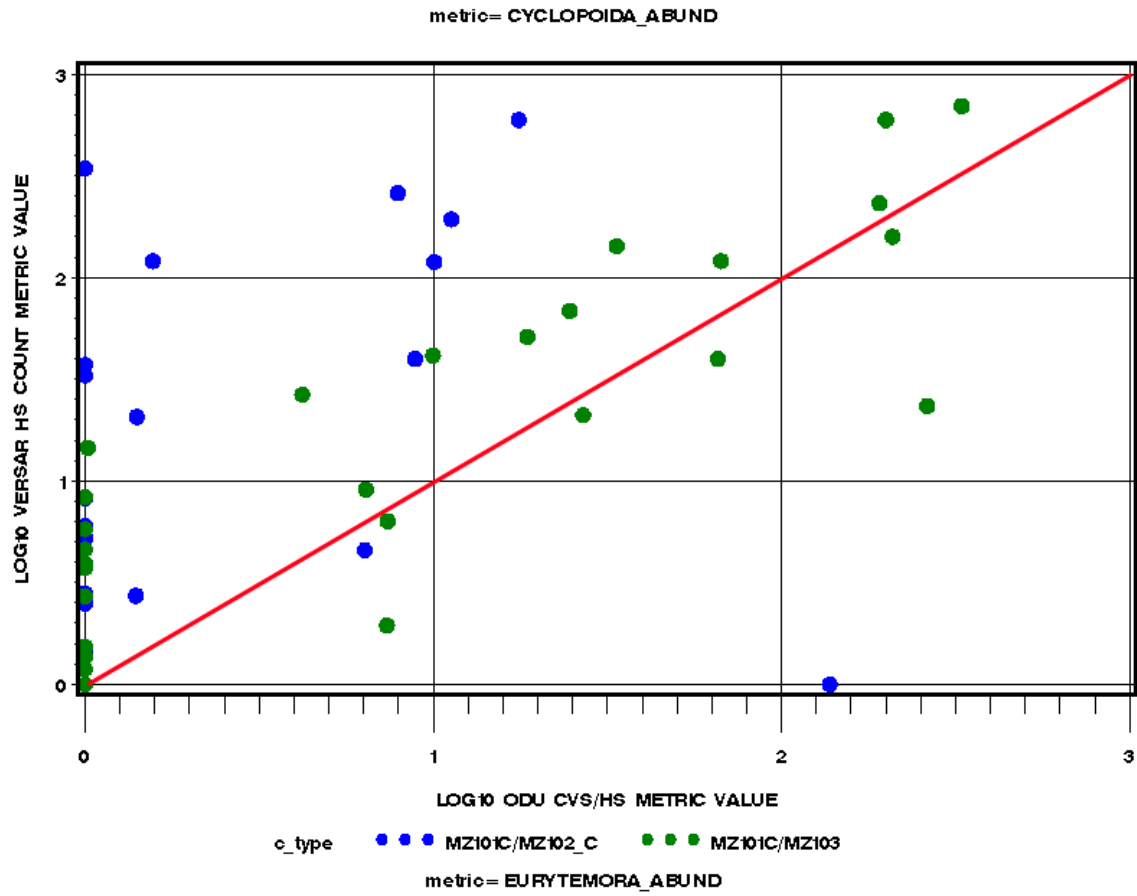


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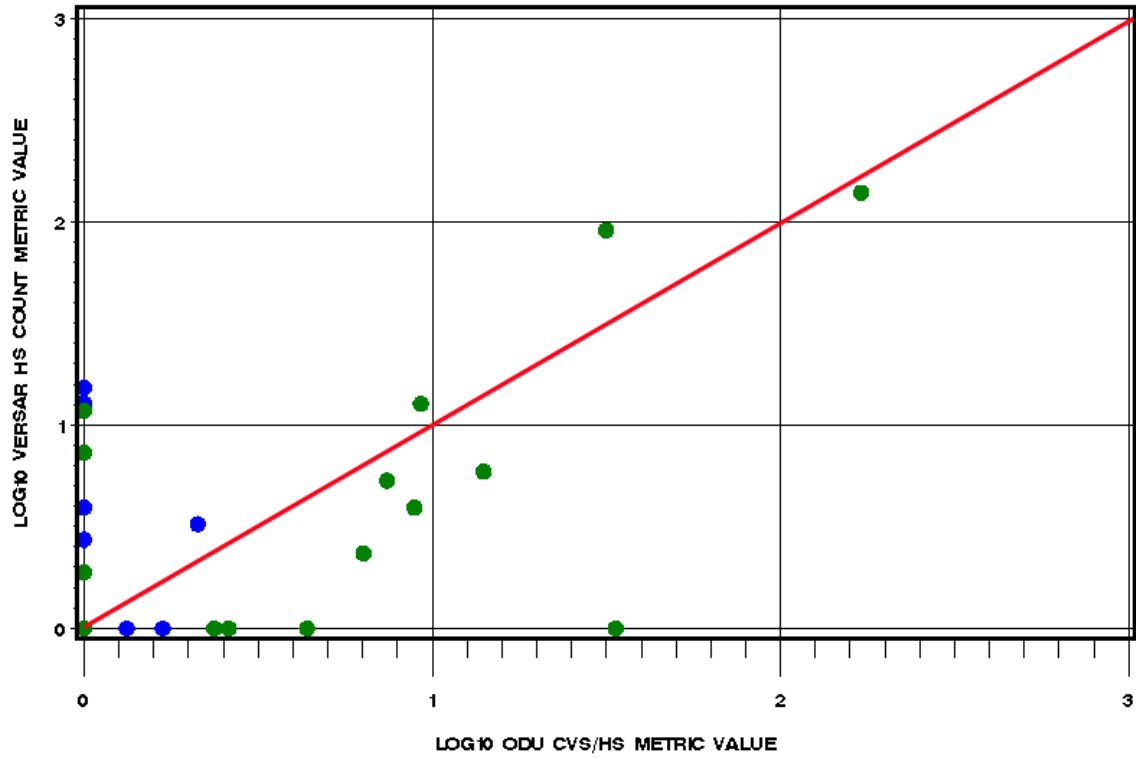


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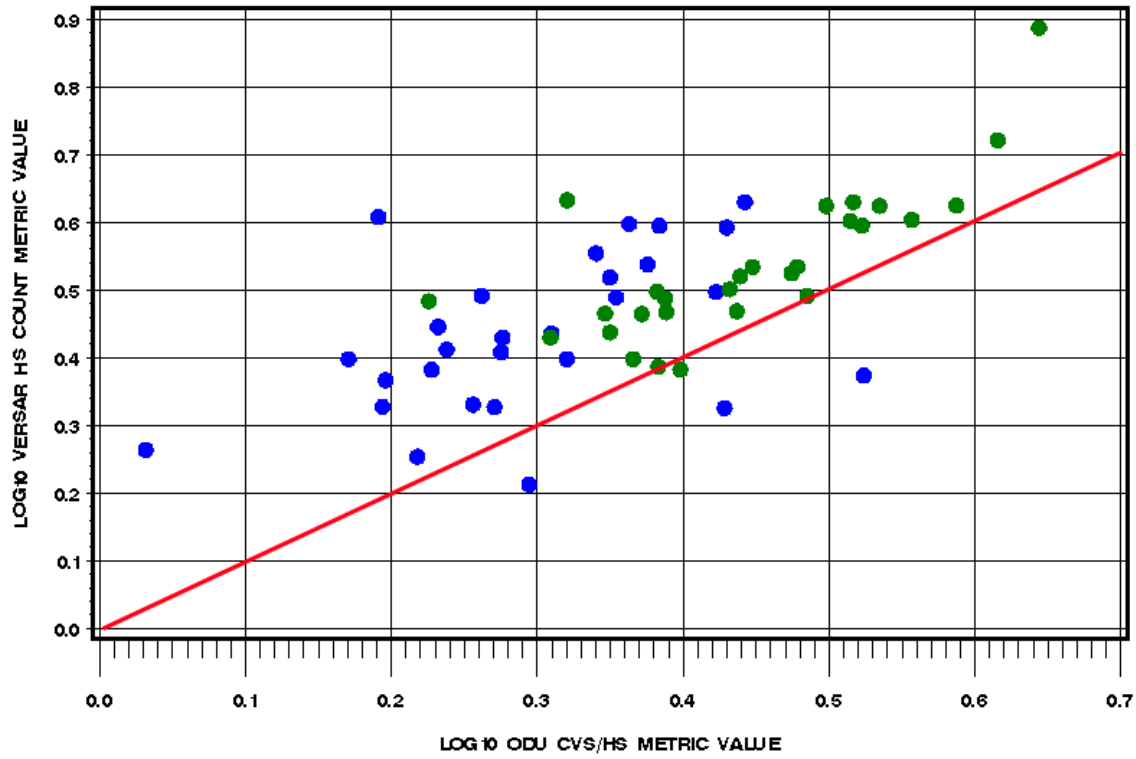




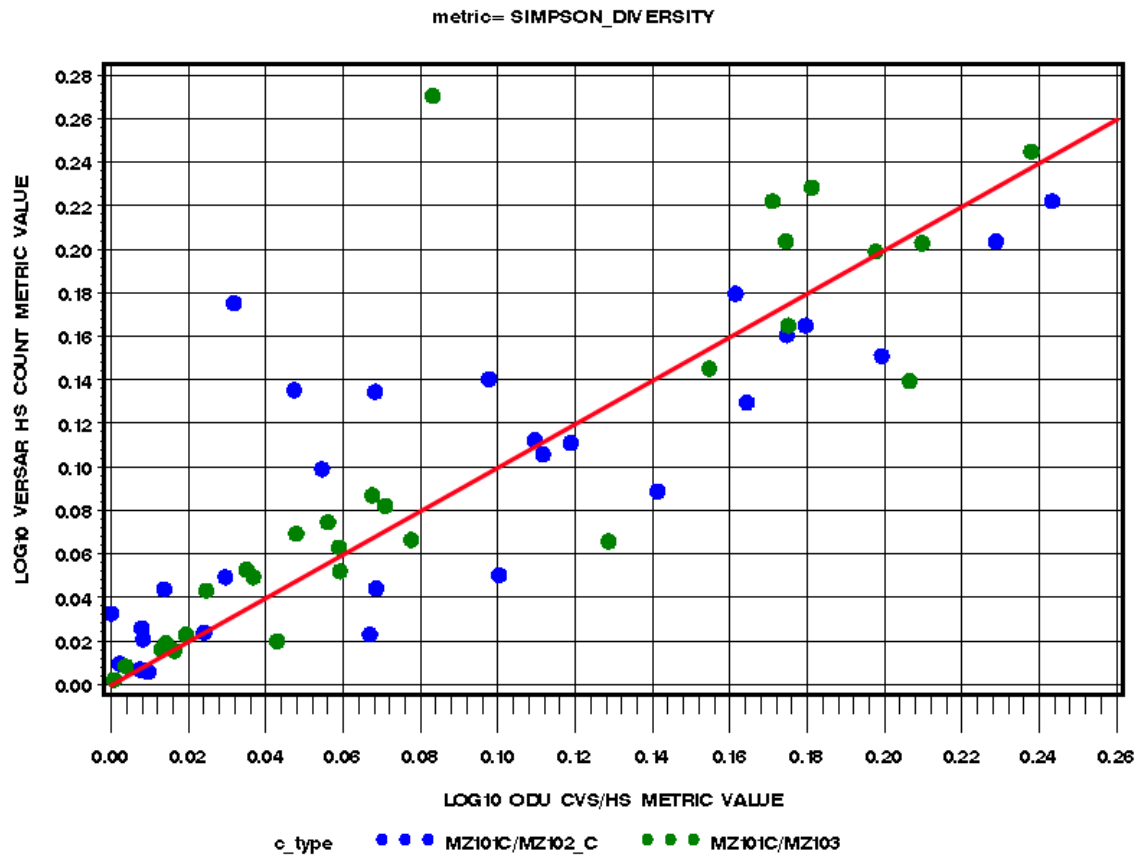
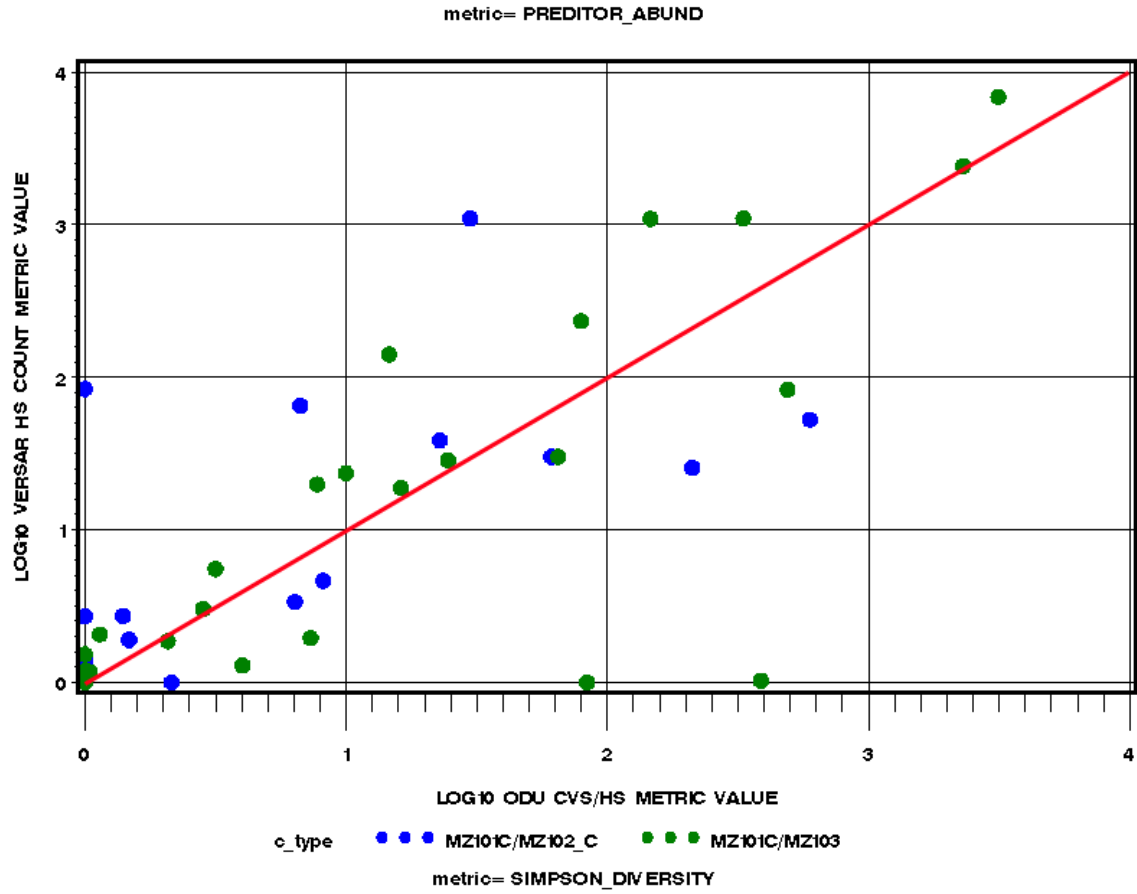
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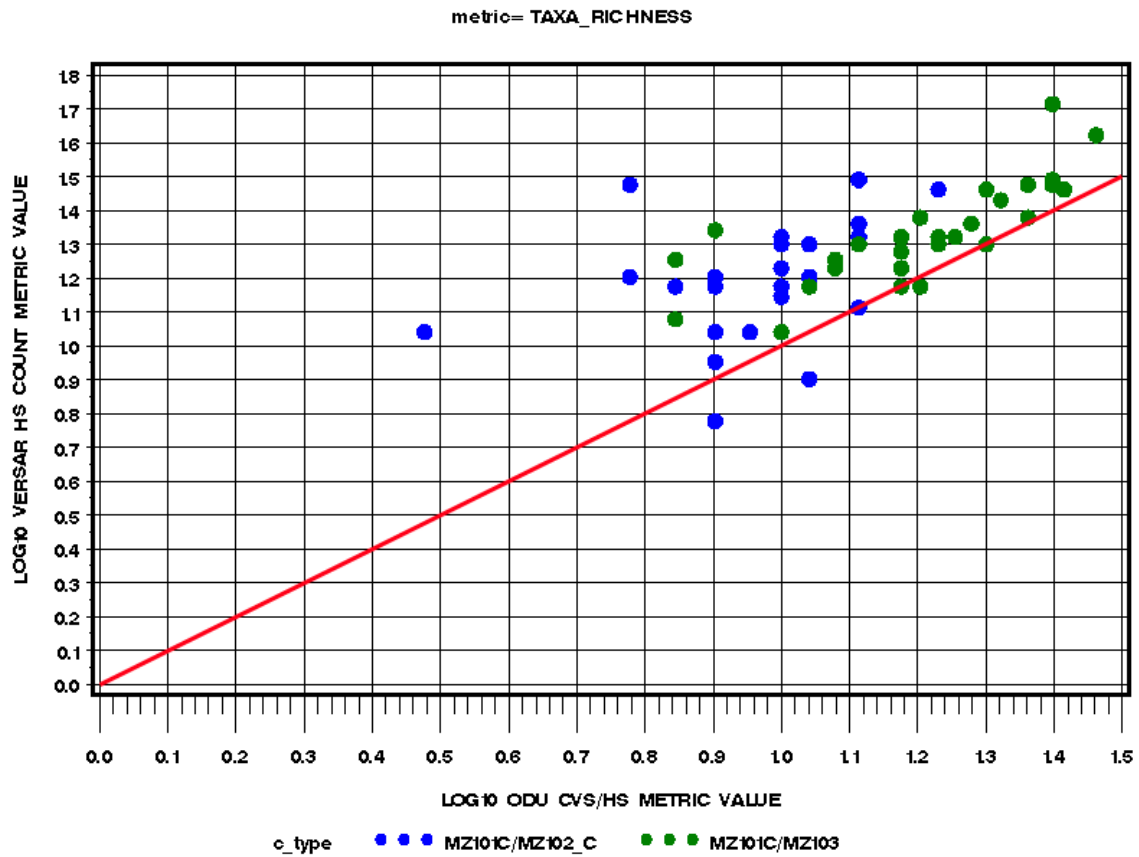
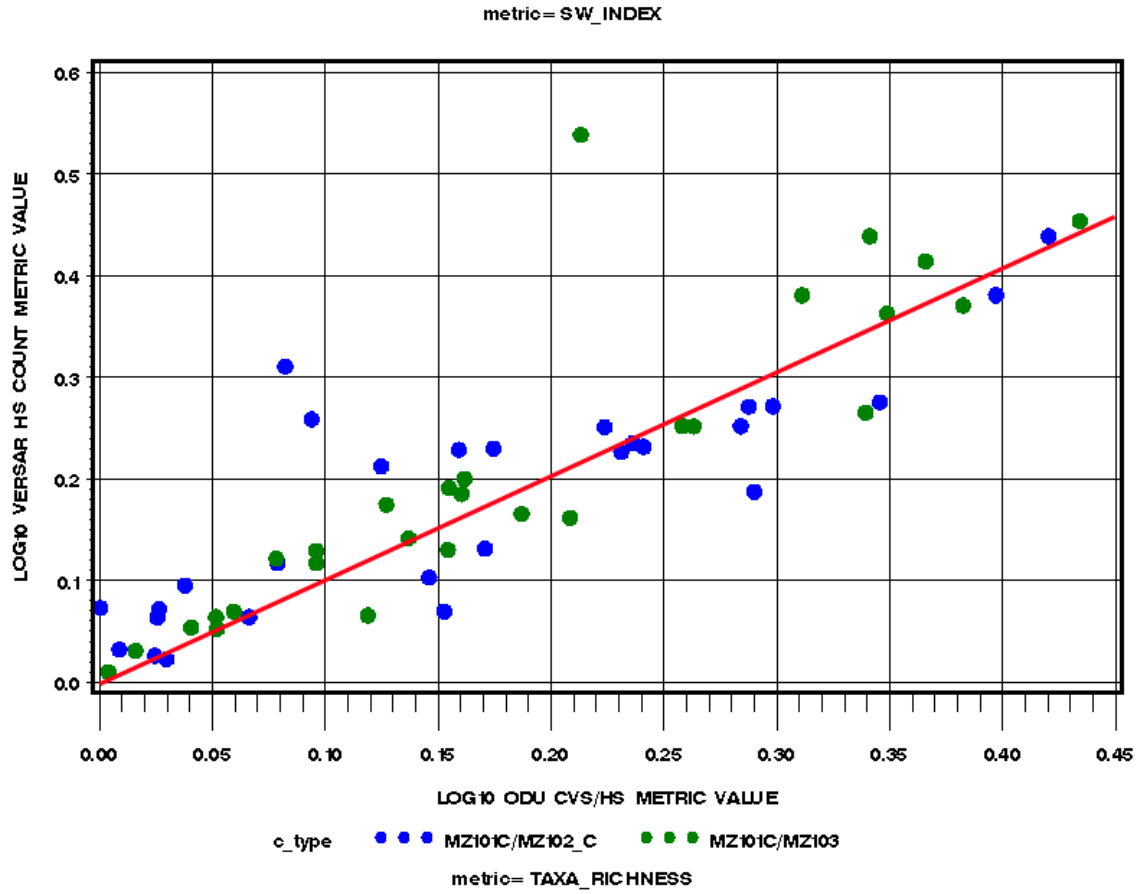
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c\_type    ● ● ● MZ101C/MZ102\_C    ● ● ● MZ101C/MZ103









***APPENDIX B. Statistical Comparisons of Versar Hensen-Stempel and  
ODU Corrected Controlled Variability Sampling Method Count  
Samples by Parameter***

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

```

----- IBI_METRIC=ACARTIA_ABUND -----
STATION          dateonly      VERSAR_      ODU_IBI_
                   IBI_VALUE      VALUE          diff
CB6.1            09JUL1996      769.56      1071.94      -302.38
CB6.1            24JUL1996     10788.86     3983.14     6805.73
CB6.1            05AUG1996    44850.79    534512.80  -489662.01
CB6.1            26AUG1996    58498.28    38561.37    19936.91
CB6.1            08SEP1997     2903.43     9544.20    -6640.77
CB6.4            05AUG1996    40958.39    22540.21    18418.18
CB6.4            12AUG1997     6394.01    1327.05     5066.96
CB7.3E           07AUG1996    31771.43    77374.20   -45602.77
CB7.3E           15JUL1997     8497.21    5095.66     3401.55
CB7.4            22JUL1996    1934.49    2492.86    -558.36
CB7.4            13AUG1997    4221.73     413.71    3808.02
LE3.6            09JUL1996     526.89     438.73      88.15
LE3.6            24JUL1996    6497.46    9608.25   -3110.79
LE3.6            05AUG1996   41349.44   10187.98   31161.45
LE3.6            26AUG1996   14928.87    8322.99    6605.89
LE3.6            15JUL1997    7052.81    7114.82    -62.01
LE5.5            22JUL1996    7705.48    5924.15    1781.33
RET4.3           10JUL1996     11.05        1.50        9.54
RET4.3           24JUL1996     370.66     380.75    -10.09
RET4.3           06AUG1996    115.31    169.16    -53.85
RET4.3           10JUL1997    136.58     54.72     81.86
RET4.3           23JUL1997    377.31    100.30    277.01
RET5.2           23SEP1997    1418.90     580.32    838.58
SBE5             08JUL1996    2634.63    2519.27    115.36
SBE5             23JUL1996     590.12    1201.66   -611.54
SBE5             08JUL1997   14651.72     627.53   14024.19
WE4.2            24JUL1996   17501.95    6317.93   11184.02
WE4.2            05AUG1996    9316.48   105451.42  -96134.95

```

----- IBI\_METRIC=ACARTIA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-18540.9	Std Deviation	95004
Median	101.8	Variance	9025732309
Mode	.	Range	520823
		Interquartile Range	6267

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -1.03269	Pr >  t  0.3109
Sign	M 3	Pr >=  M  0.3449
Signed Rank	S 50	Pr >=  S  0.2623

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=BALANIDAE\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	3.02	2.12	0.90
CB6.1	24JUL1996	0.00	7.80	-7.80
CB6.1	05AUG1996	8.63	0.00	8.63
CB6.1	26AUG1996	0.00	0.37	-0.37
CB6.1	08SEP1997	2.17	0.00	2.17
CB6.4	05AUG1996	63.05	693.31	-630.26
CB6.4	12AUG1997	11.86	2.47	9.39
CB7.3E	07AUG1996	185.71	0.00	185.71
CB7.3E	15JUL1997	129.49	370.90	-241.41
CB7.4	22JUL1996	11.74	34.30	-22.55
CB7.4	13AUG1997	35.08	0.00	35.08
LE3.6	09JUL1996	15.20	27.29	-12.09
LE3.6	24JUL1996	28.55	0.00	28.55
LE3.6	05AUG1996	73.84	11.21	62.63
LE3.6	26AUG1996	4.18	1.23	2.96
LE3.6	15JUL1997	34.26	3.57	30.69
LE5.5	22JUL1996	673.34	350.20	323.14
RET4.3	10JUL1996	0.51	0.79	-0.27
RET4.3	24JUL1996	5.06	4.65	0.40
RET4.3	06AUG1996	0.37	0.00	0.37
RET4.3	10JUL1997	14.59	21.61	-7.02
RET4.3	23JUL1997	3.24	1.68	1.56
RET5.2	23SEP1997	1181.37	1162.84	18.53
SBE5	08JUL1996	722.10	351.55	370.54
SBE5	23JUL1996	7.50	0.00	7.50
SBE5	08JUL1997	2925.67	17.83	2907.85
WE4.2	24JUL1996	175.28	47.25	128.03
WE4.2	05AUG1996	342.35	179.86	162.48

----- IBI\_METRIC=BALANIDAE\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	120.1910	Std Deviation	571.99641
Median	5.2290	Variance	327180
Mode	.	Range	3538
		Interquartile Range	49.17450

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 1.111879	Pr >  t  0.2760
Sign	M 6	Pr >=  M  0.0357
Signed Rank	S 99	Pr >=  S  0.0212

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=BLUE\_CRAB\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	0.000	0.000	0.000
CB6.1	24JUL1996	0.000	0.000	0.000
CB6.1	05AUG1996	0.000	0.000	0.000
CB6.1	26AUG1996	0.000	0.000	0.000
CB6.1	08SEP1997	0.000	0.000	0.000
CB6.4	05AUG1996	0.000	0.000	0.000
CB6.4	12AUG1997	0.000	0.000	0.000
CB7.3E	07AUG1996	0.000	0.000	0.000
CB7.3E	15JUL1997	0.000	0.000	0.000
CB7.4	22JUL1996	0.000	0.000	0.000
CB7.4	13AUG1997	0.000	0.000	0.000
LE3.6	09JUL1996	0.000	0.000	0.000
LE3.6	24JUL1996	0.000	0.000	0.000
LE3.6	05AUG1996	0.000	0.000	0.000
LE3.6	26AUG1996	0.034	0.000	0.034
LE3.6	15JUL1997	0.018	0.145	-0.127
LE5.5	22JUL1996	0.000	0.000	0.000
RET4.3	10JUL1996	0.000	0.384	-0.384
RET4.3	24JUL1996	22.311	27.254	-4.943
RET4.3	06AUG1996	11.415	36.344	-24.929
RET4.3	10JUL1997	12.376	1.758	10.618
RET4.3	23JUL1997	0.810	2.191	-1.381
RET5.2	23SEP1997	0.853	1.171	-0.318
SBE5	08JUL1996	0.116	0.461	-0.345
SBE5	23JUL1996	0.750	0.000	0.750
SBE5	08JUL1997	5.004	0.954	4.050
WE4.2	24JUL1996	0.130	13.526	-13.396
WE4.2	05AUG1996	0.000	0.000	0.000

----- IBI\_METRIC=BLUE\_CRAB\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-1.08468	Std Deviation	5.85123
Median	0.00000	Variance	34.23694
Mode	0.00000	Range	35.54700
		Interquartile Range	0.22250

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -0.98092	Pr >  t  0.3353
Sign	M -2	Pr >=  M  0.3877
Signed Rank	S -14	Pr >=  S  0.3013

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=BOSMINA\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	0.000	0.000	0.000
CB6.1	24JUL1996	0.000	0.000	0.000
CB6.1	05AUG1996	0.000	0.000	0.000
CB6.1	26AUG1996	0.000	1.943	-1.943
CB6.1	08SEP1997	0.000	0.000	0.000
CB6.4	05AUG1996	0.000	0.000	0.000
CB6.4	12AUG1997	0.000	0.000	0.000
CB7.3E	07AUG1996	0.000	0.000	0.000
CB7.3E	15JUL1997	0.000	0.000	0.000
CB7.4	22JUL1996	12.644	0.000	12.644
CB7.4	13AUG1997	0.000	0.000	0.000
LE3.6	09JUL1996	0.000	0.720	-0.720
LE3.6	24JUL1996	0.000	0.377	-0.377
LE3.6	05AUG1996	0.000	150.486	-150.486
LE3.6	26AUG1996	0.000	0.000	0.000
LE3.6	15JUL1997	0.000	0.000	0.000
LE5.5	22JUL1996	0.000	0.000	0.000
RET4.3	10JUL1996	2.569	11.681	-9.112
RET4.3	24JUL1996	8.032	7.510	0.522
RET4.3	06AUG1996	1.105	11.620	-10.515
RET4.3	10JUL1997	4.862	13.639	-8.777
RET4.3	23JUL1997	2.431	2.174	0.257
RET5.2	23SEP1997	8.656	7.648	1.008
SBE5	08JUL1996	11.921	165.545	-153.624
SBE5	23JUL1996	1.125	0.000	1.125
SBE5	08JUL1997	0.000	0.297	-0.297
WE4.2	24JUL1996	0.000	0.000	0.000
WE4.2	05AUG1996	0.000	0.781	-0.781

----- IBI\_METRIC=BOSMINA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-11.4670	Std Deviation	39.90862
Median	0.0000	Variance	1593
Mode	0.0000	Range	166.26800
		Interquartile Range	0.75050

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -1.52041	Pr >  t  0.1400
Sign	M -2.5	Pr >=  M  0.3018
Signed Rank	S -27	Pr >=  S  0.1354

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=CALANOIDA\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	769.56	1071.94	-302.38
CB6.1	24JUL1996	10788.90	3983.14	6805.76
CB6.1	05AUG1996	44850.79	534512.80	-489662.01
CB6.1	26AUG1996	58675.02	38561.37	20113.65
CB6.1	08SEP1997	2946.58	9551.70	-6605.13
CB6.4	05AUG1996	40971.10	22540.21	18430.89
CB6.4	12AUG1997	6484.47	1327.05	5157.41
CB7.3E	07AUG1996	31914.40	77375.50	-45461.10
CB7.3E	15JUL1997	8751.22	5133.46	3617.76
CB7.4	22JUL1996	1954.36	2505.52	-551.16
CB7.4	13AUG1997	5683.55	988.88	4694.67
LE3.6	09JUL1996	526.89	438.73	88.15
LE3.6	24JUL1996	6500.64	9608.25	-3107.61
LE3.6	05AUG1996	41354.44	10188.76	31165.68
LE3.6	26AUG1996	14941.88	8325.44	6616.43
LE3.6	15JUL1997	7055.09	7115.22	-60.13
LE5.5	22JUL1996	7705.51	5924.15	1781.35
RET4.3	10JUL1996	11.05	1.50	9.54
RET4.3	24JUL1996	371.55	382.25	-10.70
RET4.3	06AUG1996	115.31	169.62	-54.32
RET4.3	10JUL1997	137.46	56.36	81.10
RET4.3	23JUL1997	377.72	100.30	277.41
RET5.2	23SEP1997	1420.63	581.41	839.22
SBE5	08JUL1996	2634.66	2519.27	115.38
SBE5	23JUL1996	591.24	1201.66	-610.42
SBE5	08JUL1997	14676.74	632.94	14043.80
WE4.2	24JUL1996	17502.00	6318.07	11183.93
WE4.2	05AUG1996	9316.48	107781.02	-98464.54

----- IBI\_METRIC=CALANOIDA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-18566.7	Std Deviation	95088
Median	101.8	Variance	9041717642
Mode	.	Range	520828
		Interquartile Range	6314

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -1.03321	Pr >  t  0.3107
Sign	M 3	Pr >=  M  0.3449
Signed Rank	S 51	Pr >=  S  0.2527



VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=CLADOCERA\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	0.00	0.00	0.00
CB6.1	24JUL1996	0.00	0.00	0.00
CB6.1	05AUG1996	4.31	0.00	4.31
CB6.1	26AUG1996	20.45	212.34	-191.90
CB6.1	08SEP1997	45.48	130.72	-85.24
CB6.4	05AUG1996	346.81	762.25	-415.44
CB6.4	12AUG1997	349.86	21.04	328.82
CB7.3E	07AUG1996	5454.76	4889.36	565.40
CB7.3E	15JUL1997	0.00	0.00	0.00
CB7.4	22JUL1996	18.97	19.49	-0.52
CB7.4	13AUG1997	12314.35	1119.47	11194.88
LE3.6	09JUL1996	0.00	0.72	-0.72
LE3.6	24JUL1996	0.00	58.08	-58.08
LE3.6	05AUG1996	0.00	150.59	-150.59
LE3.6	26AUG1996	41.84	21.91	19.93
LE3.6	15JUL1997	0.00	0.00	0.00
LE5.5	22JUL1996	0.00	0.00	0.00
RET4.3	10JUL1996	2.57	11.68	-9.11
RET4.3	24JUL1996	8.33	7.51	0.82
RET4.3	06AUG1996	1.11	11.82	-10.71
RET4.3	10JUL1997	16.80	71.74	-54.94
RET4.3	23JUL1997	5.67	13.88	-8.21
RET5.2	23SEP1997	8.66	7.65	1.01
SBE5	08JUL1996	11.92	165.55	-153.62
SBE5	23JUL1996	1.13	0.00	1.13
SBE5	08JUL1997	0.00	0.30	-0.30
WE4.2	24JUL1996	0.00	0.00	0.00
WE4.2	05AUG1996	0.00	0.78	-0.78

----- IBI\_METRIC=CLADOCERA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	392.0048	Std Deviation	2123
Median	-0.1485	Variance	4508162
Mode	0.0000	Range	11610
		Interquartile Range	33.74000

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 0.976946	Pr >  t  0.3373
Sign	M -3	Pr >=  M  0.2863
Signed Rank	S -26.5	Pr >=  S  0.4022

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=COPEPODA\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	776.35	1073.06	-296.71
CB6.1	24JUL1996	10919.41	3983.14	6936.27
CB6.1	05AUG1996	46637.63	534512.80	-487875.17
CB6.1	26AUG1996	58875.41	38571.22	20304.19
CB6.1	08SEP1997	3234.63	9558.62	-6323.99
CB6.4	05AUG1996	41475.51	22540.78	18934.73
CB6.4	12AUG1997	8928.39	1327.05	7601.34
CB7.3E	07AUG1996	33135.83	77385.79	-44249.96
CB7.3E	15JUL1997	8803.02	5133.72	3669.30
CB7.4	22JUL1996	1958.88	2505.52	-546.64
CB7.4	13AUG1997	6478.77	1005.49	5473.29
LE3.6	09JUL1996	527.65	438.73	88.91
LE3.6	24JUL1996	6637.06	9745.10	-3108.04
LE3.6	05AUG1996	43540.05	10189.17	33350.88
LE3.6	26AUG1996	14958.61	8325.44	6633.17
LE3.6	15JUL1997	7055.09	7115.22	-60.13
LE5.5	22JUL1996	7783.10	5924.15	1858.94
RET4.3	10JUL1996	11.30	1.65	9.66
RET4.3	24JUL1996	375.42	387.62	-12.20
RET4.3	06AUG1996	115.67	169.95	-54.28
RET4.3	10JUL1997	177.24	64.24	113.00
RET4.3	23JUL1997	378.12	100.30	277.82
RET5.2	23SEP1997	1424.10	581.81	842.28
SBE5	08JUL1996	2636.36	2519.27	117.09
SBE5	23JUL1996	592.74	1201.66	-608.92
SBE5	08JUL1997	14681.75	632.94	14048.80
WE4.2	24JUL1996	17586.39	6318.07	11268.32
WE4.2	05AUG1996	9328.18	107781.02	-98452.83

----- IBI\_METRIC=COPEPODA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-18216.5	Std Deviation	94837
Median	115.0	Variance	8993967071
Mode	.	Range	521226
		Interquartile Range	7206

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -1.01641	Pr >  t  0.3185
Sign	M 3	Pr >=  M  0.3449
Signed Rank	S 52	Pr >=  S  0.2432

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=CYCLOPOIDA\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	0.000	0.000	0.000
CB6.1	24JUL1996	7.251	0.000	7.251
CB6.1	05AUG1996	4.313	0.000	4.313
CB6.1	26AUG1996	118.600	9.089	109.511
CB6.1	08SEP1997	259.898	6.916	252.982
CB6.4	05AUG1996	119.798	0.568	119.230
CB6.4	12AUG1997	343.928	0.000	343.928
CB7.3E	07AUG1996	192.857	10.292	182.565
CB7.3E	15JUL1997	36.258	0.000	36.258
CB7.4	22JUL1996	1.806	0.000	1.806
CB7.4	13AUG1997	596.422	16.607	579.815
LE3.6	09JUL1996	0.000	0.000	0.000
LE3.6	24JUL1996	0.000	136.854	-136.854
LE3.6	05AUG1996	19.690	0.411	19.279
LE3.6	26AUG1996	4.184	0.000	4.184
LE3.6	15JUL1997	0.000	0.000	0.000
LE5.5	22JUL1996	32.106	0.000	32.106
RET4.3	10JUL1996	0.000	0.000	0.000
RET4.3	24JUL1996	3.570	5.370	-1.800
RET4.3	06AUG1996	0.368	0.000	0.368
RET4.3	10JUL1997	38.895	7.878	31.017
RET4.3	23JUL1997	0.405	0.000	0.405
RET5.2	23SEP1997	1.731	0.401	1.330
SBE5	08JUL1996	1.703	0.000	1.703
SBE5	23JUL1996	1.500	0.000	1.500
SBE5	08JUL1997	5.004	0.000	5.004
WE4.2	24JUL1996	0.000	0.000	0.000
WE4.2	05AUG1996	2.926	0.000	2.926

----- IBI\_METRIC=CYCLOPOIDA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	57.10096	Std Deviation	137.33709
Median	3.55500	Variance	18861
Mode	0.00000	Range	716.66900
		Interquartile Range	33.99800

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 2.20006	Pr >  t  0.0365
Sign	M 9.5	Pr >=  M  <.0001
Signed Rank	S 113	Pr >=  S  <.0001

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=EURYTEMORA\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	0.000	0.000	0.000
CB6.1	24JUL1996	0.000	0.000	0.000
CB6.1	05AUG1996	0.000	0.000	0.000
CB6.1	26AUG1996	0.000	0.000	0.000
CB6.1	08SEP1997	0.000	0.000	0.000
CB6.4	05AUG1996	0.000	0.000	0.000
CB6.4	12AUG1997	0.000	0.000	0.000
CB7.3E	07AUG1996	0.000	0.000	0.000
CB7.3E	15JUL1997	0.000	6.973	-6.973
CB7.4	22JUL1996	0.000	0.000	0.000
CB7.4	13AUG1997	0.000	0.000	0.000
LE3.6	09JUL1996	0.000	0.000	0.000
LE3.6	24JUL1996	0.000	0.000	0.000
LE3.6	05AUG1996	0.000	0.779	-0.779
LE3.6	26AUG1996	0.000	0.000	0.000
LE3.6	15JUL1997	0.000	0.000	0.000
LE5.5	22JUL1996	0.000	0.000	0.000
RET4.3	10JUL1996	0.000	0.000	0.000
RET4.3	24JUL1996	0.892	1.501	-0.609
RET4.3	06AUG1996	0.000	0.464	-0.464
RET4.3	10JUL1997	0.884	1.641	-0.757
RET4.3	23JUL1997	0.405	0.000	0.405
RET5.2	23SEP1997	1.731	1.093	0.638
SBE5	08JUL1996	0.029	0.000	0.029
SBE5	23JUL1996	0.375	0.000	0.375
SBE5	08JUL1997	0.000	0.000	0.000
WE4.2	24JUL1996	0.000	0.000	0.000
WE4.2	05AUG1996	0.000	0.000	0.000

----- IBI\_METRIC=EURYTEMORA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-0.29054	Std Deviation	1.34354
Median	0.00000	Variance	1.80510
Mode	0.00000	Range	7.61100
		Interquartile Range	0

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -1.14427	Pr >  t  0.2626
Sign	M -0.5	Pr >=  M  1.0000
Signed Rank	S -10.5	Pr >=  S  0.2500

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=HARPACTICOIDA\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	2.263	1.121	1.142
CB6.1	24JUL1996	0.000	0.000	0.000
CB6.1	05AUG1996	0.000	0.000	0.000
CB6.1	26AUG1996	0.000	0.686	-0.686
CB6.1	08SEP1997	0.000	0.000	0.000
CB6.4	05AUG1996	6.305	0.000	6.305
CB6.4	12AUG1997	11.860	0.000	11.860
CB7.3E	07AUG1996	14.286	0.000	14.286
CB7.3E	15JUL1997	0.000	0.000	0.000
CB7.4	22JUL1996	0.000	0.000	0.000
CB7.4	13AUG1997	11.695	0.000	11.695
LE3.6	09JUL1996	0.000	0.000	0.000
LE3.6	24JUL1996	0.000	0.000	0.000
LE3.6	05AUG1996	0.000	0.000	0.000
LE3.6	26AUG1996	0.000	0.000	0.000
LE3.6	15JUL1997	0.000	0.000	0.000
LE5.5	22JUL1996	0.000	0.000	0.000
RET4.3	10JUL1996	0.000	0.000	0.000
RET4.3	24JUL1996	0.000	0.000	0.000
RET4.3	06AUG1996	0.000	0.328	-0.328
RET4.3	10JUL1997	0.884	0.000	0.884
RET4.3	23JUL1997	0.000	0.000	0.000
RET5.2	23SEP1997	1.731	0.000	1.731
SBE5	08JUL1996	0.000	0.000	0.000
SBE5	23JUL1996	0.000	0.000	0.000
SBE5	08JUL1997	0.000	0.000	0.000
WE4.2	24JUL1996	0.000	0.000	0.000
WE4.2	05AUG1996	2.926	0.000	2.926

----- IBI\_METRIC=HARPACTICOIDA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	1.779107	Std Deviation	4.06826
Median	0.000000	Variance	16.55077
Mode	0.000000	Range	14.97200
		Interquartile Range	1.01300

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 2.314046	Pr >  t  0.0285
Sign	M 3	Pr >=  M  0.1094
Signed Rank	S 24.5	Pr >=  S  0.0098

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=MARGALEF\_INDEX -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	2.0859	1.2603	0.8256
CB6.1	24JUL1996	1.5024	0.4820	1.0204
CB6.1	05AUG1996	0.8370	0.0758	0.7612
CB6.1	26AUG1996	1.7296	1.0408	0.6888
CB6.1	08SEP1997	2.5843	1.1909	1.3934
CB6.4	05AUG1996	1.6904	0.8897	0.8007
CB6.4	12AUG1997	3.0567	0.5532	2.5035
CB7.3E	07AUG1996	1.7909	0.7067	1.0842
CB7.3E	15JUL1997	2.9131	1.6915	1.2216
CB7.4	22JUL1996	2.4514	1.3759	1.0755
CB7.4	13AUG1997	2.9358	1.4199	1.5159
LE3.6	09JUL1996	0.6325	0.9709	-0.3384
LE3.6	24JUL1996	0.7947	0.6522	0.1425
LE3.6	05AUG1996	1.1228	0.8653	0.2575
LE3.6	26AUG1996	1.5596	0.8851	0.6745
LE3.6	15JUL1997	1.1271	0.5635	0.5636
LE5.5	22JUL1996	2.3008	1.2385	1.0623
RET4.3	10JUL1996	1.3656	2.3420	-0.9764
RET4.3	24JUL1996	2.9607	1.3072	1.6535
RET4.3	06AUG1996	1.5024	1.0911	0.4113
RET4.3	10JUL1997	3.2702	1.7702	1.5000
RET4.3	23JUL1997	2.1428	1.6468	0.4960
RET5.2	23SEP1997	1.1421	0.8033	0.3388
SBE5	08JUL1996	1.5829	0.7300	0.8529
SBE5	23JUL1996	2.1025	0.8279	1.2746
SBE5	08JUL1997	1.1179	1.6828	-0.5649
WE4.2	24JUL1996	1.3272	0.5707	0.7565
WE4.2	05AUG1996	1.4123	0.6895	0.7228

----- IBI\_METRIC=MARGALEF\_INDEX -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	0.775639	Std Deviation	0.70025
Median	0.780950	Variance	0.49035
Mode	.	Range	3.47990
		Interquartile Range	0.69925

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 5.861162	Pr >  t  <.0001
Sign	M 11	Pr >=  M  <.0001
Signed Rank	S 175	Pr >=  S  <.0001

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=PREDITOR\_ABUND -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	0.00	0.000	0.00
CB6.1	24JUL1996	0.00	0.000	0.00
CB6.1	05AUG1996	0.00	0.000	0.00
CB6.1	26AUG1996	24.54	211.109	-186.57
CB6.1	08SEP1997	51.98	596.298	-544.32
CB6.4	05AUG1996	0.03	0.000	0.03
CB6.4	12AUG1997	83.02	0.000	83.02
CB7.3E	07AUG1996	64.29	5.691	58.60
CB7.3E	15JUL1997	0.00	0.000	0.00
CB7.4	22JUL1996	0.90	0.478	0.43
CB7.4	13AUG1997	1099.29	28.908	1070.38
LE3.6	09JUL1996	0.00	0.000	0.00
LE3.6	24JUL1996	0.00	1.148	-1.15
LE3.6	05AUG1996	0.00	0.000	0.00
LE3.6	26AUG1996	37.67	21.871	15.80
LE3.6	15JUL1997	0.00	0.000	0.00
LE5.5	22JUL1996	0.00	0.000	0.00
RET4.3	10JUL1996	0.00	0.000	0.00
RET4.3	24JUL1996	2.38	5.370	-2.99
RET4.3	06AUG1996	0.00	0.000	0.00
RET4.3	10JUL1997	29.17	60.139	-30.97
RET4.3	23JUL1997	3.65	7.178	-3.53
RET5.2	23SEP1997	1.73	0.401	1.33
SBE5	08JUL1996	1.70	0.000	1.70
SBE5	23JUL1996	0.38	0.000	0.38
SBE5	08JUL1997	0.00	0.000	0.00
WE4.2	24JUL1996	0.00	0.000	0.00
WE4.2	05AUG1996	0.00	0.000	0.00

----- IBI\_METRIC=PREDITOR\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	16.50446	Std Deviation	234.18389
Median	0.00000	Variance	54842
Mode	0.00000	Range	1615
		Interquartile Range	0.40000

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 0.372927	Pr >  t  0.7121
Sign	M 1.5	Pr >=  M  0.6072
Signed Rank	S 4	Pr >=  S  0.8469

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=SIMPSON\_DIVERSITY -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	0.1228	0.2602	-0.1374
CB6.1	24JUL1996	0.0615	0.0185	0.0430
CB6.1	05AUG1996	0.0781	0.0002	0.0779
CB6.1	26AUG1996	0.0162	0.0176	-0.0014
CB6.1	08SEP1997	0.2561	0.1340	0.1221
CB6.4	05AUG1996	0.0543	0.1667	-0.1124
CB6.4	12AUG1997	0.4972	0.0760	0.4212
CB7.3E	07AUG1996	0.3656	0.1153	0.2503
CB7.3E	15JUL1997	0.3479	0.4603	-0.1124
CB7.4	22JUL1996	0.2953	0.2871	0.0082
CB7.4	13AUG1997	0.5984	0.6939	-0.0955
LE3.6	09JUL1996	0.1072	0.1711	-0.0639
LE3.6	24JUL1996	0.0566	0.0571	-0.0005
LE3.6	05AUG1996	0.1064	0.0322	0.0742
LE3.6	26AUG1996	0.0134	0.0224	-0.0090
LE3.6	15JUL1997	0.0223	0.0052	0.0171
LE5.5	22JUL1996	0.2912	0.3147	-0.0235
RET4.3	10JUL1996	0.4161	0.5824	-0.1663
RET4.3	24JUL1996	0.2758	0.2934	-0.0176
RET4.3	06AUG1996	0.4623	0.5121	-0.0498
RET4.3	10JUL1997	0.6678	0.7512	-0.0834
RET4.3	23JUL1997	0.2270	0.3847	-0.1577
RET5.2	23SEP1997	0.5124	0.4507	0.0617
SBE5	08JUL1996	0.4472	0.4954	-0.0482
SBE5	23JUL1996	0.3818	0.2526	0.1292
SBE5	08JUL1997	0.3633	0.1705	0.1928
WE4.2	24JUL1996	0.0492	0.0193	0.0299
WE4.2	05AUG1996	0.1204	0.0706	0.0498

----- IBI\_METRIC=SIMPSON\_DIVERSITY -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	0.01423	Std Deviation	0.12863
Median	-0.00095	Variance	0.01654
Mode	.	Range	0.58750
		Interquartile Range	0.14160

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 0.585344	Pr >  t  0.5632
Sign	M -1	Pr >=  M  0.8506
Signed Rank	S 1.5	Pr >=  S  0.9735



VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=SW\_INDEX -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	0.3540	0.4817	-0.1277
CB6.1	24JUL1996	0.1799	0.0628	0.1171
CB6.1	05AUG1996	0.1837	0.0012	0.1825
CB6.1	26AUG1996	0.0623	0.0582	0.0041
CB6.1	08SEP1997	0.6316	0.3329	0.2987
CB6.4	05AUG1996	0.1744	0.4212	-0.2468
CB6.4	12AUG1997	1.0451	0.2088	0.8363
CB7.3E	07AUG1996	0.8147	0.2416	0.5731
CB7.3E	15JUL1997	0.8690	0.9873	-0.1183
CB7.4	22JUL1996	0.6852	0.7026	-0.0174
CB7.4	13AUG1997	1.4035	1.4952	-0.0917
LE3.6	09JUL1996	0.2683	0.4000	-0.1317
LE3.6	24JUL1996	0.1598	0.1651	-0.0053
LE3.6	05AUG1996	0.2457	0.0913	0.1544
LE3.6	26AUG1996	0.0536	0.0708	-0.0172
LE3.6	15JUL1997	0.0768	0.0207	0.0561
LE5.5	22JUL1996	0.7054	0.7423	-0.0369
RET4.3	10JUL1996	0.8863	1.2166	-0.3303
RET4.3	24JUL1996	0.7198	0.7237	-0.0039
RET4.3	06AUG1996	0.7861	0.9234	-0.1373
RET4.3	10JUL1997	1.7470	1.6337	0.1133
RET4.3	23JUL1997	0.5403	0.9503	-0.4100
RET5.2	23SEP1997	0.7826	0.6741	0.1085
SBE5	08JUL1996	0.8680	0.9395	-0.0715
SBE5	23JUL1996	0.6989	0.4948	0.2041
SBE5	08JUL1997	0.6940	0.4430	0.2510
WE4.2	24JUL1996	0.1583	0.0609	0.0974
WE4.2	05AUG1996	0.3103	0.1992	0.1111

----- IBI\_METRIC=SW\_INDEX -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	0.048632	Std Deviation	0.25064
Median	0.000100	Variance	0.06282
Mode	.	Range	1.24630
		Interquartile Range	0.24075

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 1.026738	Pr >  t  0.3137
Sign	M 0	Pr >=  M  1.0000
Signed Rank	S 28	Pr >=  S  0.5335

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

----- IBI\_METRIC=TAXA\_RICHNESS -----

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	15	10	5
CB6.1	24JUL1996	15	5	10
CB6.1	05AUG1996	10	2	8
CB6.1	26AUG1996	20	12	8
CB6.1	08SEP1997	22	12	10
CB6.4	05AUG1996	19	10	9
CB6.4	12AUG1997	29	5	24
CB7.3E	07AUG1996	20	9	11
CB7.3E	15JUL1997	28	16	12
CB7.4	22JUL1996	20	12	8
CB7.4	13AUG1997	30	12	18
LE3.6	09JUL1996	5	7	-2
LE3.6	24JUL1996	8	7	1
LE3.6	05AUG1996	13	9	4
LE3.6	26AUG1996	16	9	7
LE3.6	15JUL1997	11	6	5
LE5.5	22JUL1996	22	12	10
RET4.3	10JUL1996	7	10	-3
RET4.3	24JUL1996	19	9	10
RET4.3	06AUG1996	10	8	2
RET4.3	10JUL1997	19	10	9
RET4.3	23JUL1997	14	9	5
RET5.2	23SEP1997	10	7	3
SBE5	08JUL1996	14	7	7
SBE5	23JUL1996	15	7	8
SBE5	08JUL1997	12	12	0
WE4.2	24JUL1996	14	6	8
WE4.2	05AUG1996	14	9	5

----- IBI\_METRIC=TAXA\_RICHNESS -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	7.214286	Std Deviation	5.54682
Median	8.000000	Variance	30.76720
Mode	8.000000	Range	27.00000
		Interquartile Range	5.50000

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 6.882218	Pr >  t  <.0001
Sign	M 11.5	Pr >=  M  <.0001
Signed Rank	S 182	Pr >=  S  <.0001

VERSAR MZ101C vs. ODU MZ102\_C Comparisons

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----- IBI_METRIC=TOT_ABUND -----

```

STATION	dateonly	VERSAR_ IBI_VALUE	ODU_IBI_ VALUE	diff
CB6.1	09JUL1996	822.09	1263.16	-441.07
CB6.1	24JUL1996	11138.59	4020.55	7118.04
CB6.1	05AUG1996	46749.76	534576.27	-487826.51
CB6.1	26AUG1996	58977.90	38906.54	20071.36
CB6.1	08SEP1997	3381.39	10269.36	-6887.97
CB6.4	05AUG1996	42121.41	24723.31	17398.10
CB6.4	12AUG1997	9511.42	1380.98	8130.45
CB7.3E	07AUG1996	40512.11	82424.08	-41911.97
CB7.3E	15JUL1997	10597.32	7099.97	3497.35
CB7.4	22JUL1996	2322.99	2965.56	-642.57
CB7.4	13AUG1997	19496.98	2314.20	17182.78
LE3.6	09JUL1996	558.04	483.01	75.03
LE3.6	24JUL1996	6691.06	9896.56	-3205.50
LE3.6	05AUG1996	43801.10	10357.33	33443.77
LE3.6	26AUG1996	15029.91	8418.01	6611.90
LE3.6	15JUL1997	7132.87	7133.51	-0.64
LE5.5	22JUL1996	9204.25	7201.40	2002.85
RET4.3	10JUL1996	80.93	46.66	34.27
RET4.3	24JUL1996	436.91	454.86	-17.95
RET4.3	06AUG1996	399.64	611.18	-211.54
RET4.3	10JUL1997	245.75	161.43	84.32
RET4.3	23JUL1997	431.26	128.74	302.52
RET5.2	23SEP1997	2644.49	1753.59	890.90
SBE5	08JUL1996	3687.46	3711.08	-23.62
SBE5	23JUL1996	779.53	1403.94	-624.41
SBE5	08JUL1997	18772.00	689.99	18082.01
WE4.2	24JUL1996	17950.38	6379.98	11570.40
WE4.2	05AUG1996	9942.77	109416.89	-99474.12

```

----- IBI_METRIC=TOT_ABUND -----

```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-17670.4	Std Deviation	95005
Median	79.7	Variance	9025929806
Mode	.	Range	521270
		Interquartile Range	8157

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -0.98419	Pr >  t  0.3338
Sign	M 2	Pr >=  M  0.5716
Signed Rank	S 48	Pr >=  S  0.2823



***APPENDIX C. Statistical Comparisons Of Versar And ODU Hensen  
Stempel Method Count Samples By Parameter***

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=ACARTIA_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	8823.53	7843.37	980.16
CB6.1	11SEP2000	17507.63	6616.73	10890.90
CB6.1	14AUG2002	8303.47	110982.12	-102678.66
CB6.1	16SEP2002	2594.21	4332.70	-1738.49
CB6.4	05AUG1996	40958.39	39042.65	1915.74
CB6.4	06JUL1998	114.46	88.09	26.37
CB6.4	07AUG2000	5631.49	4654.35	977.14
CB6.4	14SEP2000	8402.39	9632.43	-1230.04
CB6.4	15JUL2002	11863.49	2722.16	9141.33
CB7.3E	06JUL1999	10144.06	9592.52	551.54
CB7.3E	11JUL2000	641.68	729.86	-88.18
CB7.3E	19SEP2002	1726.71	994.81	731.90
CB7.4	13AUG1997	4221.73	4588.64	-366.91
CB7.4	06JUL1999	4607.55	5818.31	-1210.75
CB7.4	05AUG1999	524.37	437.78	86.60
CB7.4	21SEP1999	375.57	759.49	-383.92
CB7.4	11SEP2000	2189.57	2250.78	-61.21
LE3.6	09AUG2000	1688.58	1173.26	515.32
RET3.1	08JUL1999	2186.24	1706.51	479.72
RET3.1	09AUG2001	142.95	33.49	109.46
RET3.1	12SEP2002	5123.74	2519.30	2604.44
RET4.3	06AUG1996	115.31	267.20	-151.89
RET4.3	10JUL1997	136.58	501.49	-364.91
RET4.3	09SEP1998	5750.66	6268.32	-517.66
SBE5	15SEP1999	4177.38	4027.19	150.18
SBE5	21SEP2000	6081.77	7415.17	-1333.40
WE4.2	05AUG1996	9316.48	10697.31	-1380.83
WE4.2	06JUL1998	866.29	758.45	107.84

```
----- metric=ACARTIA_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-2937.08	Std Deviation	19746
Median	56.48	Variance	389914964
Mode	.	Range	113570
		Interquartile Range	1093

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -0.78706	Pr >  t  0.4381
Sign	M 1	Pr >=  M  0.8506
Signed Rank	S 12	Pr >=  S  0.7902

VERSAR MZ101C vs. ODU MZ103 Comparisons

----- metric=BALANIDAE\_ABUND -----

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	14.504	25.232	-10.728
CB6.1	11SEP2000	3.635	0.000	3.635
CB6.1	14AUG2002	123.208	947.448	-824.240
CB6.1	16SEP2002	64.605	74.559	-9.954
CB6.4	05AUG1996	63.052	75.664	-12.612
CB6.4	06JUL1998	2.868	3.670	-0.802
CB6.4	07AUG2000	10.252	10.935	-0.683
CB6.4	14SEP2000	4.573	15.177	-10.604
CB6.4	15JUL2002	0.000	0.000	0.000
CB7.3E	06JUL1999	45.018	45.021	-0.003
CB7.3E	11JUL2000	8.556	8.021	0.535
CB7.3E	19SEP2002	131.669	30.679	100.990
CB7.4	13AUG1997	35.084	0.000	35.084
CB7.4	06JUL1999	20.091	15.068	5.023
CB7.4	05AUG1999	39.205	9.801	29.404
CB7.4	21SEP1999	48.658	11.241	37.417
CB7.4	11SEP2000	13.505	6.077	7.428
LE3.6	09AUG2000	6.055	9.732	-3.677
RET3.1	08JUL1999	5.693	7.908	-2.215
RET3.1	09AUG2001	6.903	0.000	6.903
RET3.1	12SEP2002	193.755	630.642	-436.887
RET4.3	06AUG1996	0.368	0.000	0.368
RET4.3	10JUL1997	14.586	8.912	5.674
RET4.3	09SEP1998	38.411	19.753	18.658
SBE5	15SEP1999	9.372	21.421	-12.049
SBE5	21SEP2000	35.136	19.164	15.972
WE4.2	05AUG1996	342.346	247.590	94.756
WE4.2	06JUL1998	1.600	0.889	0.711

----- metric=BALANIDAE\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-34.3534	Std Deviation	178.60557
Median	0.4515	Variance	31900
Mode	.	Range	925.23000
		Interquartile Range	18.51550

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -1.01778	Pr >  t  0.3178
Sign	M 1.5	Pr >=  M  0.7011
Signed Rank	S 29	Pr >=  S  0.4964

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=BLUE_CRAB_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	0.000	0.058	-0.058
CB6.1	11SEP2000	0.058	0.000	0.058
CB6.1	14AUG2002	0.060	0.000	0.060
CB6.1	16SEP2002	0.000	0.000	0.000
CB6.4	05AUG1996	0.000	0.000	0.000
CB6.4	06JUL1998	0.000	0.000	0.000
CB6.4	07AUG2000	0.000	0.000	0.000
CB6.4	14SEP2000	0.000	2.168	-2.168
CB6.4	15JUL2002	0.000	0.000	0.000
CB7.3E	06JUL1999	0.000	0.000	0.000
CB7.3E	11JUL2000	0.000	9.625	-9.625
CB7.3E	19SEP2002	0.000	0.000	0.000
CB7.4	13AUG1997	0.000	0.000	0.000
CB7.4	06JUL1999	0.000	0.000	0.000
CB7.4	05AUG1999	0.000	0.000	0.000
CB7.4	21SEP1999	0.000	0.246	-0.246
CB7.4	11SEP2000	0.000	1.351	-1.351
LE3.6	09AUG2000	0.069	0.000	0.069
RET3.1	08JUL1999	17.080	17.397	-0.317
RET3.1	09AUG2001	0.000	14.716	-14.716
RET3.1	12SEP2002	3.588	5.882	-2.294
RET4.3	06AUG1996	11.415	14.729	-3.314
RET4.3	10JUL1997	12.376	12.963	-0.587
RET4.3	09SEP1998	30.180	2.722	27.458
SBE5	15SEP1999	0.471	2.678	-2.207
SBE5	21SEP2000	0.613	1.916	-1.303
WE4.2	05AUG1996	0.000	0.094	-0.094
WE4.2	06JUL1998	0.000	0.000	0.000

```
----- metric=BLUE_CRAB_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-0.37982	Std Deviation	6.35077
Median	0.00000	Variance	40.33231
Mode	0.00000	Range	42.17400
		Interquartile Range	1.32700

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -0.31647	Pr >  t  0.7541
Sign	M -4.5	Pr >=  M  0.0490
Signed Rank	S -51	Pr >=  S  0.0134



VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=BOSMINA_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	0.000	0.000	0.000
CB6.1	11SEP2000	3.635	0.000	3.635
CB6.1	14AUG2002	0.000	0.000	0.000
CB6.1	16SEP2002	0.000	0.000	0.000
CB6.4	05AUG1996	0.000	9.458	-9.458
CB6.4	06JUL1998	0.000	0.000	0.000
CB6.4	07AUG2000	0.000	0.000	0.000
CB6.4	14SEP2000	0.000	0.000	0.000
CB6.4	15JUL2002	3.386	0.000	3.386
CB7.3E	06JUL1999	0.000	49.523	-49.523
CB7.3E	11JUL2000	0.000	0.000	0.000
CB7.3E	19SEP2002	0.000	0.000	0.000
CB7.4	13AUG1997	0.000	0.000	0.000
CB7.4	06JUL1999	0.000	0.000	0.000
CB7.4	05AUG1999	0.000	0.000	0.000
CB7.4	21SEP1999	0.000	0.000	0.000
CB7.4	11SEP2000	1.351	0.000	1.351
LE3.6	09AUG2000	0.000	0.000	0.000
RET3.1	08JUL1999	8.540	20.560	-12.020
RET3.1	09AUG2001	11.007	2.030	8.977
RET3.1	12SEP2002	0.000	1.961	-1.961
RET4.3	06AUG1996	1.105	1.381	-0.276
RET4.3	10JUL1997	4.862	3.241	1.621
RET4.3	09SEP1998	21.949	74.074	-52.125
SBE5	15SEP1999	13.389	83.007	-69.618
SBE5	21SEP2000	0.000	0.000	0.000
WE4.2	05AUG1996	0.000	0.000	0.000
WE4.2	06JUL1998	0.000	0.000	0.000

```
----- metric=BOSMINA_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-6.28611	Std Deviation	18.51662
Median	0.00000	Variance	342.86513
Mode	0.00000	Range	78.59500
		Interquartile Range	0.13800

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -1.79638	Pr >  t  0.0836
Sign	M -1	Pr >=  M  0.7744
Signed Rank	S -16	Pr >=  S  0.2334

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=CALANOIDA_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	8823.79	7843.37	980.42
CB6.1	11SEP2000	17511.27	6618.55	10892.72
CB6.1	14AUG2002	8318.64	111047.46	-102728.82
CB6.1	16SEP2002	4122.76	5272.97	-1150.22
CB6.4	05AUG1996	40971.10	39042.95	1928.15
CB6.4	06JUL1998	114.85	88.09	26.76
CB6.4	07AUG2000	5662.25	4661.19	1001.06
CB6.4	14SEP2000	8430.33	9638.93	-1208.60
CB6.4	15JUL2002	12097.10	2766.17	9330.93
CB7.3E	06JUL1999	10391.66	9736.59	655.07
CB7.3E	11JUL2000	715.49	824.57	-109.08
CB7.3E	19SEP2002	4477.89	2464.93	2012.96
CB7.4	13AUG1997	5683.55	5541.15	142.39
CB7.4	06JUL1999	5285.95	6478.29	-1192.34
CB7.4	05AUG1999	946.04	751.41	194.63
CB7.4	21SEP1999	1099.69	791.61	308.08
CB7.4	11SEP2000	2292.29	2422.29	-130.00
LE3.6	09AUG2000	1688.58	1173.26	515.32
RET3.1	08JUL1999	2186.24	1709.67	476.56
RET3.1	09AUG2001	143.13	33.49	109.64
RET3.1	12SEP2002	5202.69	2527.14	2675.55
RET4.3	06AUG1996	115.31	267.20	-151.89
RET4.3	10JUL1997	137.46	503.92	-366.46
RET4.3	09SEP1998	5992.45	6401.65	-409.20
SBE5	15SEP1999	4196.55	4045.94	150.61
SBE5	21SEP2000	6246.27	7597.23	-1350.96
WE4.2	05AUG1996	9316.48	10699.94	-1383.46
WE4.2	06JUL1998	866.85	758.45	108.40

```
----- metric=CALANOIDA_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-2809.71	Std Deviation	19780
Median	126.02	Variance	391266514
Mode	.	Range	113622
		Interquartile Range	1206

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -0.75163	Pr >  t  0.4588
Sign	M 3	Pr >=  M  0.3449
Signed Rank	S 36	Pr >=  S  0.4223

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=CLADOCERA_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	7.21	0.00	7.21
CB6.1	11SEP2000	3.64	0.00	3.64
CB6.1	14AUG2002	156.81	1110.80	-953.99
CB6.1	16SEP2002	44.56	29.00	15.56
CB6.4	05AUG1996	346.81	397.24	-50.43
CB6.4	06JUL1998	2.53	1.84	0.69
CB6.4	07AUG2000	27.34	24.61	2.73
CB6.4	14SEP2000	0.00	0.00	0.00
CB6.4	15JUL2002	1098.10	150.67	947.43
CB7.3E	06JUL1999	85.53	58.53	27.01
CB7.3E	11JUL2000	2441.61	2309.90	131.71
CB7.3E	19SEP2002	16.17	1.23	14.94
CB7.4	13AUG1997	12314.35	13095.01	-780.66
CB7.4	06JUL1999	1781.41	2944.31	-1162.90
CB7.4	05AUG1999	9762.15	4528.06	5234.09
CB7.4	21SEP1999	28.42	1.61	26.82
CB7.4	11SEP2000	2.70	0.00	2.70
LE3.6	09AUG2000	0.87	1.08	-0.22
RET3.1	08JUL1999	9.49	23.98	-14.49
RET3.1	09AUG2001	11.01	2.03	8.98
RET3.1	12SEP2002	0.00	13.72	-13.72
RET4.3	06AUG1996	1.11	1.38	-0.28
RET4.3	10JUL1997	16.80	27.55	-10.75
RET4.3	09SEP1998	21.95	74.07	-52.13
SBE5	15SEP1999	18.75	88.36	-69.62
SBE5	21SEP2000	0.00	0.00	0.00
WE4.2	05AUG1996	0.00	0.00	0.00
WE4.2	06JUL1998	0.00	0.00	0.00

```
----- metric=CLADOCERA_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	118.3688	Std Deviation	1068
Median	0.0000	Variance	1140849
Mode	0.0000	Range	6397
		Interquartile Range	26.06600

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 0.586411	Pr >  t  0.5625
Sign	M 1	Pr >=  M  0.8388
Signed Rank	S 1	Pr >=  S  0.9779

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=COPEPODA_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	8838.21	7843.37	994.83
CB6.1	11SEP2000	17525.87	6620.37	10905.50
CB6.1	14AUG2002	8355.97	111406.84	-103050.87
CB6.1	16SEP2002	4606.18	5707.90	-1101.72
CB6.4	05AUG1996	41475.51	39383.44	2092.07
CB6.4	06JUL1998	116.54	89.01	27.53
CB6.4	07AUG2000	5665.66	4662.56	1003.11
CB6.4	14SEP2000	8448.47	9638.95	-1190.48
CB6.4	15JUL2002	12198.78	2791.15	9407.63
CB7.3E	06JUL1999	10472.69	9759.10	713.59
CB7.3E	11JUL2000	720.84	832.60	-111.75
CB7.3E	19SEP2002	5321.03	2838.01	2483.02
CB7.4	13AUG1997	6478.77	5797.92	680.86
CB7.4	06JUL1999	5456.72	6704.31	-1247.59
CB7.4	05AUG1999	1195.98	836.35	359.62
CB7.4	21SEP1999	1165.78	801.24	364.53
CB7.4	11SEP2000	2320.65	2452.69	-132.03
LE3.6	09AUG2000	1689.45	1174.88	514.56
RET3.1	08JUL1999	2187.18	1716.05	471.13
RET3.1	09AUG2001	143.51	33.49	110.02
RET3.1	12SEP2002	5285.23	2544.79	2740.45
RET4.3	06AUG1996	115.67	267.20	-151.52
RET4.3	10JUL1997	177.24	571.16	-393.93
RET4.3	09SEP1998	6017.14	6441.15	-424.01
SBE5	15SEP1999	4219.31	4077.28	142.03
SBE5	21SEP2000	6252.66	7597.23	-1344.57
WE4.2	05AUG1996	9328.18	10710.48	-1382.29
WE4.2	06JUL1998	867.92	758.45	109.47

```
----- metric=COPEPODA_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-2764.67	Std Deviation	19854
Median	126.02	Variance	394185468
Mode	.	Range	113956
		Interquartile Range	1263

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -0.73684	Pr >  t  0.4676
Sign	M 3	Pr >=  M  0.3449
Signed Rank	S 38	Pr >=  S  0.3966

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=CYCLOPOIDA_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	3.604	0.000	3.604
CB6.1	11SEP2000	7.329	0.000	7.329
CB6.1	14AUG2002	22.401	261.365	-238.964
CB6.1	16SEP2002	231.685	190.539	41.146
CB6.4	05AUG1996	119.798	66.206	53.592
CB6.4	06JUL1998	0.000	0.000	0.000
CB6.4	07AUG2000	1.709	0.000	1.709
CB6.4	14SEP2000	13.604	0.019	13.585
CB6.4	15JUL2002	67.822	23.700	44.122
CB7.3E	06JUL1999	40.516	9.004	31.512
CB7.3E	11JUL2000	5.347	6.416	-1.069
CB7.3E	19SEP2002	697.613	328.895	368.718
CB7.4	13AUG1997	596.422	198.786	397.636
CB7.4	06JUL1999	158.217	207.940	-49.723
CB7.4	05AUG1999	142.120	32.670	109.450
CB7.4	21SEP1999	25.615	3.212	22.403
CB7.4	11SEP2000	8.103	5.413	2.690
LE3.6	09AUG2000	0.000	0.000	0.000
RET3.1	08JUL1999	0.949	6.377	-5.428
RET3.1	09AUG2001	0.187	0.000	0.187
RET3.1	12SEP2002	50.250	17.645	32.605
RET4.3	06AUG1996	0.368	0.000	0.368
RET4.3	10JUL1997	38.895	64.813	-25.918
RET4.3	09SEP1998	2.744	0.000	2.744
SBE5	15SEP1999	20.084	25.989	-5.905
SBE5	21SEP2000	4.791	0.000	4.791
WE4.2	05AUG1996	2.926	0.000	2.926
WE4.2	06JUL1998	0.533	0.000	0.533

```
----- metric=CYCLOPOIDA_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	29.09439	Std Deviation	114.18459
Median	2.83500	Variance	13038
Mode	0.00000	Range	636.60000
		Interquartile Range	32.05850

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----	
Student's t	t 1.348282	Pr >  t	0.1888
Sign	M 7	Pr >=  M	0.0094
Signed Rank	S 87.5	Pr >=  S	0.0231

VERSAR MZ101C vs. ODU MZ103 Comparisons

```

----- metric=EURYTEMORA_ABUND -----
STATION          SAMPLE_DATE    value_VERSAR  value_ODU      diff
CB6.1            06JUL1999      0.000         0.000          0.000
CB6.1            11SEP2000      0.000         0.000          0.000
CB6.1            14AUG2002      0.000         0.000          0.000
CB6.1            16SEP2002      0.000         0.000          0.000
CB6.4            05AUG1996      0.000         0.000          0.000
CB6.4            06JUL1998      0.000         0.000          0.000
CB6.4            07AUG2000      0.000         0.000          0.000
CB6.4            14SEP2000      0.000         0.000          0.000
CB6.4            15JUL2002      0.000         0.000          0.000
CB7.3E           06JUL1999      0.000         0.000          0.000
CB7.3E           11JUL2000      0.000         0.000          0.000
CB7.3E           19SEP2002      0.000         0.000          0.000
CB7.4            13AUG1997      0.000         0.000          0.000
CB7.4            06JUL1999      0.000         0.000          0.000
CB7.4            05AUG1999      0.000         0.000          0.000
CB7.4            21SEP1999      0.000         0.000          0.000
CB7.4            11SEP2000      0.000         0.000          0.000
LE3.6            09AUG2000      0.000         0.000          0.000
RET3.1           08JUL1999      0.000         3.163         -3.163
RET3.1           09AUG2001      0.000         0.000          0.000
RET3.1           12SEP2002      0.000         7.842         -7.842
RET4.3           06AUG1996      0.000         0.000          0.000
RET4.3           10JUL1997      0.884         2.431         -1.547
RET4.3           09SEP1998      2.744        133.333       -130.589
SBE5             15SEP1999      0.000         0.000          0.000
SBE5             21SEP2000      0.000         0.000          0.000
WE4.2            05AUG1996      0.000         0.000          0.000
WE4.2            06JUL1998      0.533         0.000          0.533

```

----- metric=EURYTEMORA\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-5.09314	Std Deviation	24.64665
Median	0.00000	Variance	607.45714
Mode	0.00000	Range	131.12200
		Interquartile Range	0

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -1.09347	Pr >  t  0.2838
Sign	M -1.5	Pr >=  M  0.3750
	Signed Rank S	-6.5 Pr >=  S  0.1250

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=HARPACTICOIDA_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	0.000	0.000	0.000
CB6.1	11SEP2000	0.000	0.000	0.000
CB6.1	14AUG2002	0.000	32.671	-32.671
CB6.1	16SEP2002	138.120	169.829	-31.709
CB6.4	05AUG1996	6.305	0.000	6.305
CB6.4	06JUL1998	0.000	0.000	0.000
CB6.4	07AUG2000	0.000	1.367	-1.367
CB6.4	14SEP2000	0.000	0.000	0.000
CB6.4	15JUL2002	0.000	0.000	0.000
CB7.3E	06JUL1999	0.000	0.000	0.000
CB7.3E	11JUL2000	0.000	1.604	-1.604
CB7.3E	19SEP2002	90.089	30.679	59.410
CB7.4	13AUG1997	11.695	8.283	3.412
CB7.4	06JUL1999	0.000	0.000	0.000
CB7.4	05AUG1999	4.901	13.068	-8.167
CB7.4	21SEP1999	4.336	6.423	-2.087
CB7.4	11SEP2000	0.000	3.376	-3.376
LE3.6	09AUG2000	0.000	0.000	0.000
RET3.1	08JUL1999	0.000	0.000	0.000
RET3.1	09AUG2001	0.000	0.000	0.000
RET3.1	12SEP2002	10.764	0.000	10.764
RET4.3	06AUG1996	0.000	0.000	0.000
RET4.3	10JUL1997	0.884	0.000	0.884
RET4.3	09SEP1998	0.000	0.000	0.000
SBE5	15SEP1999	1.339	5.355	-4.016
SBE5	21SEP2000	0.000	0.000	0.000
WE4.2	05AUG1996	2.926	7.902	-4.976
WE4.2	06JUL1998	0.000	0.000	0.000

```
----- metric=HARPACTICOIDA_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-0.32850	Std Deviation	14.77636
Median	0.00000	Variance	218.34091
Mode	0.00000	Range	92.08100
		Interquartile Range	1.84550

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -0.11764	Pr >  t  0.9072
Sign	M -2	Pr >=  M  0.4240
Signed Rank	S -11.5	Pr >=  S  0.5016

VERSAR MZ101C vs. ODU MZ103 Comparisons

----- metric=MARGALEF\_INDEX -----

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	2.0754	1.4426	0.6328
CB6.1	11SEP2000	2.0465	0.6819	1.3646
CB6.1	14AUG2002	2.4229	1.8030	0.6199
CB6.1	16SEP2002	2.1018	2.0561	0.0457
CB6.4	05AUG1996	1.6904	1.0381	0.6523
CB6.4	06JUL1998	3.2935	1.0923	2.2012
CB6.4	07AUG2000	2.4252	2.0089	0.4163
CB6.4	14SEP2000	1.4371	1.4165	0.0206
CB6.4	15JUL2002	2.3132	1.7494	0.5638
CB7.3E	06JUL1999	3.0013	2.2719	0.7294
CB7.3E	11JUL2000	2.3506	1.9820	0.3686
CB7.3E	19SEP2002	3.2151	2.8682	0.3469
CB7.4	13AUG1997	2.9358	2.3317	0.6041
CB7.4	06JUL1999	3.0183	2.6044	0.4139
CB7.4	05AUG1999	4.2687	3.1268	1.1419
CB7.4	21SEP1999	6.7181	3.4063	3.3118
CB7.4	11SEP2000	3.2121	2.4266	0.7855
LE3.6	09AUG2000	2.1476	1.4110	0.7366
RET3.1	08JUL1999	1.9445	1.7339	0.2106
RET3.1	09AUG2001	1.9186	1.2218	0.6968
RET3.1	12SEP2002	1.7377	1.2386	0.4991
RET4.3	06AUG1996	1.5024	1.3220	0.1804
RET4.3	10JUL1997	3.2702	2.2861	0.9841
RET4.3	09SEP1998	2.1707	1.7034	0.4673
SBE5	15SEP1999	3.2117	2.1478	1.0639
SBE5	21SEP2000	1.9319	1.4459	0.4860
WE4.2	05AUG1996	1.4123	1.5014	-0.0891
WE4.2	06JUL1998	1.9164	1.3540	0.5624

----- metric=MARGALEF\_INDEX -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	0.714907	Std Deviation	0.68170
Median	0.583950	Variance	0.46472
Mode	.	Range	3.40090
		Interquartile Range	0.36980

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 5.549239	Pr >  t  <.0001
Sign	M 13	Pr >=  M  <.0001
Signed Rank	S 200	Pr >=  S  <.0001



VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=PREDITOR_ABUND -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	0.00	0.00	0.00
CB6.1	11SEP2000	0.18	0.04	0.13
CB6.1	14AUG2002	82.14	490.06	-407.92
CB6.1	16SEP2002	0.00	82.84	-82.84
CB6.4	05AUG1996	0.03	387.78	-387.75
CB6.4	06JUL1998	2.02	1.84	0.19
CB6.4	07AUG2000	27.61	23.59	4.02
CB6.4	14SEP2000	4.54	2.17	2.37
CB6.4	15JUL2002	1094.82	145.59	949.23
CB7.3E	06JUL1999	22.51	9.00	13.51
CB7.3E	11JUL2000	2438.40	2309.90	128.50
CB7.3E	19SEP2002	233.31	78.54	154.77
CB7.4	13AUG1997	1099.29	331.31	767.98
CB7.4	06JUL1999	0.30	3.01	-2.72
CB7.4	05AUG1999	6905.06	3147.61	3757.45
CB7.4	21SEP1999	140.68	13.65	127.03
CB7.4	11SEP2000	18.91	6.75	12.16
LE3.6	09AUG2000	0.87	1.08	-0.22
RET3.1	08JUL1999	0.95	6.33	-5.38
RET3.1	09AUG2001	0.19	0.00	0.19
RET3.1	12SEP2002	0.00	0.00	0.00
RET4.3	06AUG1996	0.00	0.00	0.00
RET4.3	10JUL1997	29.17	64.00	-34.83
RET4.3	09SEP1998	0.53	0.00	0.53
SBE5	15SEP1999	17.79	15.28	2.51
SBE5	21SEP2000	0.00	0.00	0.00
WE4.2	05AUG1996	0.00	0.00	0.00
WE4.2	06JUL1998	1.07	0.14	0.93

```
----- metric=PREDITOR_ABUND -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	178.5645	Std Deviation	747.79339
Median	0.1880	Variance	559195
Mode	0.0000	Range	4165
		Interquartile Range	12.93800

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 1.26355	Pr >  t  0.2172
Sign	M 4.5	Pr >=  M  0.0931
Signed Rank	S 46	Pr >=  S  0.1666

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=SIMPSON_DIVERSITY -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	0.1291	0.0840	0.0451
CB6.1	11SEP2000	0.0051	0.0019	0.0032
CB6.1	14AUG2002	0.1047	0.0584	0.0463
CB6.1	16SEP2002	0.6923	0.5181	0.1742
CB6.4	05AUG1996	0.0543	0.0457	0.0086
CB6.4	06JUL1998	0.2082	0.1775	0.0307
CB6.4	07AUG2000	0.0447	0.0333	0.0114
CB6.4	14SEP2000	0.0194	0.0090	0.0104
CB6.4	15JUL2002	0.2218	0.1684	0.0534
CB7.3E	06JUL1999	0.1875	0.1380	0.0495
CB7.3E	11JUL2000	0.3972	0.4280	-0.0308
CB7.3E	19SEP2002	0.7577	0.7299	0.0278
CB7.4	13AUG1997	0.5984	0.4948	0.1036
CB7.4	06JUL1999	0.5814	0.5768	0.0046
CB7.4	05AUG1999	0.5954	0.6208	-0.0254
CB7.4	21SEP1999	0.8643	0.2113	0.6530
CB7.4	11SEP2000	0.1655	0.1958	-0.0303
LE3.6	09AUG2000	0.0364	0.0386	-0.0022
RET3.1	08JUL1999	0.0472	0.1041	-0.0569
RET3.1	09AUG2001	0.3787	0.6089	-0.2302
RET3.1	12SEP2002	0.1637	0.3449	-0.1812
RET4.3	06AUG1996	0.4623	0.4966	-0.0343
RET4.3	10JUL1997	0.6678	0.4827	0.1851
RET4.3	09SEP1998	0.1731	0.1167	0.0564
SBE5	15SEP1999	0.1273	0.1460	-0.0187
SBE5	21SEP2000	0.1564	0.1454	0.0110
WE4.2	05AUG1996	0.1204	0.0884	0.0320
WE4.2	06JUL1998	0.0377	0.0306	0.0071

```
----- metric=SIMPSON_DIVERSITY -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	0.032264	Std Deviation	0.14677
Median	0.010700	Variance	0.02154
Mode	.	Range	0.88320
		Interquartile Range	0.06995

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 1.163221	Pr >  t  0.2549
Sign	M 5	Pr >=  M  0.0872
Signed Rank	S 67	Pr >=  S  0.1293

VERSAR MZ101C vs. ODU MZ103 Comparisons

```

----- metric=SW_INDEX -----
STATION          SAMPLE_DATE  value_VERSAR  value_ODU      diff
CB6.1            06JUL1999    0.3471        0.24744        0.09966
CB6.1            11SEP2000    0.0240        0.00920        0.01480
CB6.1            14AUG2002    0.3232        0.19790        0.12530
CB6.1            16SEP2002    1.5958        1.32220        0.27360
CB6.4            05AUG1996    0.1744        0.14678        0.02762
CB6.4            06JUL1998    0.5862        0.45122        0.13498
CB6.4            07AUG2000    0.1597        0.12640        0.03330
CB6.4            14SEP2000    0.0742        0.03760        0.03660
CB6.4            15JUL2002    0.5319        0.44680        0.08510
CB7.3E           06JUL1999    0.5530        0.42884        0.12416
CB7.3E           11JUL2000    0.7876        0.81250        -0.02490
CB7.3E           19SEP2002    1.8431        1.71800        0.12510
CB7.4            13AUG1997    1.4035        1.04789        0.35561
CB7.4            06JUL1999    1.3050        1.23360        0.07140
CB7.4            05AUG1999    1.3484        1.41247        -0.06407
CB7.4            21SEP1999    2.4559        0.63382        1.82208
CB7.4            11SEP2000    0.4648        0.53820        -0.07340
LE3.6            09AUG2000    0.1289        0.12740        0.00150
RET3.1           08JUL1999    0.1638        0.31494        -0.15114
RET3.1           09AUG2001    0.8424        1.18500        -0.34260
RET3.1           12SEP2002    0.4525        0.61650        -0.16400
RET4.3           06AUG1996    0.7861        0.83316        -0.04706
RET4.3           10JUL1997    1.7470        1.19437        0.55263
RET4.3           09SEP1998    0.4957        0.33987        0.15583
SBE5             15SEP1999    0.3500        0.42694        -0.07694
SBE5             21SEP2000    0.3861        0.37070        0.01540
WE4.2            05AUG1996    0.3103        0.24776        0.06254
WE4.2            06JUL1998    0.1322        0.09824        0.03396

```

----- metric=SW\_INDEX -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	0.114538	Std Deviation	0.37342
Median	0.035278	Variance	0.13944
Mode	.	Range	2.16468
		Interquartile Range	0.16118

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 1.623033	Pr >  t  0.1162
Sign	M 6	Pr >=  M  0.0357
	Signed Rank S 83	Pr >=  S  0.0572

VERSAR MZ101C vs. ODU MZ103 Comparisons

```
----- metric=TAXA_RICHNESS -----
```

STATION	SAMPLE_DATE	value_VERSAR	value_ODU	diff
CB6.1	06JUL1999	20	14	6
CB6.1	11SEP2000	21	7	14
CB6.1	14AUG2002	23	22	1
CB6.1	16SEP2002	19	19	0
CB6.4	05AUG1996	19	12	7
CB6.4	06JUL1998	17	6	11
CB6.4	07AUG2000	22	18	4
CB6.4	14SEP2000	14	14	0
CB6.4	15JUL2002	23	15	8
CB7.3E	06JUL1999	29	22	7
CB7.3E	11JUL2000	20	17	3
CB7.3E	19SEP2002	29	24	5
CB7.4	13AUG1997	30	24	6
CB7.4	06JUL1999	28	25	3
CB7.4	05AUG1999	41	28	13
CB7.4	21SEP1999	51	24	27
CB7.4	11SEP2000	26	20	6
LE3.6	09AUG2000	17	11	6
RET3.1	08JUL1999	16	14	2
RET3.1	09AUG2001	11	6	5
RET3.1	12SEP2002	16	11	5
RET4.3	06AUG1996	10	9	1
RET4.3	10JUL1997	19	16	3
RET4.3	09SEP1998	20	16	4
SBE5	15SEP1999	28	19	9
SBE5	21SEP2000	18	14	4
WE4.2	05AUG1996	14	15	-1
WE4.2	06JUL1998	14	10	4

```
----- metric=TAXA_RICHNESS -----
```

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	5.821429	Std Deviation	5.53142
Median	5.000000	Variance	30.59656
Mode	4.000000	Range	28.00000
		Interquartile Range	4.00000

NOTE: The mode displayed is the smallest of 2 modes with a count of 4.

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 5.568937	Pr >  t  <.0001
Sign	M 12	Pr >=  M  <.0001
Signed Rank	S 173.5	Pr >=  S  <.0001

VERSAR MZ101C vs. ODU MZ103 Comparisons

```

----- metric=TOT_ABUND -----
STATION          SAMPLE_DATE  value_VERSAR  value_ODU      diff
CB6.1            06JUL1999    9462.40       8089.03       1373.37
CB6.1            11SEP2000    17552.86      6623.14      10929.72
CB6.1            14AUG2002    8778.08      114380.37    -105602.30
CB6.1            16SEP2002    5241.09      6337.77      -1096.68
CB6.4            05AUG1996    42121.41     39950.92     2170.49
CB6.4            06JUL1998    128.77        96.35        32.42
CB6.4            07AUG2000    5761.97      4733.99     1027.98
CB6.4            14SEP2000    8484.96      9675.94     -1190.99
CB6.4            15JUL2002    13503.92     2989.57     10514.35
CB7.3E           06JUL1999    11262.31     10205.07     1057.23
CB7.3E           11JUL2000    3238.62      3177.89        60.73
CB7.3E           19SEP2002    6056.64      3038.34     3018.29
CB7.4            13AUG1997    19496.98     19224.70     272.28
CB7.4            06JUL1999    7673.46      9886.70     -2213.24
CB7.4            05AUG1999    11738.41     5606.02     6132.39
CB7.4            21SEP1999    1707.08       851.18     855.90
CB7.4            11SEP2000    2399.64     2514.81     -115.17
LE3.6            09AUG2000    1720.24     1196.65     523.59
RET3.1           08JUL1999    2239.88     1803.44     436.44
RET3.1           09AUG2001    183.46        59.88     123.59
RET3.1           12SEP2002    5608.37     3208.79     2399.57
RET4.3           06AUG1996    399.64       424.79     -25.15
RET4.3           10JUL1997    245.75       707.27     -461.52
RET4.3           09SEP1998    6329.63     6672.18     -342.55
SBE5             15SEP1999    4476.82     4358.44     118.39
SBE5             21SEP2000    6632.61     8030.39    -1397.78
WE4.2            05AUG1996    9942.77     11205.85    -1263.08
WE4.2            06JUL1998    883.11       770.38     112.73

```

----- metric=TOT\_ABUND -----

The UNIVARIATE Procedure  
Variable: diff

Basic Statistical Measures

Location		Variability	
Mean	-2591.03	Std Deviation	20429
Median	120.99	Variance	417327991
Mode	.	Range	116532
		Interquartile Range	1617

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t -0.67114	Pr >  t  0.5078
Sign	M 4	Pr >=  M  0.1849
Signed Rank	S 56	Pr >=  S  0.2079





