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• *Design*

• *Analyze*

• *Report*

Status: Preliminary Report
Date: May 22, 2019
Project Title: Macroinvertebrate Data: 2017

I) Abundance and Biomass Data

The 2017 macroinvertebrate data provided information on abundance and biomass data at the level of taxonomic groups. The taxonomic level data were reformatted, and aggregated across taxa groups for analysis by SCS. All descriptions and analyses below relate to this aggregated data.

There were 97 observations in the compiled, aggregated data for 2017. Print Out #1 represents a listing of the data. The variables included were: *site*, *RKM*, *year*, *abundance* and *biomass*. The recorded values for site were KR2, KR4, KR6, KR7, KR9, KR9.1, KR10, and KR10.5. Descriptions of all sites are given on the KTOI Web database site at <http://scsnetw.com/ktoi>. The dates ranged from mid-March to late October. A Julian date variable was also created from this date range. Each site was represented by five to six replications. As per recommendation of Charlie Holderman, all values were adjusted to represent response levels per meter square (g/m^2 and \#/m^2 for biomass and abundance, respectively). No subsampling was present in the 2017 data.

II) Summary Statistics for Abundance and Biomass

Computations were carried out separately for each site over all sample periods. Basic summary information for both the abundance and biomass data are presented in Print Out #2. The 8 sites varied widely in their minimum, mean, maximum and variance values. The number of observations ranged from 6 to 15. Large maximum abundances were noted at site KR9.1. The maximum biomass value at site KR9.1 was also very large.

A more detailed summary of each site is given in Print Out #3. Site KR2 in 2017, for example, had a mean abundance of 1690.35 with a sample size of 6. The variance was 1697351.49 and the standard error of the mean was 531.8. The skewness value, a measure of symmetry for the frequency distribution, was moderate at -0.05 indicating a slightly asymmetric distribution. Biomass for KR2 had a mean value of 0.94 g/m^2 with 6 observations. The variance was 1.19 and the standard error was 0.45 g/m^2 . Skewness for biomass was higher at 0.799. Further examination of the quantiles and frequency plots for abundance and biomass also indicate some skewness. Statistical tests for normality are significant for both response variables in KR2, thus, the hypothesis that the data originates from a symmetric normal distribution is rejected. Because sample size estimation and statistical inference assume normally distributed

data, a transformation of the data is required prior to further analysis. As was the case for previous years, the natural logarithm was chosen as a transformation to mitigate distributional skewness. Abundance and biomass for the remaining sites were also notably skewed, therefore, these data were also log transformed prior to analysis. This transformation was successful in mitigating the effects of the anomalous data values noted earlier. Summary information for the transformed data (referred to as L_abun and L_bio for abundance and biomass, respectively) are given in Print Out #4. All subsequent statistical analyses reported here will be based on the log transformed data.

Trends Over Time and RKM

Plots of abundance and biomass trends for each site across date are given in Print Out #5. These plots provide both the mean trend and box plots for log transformed responses at each date. The box plots at each time indicate the spread of the data on each side of the mean. Only one sample date is available for site KR2 and KR4, and there are three dates for the remaining sites. These show variable trends, either increasing or decreasing, depending on site.

Print Out #6 gives abundance and biomass trends over RKM. While the variability is high for both responses, some trend is evident, where abundance and biomass values tend to show elevated values within the nutrient addition zone peaking at KR9.1 (RKM 276.1, denoted with vertical reference line). As in previous data sets, it is noted that sites KR2-KR4 (RKM 123-231) show consistently lower levels of abundance and biomass than sites KR9 and KR9.1 (RKM 262.2 and 276.1, respectively).

III) Determination of Sample Sizes

The formulation for calculating sample size is given by:

$$n = (z*s/d)^2$$

where s, d and z are related to the variability, desired precision, and confidence levels, respectively. For this analysis, sample sizes were evaluated at the confidence levels: 90, 95, and 99%. The measure of variability was obtained from the data at hand and the precision set to approximately 10% of the overall mean abundance value and 50% of the mean biomass value due to low response levels. Because of the logarithmic transformations used for abundance and biomass responses, this value may vary slightly. Sample size estimation was carried out separately for abundance and biomass at each site.

Estimated sample sizes for abundance and biomass are given in the Print Outs #7. For abundance, the sample sizes were small at all confidence levels, indicating that the current sampling scheme of 6 replications is sufficient for that response. Biomass sample sizes at 95% confidence for biomass were nominal for all but a few sites. Sites KR6, KR9, KR10, and KR10.5 had very large estimated sample sizes, primarily due to variance measures larger than their respective means or very small mean values, making the estimation of 10% of the mean value

difficult. This may be due to sampling error or naturally small mean biomass values at these sites. Overall, however, the current sampling scheme can be considered as providing a precision level at or below the desired levels.

Note that for all the above calculations, the resulting sample size values are preliminary and also based on limited data. Thus, care should be exercised in applying these results to setting policy regarding future sampling protocols.

IV) Comparison of Years

Print Out #8 presents the estimated sample sizes (at the 95% level of confidence) for abundance and biomass in all years 2003 - 2017. Missing values (“-”) in the tables are due to changes in the sites sampled across years.

Sample sizes for abundance are equivalent and adequate for all years indicating few changes over the 2003-2017 period. Biomass sample sizes are comparable for all sites except for KR6, KR9, KR10, and KR10.5, as noted above. Because the macroinvertebrate designation encompasses a large range of species and organism sizes, variability in the biomass response is inevitable. Computation of sample size estimates based on taxonomic classes such as species, family, functional group, etc., may provide more reliable information on the biomass response in the future. It is notable, however, that over the course of the project, sample size estimates have decreased and stabilized indicating less sample variability. This is indicative to improved sampling methods as well as better establishment and consistency of macroinvertebrate sampling protocols.

Plots of abundance and biomass over sites in the years spanning 2003-2017 are given in Print Out #9. On these plots, the nutrient addition site (KR9.1) is indicated with a vertical reference line. Both abundance and biomass show general trends similar to those of the preceding years, however, it is noted that the abundance response in 2017 was average in comparison to previous years. Similarly, while biomass showed an elevated response in the nutrient addition zone typical of the Post Nutrient Addition period, the overall pattern in the fertilization zone was somewhat larger than many past years. Lower river values were average, relative to all years. Annual changes in abundance or biomass trends may reflect actual fluxuations in the responses as well as sampling error due to changes and refinements in the sampling procedures, protocols, and personnel. Overall, however, the nutrient addition site, KR9.1, shows a continued elevation in response rates for 2017, as well as higher response levels than pre-nutrient addition years. This is also contrasted to the consistently lower responses at geographically similar sites KR10 and KR10.5, where no nutrient addition treatments have been applied.

V) Additional Remarks

- The data provided to SCS for 2017 macroinvertebrates were recompiled for analysis. Additional information on family, taxa, etc., were not included in this report. The data provided was free from errors and missing values.
- The 2017 macroinvertebrate data have now been incorporated into the relational database as part of the KTOI Ecosystem Web site (<http://ktoi.scsnetw.com>).
- Responses in the nutrient addition sites, KR9 and KR9.1, in 2017 continue to show higher average abundance and biomass values over the years before nutrient addition began. In contrast, sites KR10 and KR10.5, just upriver from the nutrient addition site, consistently shows lower levels of these responses.
- Trend analysis and sample size estimates for abundance and biomass measurements may be improved with additional information on subgroups. Such Information may include species, ecological, functional, or taxonomic classifications.
- Any additional information regarding biological, ecological, environmental, or physical variables could enhance the estimation process. To be of maximum utility, these variables should be available for each site during all sampling periods. Examples of potentially useful variables might be air and water temperature, thermal or degree day measurements, stream velocity and discharge rates, and habitat or substrate information (cobble size, depth, embeddedness, etc.).

2017 Macroinvertebrate Data

Obs	Site	RKM	year	jul	abundance	Biomass
1	KR10.5	299.2	2017	73	2880	1.6876
2	KR10.5	299.2	2017	73	4968	2.0728
3	KR10.5	299.2	2017	73	3128	1.8872
4	KR10.5	299.2	2017	73	2760	1.1384
5	KR10.5	299.2	2017	73	3368	2.2668
6	KR6	250.0	2017	73	1140	2.5112
7	KR6	250.0	2017	73	1212	1.7224
8	KR6	250.0	2017	73	6960	5.5608
9	KR6	250.0	2017	73	1252	0.4652
10	KR6	250.0	2017	73	4880	1.42
11	KR7	255.4	2017	73	360	1.5668
12	KR7	255.4	2017	73	348	1.8196
13	KR7	255.4	2017	73	280	0.5176
14	KR7	255.4	2017	73	88	0.3016
15	KR7	255.4	2017	73	464	3.5668
16	KR9	262.2	2017	73	148	0.8272
17	KR9	262.2	2017	73	120	0.2528
18	KR9	262.2	2017	73	244	0.0724
19	KR9	262.2	2017	73	96	0.4976
20	KR9	262.2	2017	73	76	0.2464
21	KR9.1	276.1	2017	73	924	0.6008
22	KR9.1	276.1	2017	73	3312	2.2068
23	KR9.1	276.1	2017	73	9016	5.5164
24	KR9.1	276.1	2017	73	2616	5.7968
25	KR9.1	276.1	2017	73	3016	2.1152
26	KR2	170.0	2017	208	2998.7	2.19077
27	KR2	170.0	2017	208	3017.8	2.4257
28	KR2	170.0	2017	208	668.5	0.0382
29	KR2	170.0	2017	208	2540.3	0.69142
30	KR2	170.0	2017	208	133.7	0.0382
31	KR2	170.0	2017	208	783.1	0.24066
32	KR4	231.3	2017	208	191	0.0573
33	KR4	231.3	2017	208	821.3	0.0955
34	KR4	231.3	2017	208	401.1	0.05157
35	KR4	231.3	2017	208	2731.3	0.50042
36	KR4	231.3	2017	208	1642.6	0.31324
37	KR4	231.3	2017	208	1795.4	0.71243
38	KR6	250.0	2017	209	3004	0.7804

2017 Macroinvertebrate Data

Obs	Site	RKM	year	jul	abundance	Biomass
39	KR6	250.0	2017	209	2656	0.9616
40	KR6	250.0	2017	209	3372	0.4992
41	KR6	250.0	2017	209	3720	0.7232
42	KR6	250.0	2017	209	3440	0.768
43	KR7	255.4	2017	209	3068	1.4508
44	KR7	255.4	2017	209	4916	0.7456
45	KR7	255.4	2017	209	3740	0.9428
46	KR7	255.4	2017	209	3440	0.7696
47	KR7	255.4	2017	209	2736	1.8112
48	KR9	262.2	2017	209	4708	0.8784
49	KR9	262.2	2017	209	6624	5.6512
50	KR9	262.2	2017	209	6908	2.3168
51	KR9	262.2	2017	209	8260	1.8632
52	KR9	262.2	2017	209	4504	0.5276
53	KR9.1	276.1	2017	209	2480	1.478
54	KR9.1	276.1	2017	209	6436	0.9468
55	KR9.1	276.1	2017	209	12108	3.7032
56	KR9.1	276.1	2017	209	4244	1.3204
57	KR9.1	276.1	2017	209	5596	1.9056
58	KR10	285.6	2017	210	1184	2.5824
59	KR10	285.6	2017	210	1256	1.4016
60	KR10	285.6	2017	210	1508	1.3348
61	KR10	285.6	2017	210	904	1.2596
62	KR10	285.6	2017	210	296	0.9292
63	KR10.5	299.2	2017	210	4020	0.8036
64	KR10.5	299.2	2017	210	4356	1.1672
65	KR10.5	299.2	2017	210	6876	0.9352
66	KR10.5	299.2	2017	210	2724	2.2132
67	KR10.5	299.2	2017	210	3996	1.0228
68	KR10	285.6	2017	304	2620	0.3928
69	KR10	285.6	2017	304	2160	0.304
70	KR10	285.6	2017	304	4332	1.6768
71	KR10	285.6	2017	304	2576	2.1896
72	KR10	285.6	2017	304	1788	1.0952
73	KR10.5	299.2	2017	304	3112	0.8528
74	KR10.5	299.2	2017	304	3400	0.332
75	KR10.5	299.2	2017	304	1520	0.1572
76	KR10.5	299.2	2017	304	6844	1.374

2017 Macroinvertebrate Data

Obs	Site	RKM	year	jul	abundance	Biomass
77	KR10.5	299.2	2017	304	3200	0.4812
78	KR6	250.0	2017	304	2460	0.4028
79	KR6	250.0	2017	304	1480	0.4212
80	KR6	250.0	2017	304	3432	1.0256
81	KR6	250.0	2017	304	4056	0.5844
82	KR6	250.0	2017	304	1712	0.5324
83	KR7	255.4	2017	304	4092	1.8392
84	KR7	255.4	2017	304	532	1.4888
85	KR7	255.4	2017	304	4680	3.8512
86	KR7	255.4	2017	304	5032	4.946
87	KR7	255.4	2017	304	5616	3.4996
88	KR9	262.2	2017	304	7344	5.0736
89	KR9	262.2	2017	304	9032	7.6712
90	KR9	262.2	2017	304	8504	2.1184
91	KR9	262.2	2017	304	2872	0.538
92	KR9	262.2	2017	304	4448	0.9192
93	KR9.1	276.1	2017	304	11756	3.8984
94	KR9.1	276.1	2017	304	12984	4.4408
95	KR9.1	276.1	2017	304	5900	5.6776
96	KR9.1	276.1	2017	304	23568	10.2132
97	KR9.1	276.1	2017	304	10344	9.6488

2017 Macroinvertebrate Data Means and Standard Errors

Obs	Site	n	min_abun	mean_abun	max_abun	std_abun	min_bio	mean_bio	max_bio	std_bio
1	KR2	6	133.7	1690.35	3017.8	1302.8244268	0.0382	0.9374916667	2.4257	1.0907838708
2	KR4	6	191	1263.7833333	2731.3	966.49900448	0.05157	0.28841	0.71243	0.2727918676
3	KR6	15	1140	2985.0666667	6960	1591.4086961	0.4028	1.2252266667	5.5608	1.331556996
4	KR7	15	88	2626.1333333	5616	2066.4055012	0.3016	1.9411466667	4.946	1.3858820388
5	KR9	15	76	4259.2	9032	3444.853785	0.0724	1.9636	7.6712	2.3185841985
6	KR9.1	15	924	7620	23568	5889.66863	0.6008	3.9645866667	10.2132	2.9844942404
7	KR10	10	296	1862.4	4332	1135.3851231	0.304	1.3166	2.5824	0.71358172
8	KR10.5	15	1520	3810.1333333	6876	1473.6271028	0.1572	1.2261333333	2.2668	0.6760201293

**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: abundance (abundance)**

RKM=170 Site=KR2

Moments			
N	6	Sum Weights	6
Mean	1690.35	Sum Observations	10142.1
Std Deviation	1302.82443	Variance	1697351.49
Skewness	-0.053317	Kurtosis	-2.8006237
Uncorrected SS	25630456.2	Corrected SS	8486757.44
Coeff Variation	77.0742406	Std Error Mean	531.875845

Basic Statistical Measures			
Location		Variability	
Mean	1690.350	Std Deviation	1303
Median	1661.700	Variance	1697351
Mode	.	Range	2884
		Interquartile Range	2330

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	3.178091	Pr > t 	0.0246
Sign	M	3	Pr >= M 	0.0313
Signed Rank	S	10.5	Pr >= S 	0.0313

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.835973	Pr < W	0.1207
Kolmogorov-Smirnov	D	0.256902	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.085228	Pr > W-Sq	0.1449
Anderson-Darling	A-Sq	0.497997	Pr > A-Sq	0.1283

Quantiles (Definition 5)	
Level	Quantile
100% Max	3017.8
99%	3017.8
95%	3017.8
90%	3017.8
75% Q3	2998.7

The UNIVARIATE Procedure
Variable: abundance (abundance)

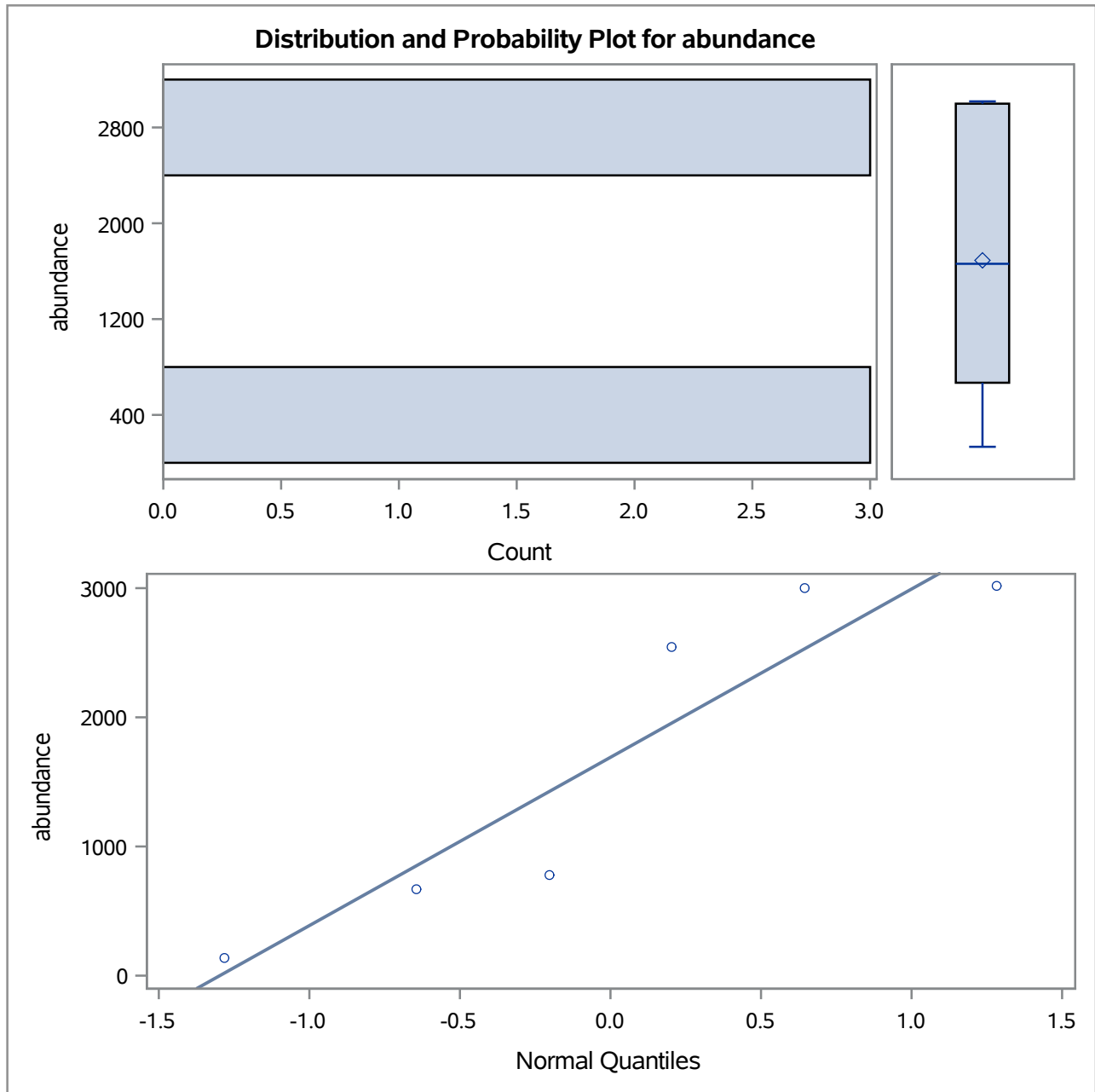
RKM=170 Site=KR2

Quantiles (Definition 5)	
Level	Quantile
50% Median	1661.7
25% Q1	668.5
10%	133.7
5%	133.7
1%	133.7
0% Min	133.7

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
133.7	5	668.5	3
668.5	3	783.1	6
783.1	6	2540.3	4
2540.3	4	2998.7	1
2998.7	1	3017.8	2

The UNIVARIATE Procedure

RKM=170 Site=KR2



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: Biomass (Biomass)**

RKM=170 Site=KR2

Moments			
N	6	Sum Weights	6
Mean	0.93749167	Sum Observations	5.62495
Std Deviation	1.09078387	Variance	1.18980945
Skewness	0.79904591	Kurtosis	-1.8393826
Uncorrected SS	11.222391	Corrected SS	5.94904726
Coeff Variation	116.351314	Std Error Mean	0.44531065

Basic Statistical Measures			
Location		Variability	
Mean	0.937492	Std Deviation	1.09078
Median	0.466040	Variance	1.18981
Mode	0.038200	Range	2.38750
		Interquartile Range	2.15257

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	2.105253	Pr > t 	0.0892
Sign	M	3	Pr >= M 	0.0313
Signed Rank	S	10.5	Pr >= S 	0.0313

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.798211	Pr < W	0.0566
Kolmogorov-Smirnov	D	0.255907	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.100124	Pr > W-Sq	0.0898
Anderson-Darling	A-Sq	0.584496	Pr > A-Sq	0.0739

Quantiles (Definition 5)	
Level	Quantile
100% Max	2.42570
99%	2.42570
95%	2.42570
90%	2.42570
75% Q3	2.19077

The UNIVARIATE Procedure
Variable: Biomass (Biomass)

RKM=170 Site=KR2

Quantiles (Definition 5)	
Level	Quantile
50% Median	0.46604
25% Q1	0.03820
10%	0.03820
5%	0.03820
1%	0.03820
0% Min	0.03820

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
0.03820	5	0.03820	5
0.03820	3	0.24066	6
0.24066	6	0.69142	4
0.69142	4	2.19077	1
2.19077	1	2.42570	2

**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: abundance (abundance)**

RKM=231.3 Site=KR4

Moments			
N	6	Sum Weights	6
Mean	1263.78333	Sum Observations	7582.7
Std Deviation	966.499004	Variance	934120.326
Skewness	0.46579233	Kurtosis	-0.9111032
Uncorrected SS	14253491.5	Corrected SS	4670601.63
Coeff Variation	76.476638	Std Error Mean	394.571566

Basic Statistical Measures			
Location		Variability	
Mean	1263.783	Std Deviation	966.49900
Median	1231.950	Variance	934120
Mode	.	Range	2540
		Interquartile Range	1394

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	3.202926	Pr > t 	0.0239
Sign	M	3	Pr >= M 	0.0313
Signed Rank	S	10.5	Pr >= S 	0.0313

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.941705	Pr < W	0.6730
Kolmogorov-Smirnov	D	0.176459	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.035996	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.235501	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	2731.30
99%	2731.30
95%	2731.30
90%	2731.30
75% Q3	1795.40

The UNIVARIATE Procedure
Variable: abundance (abundance)

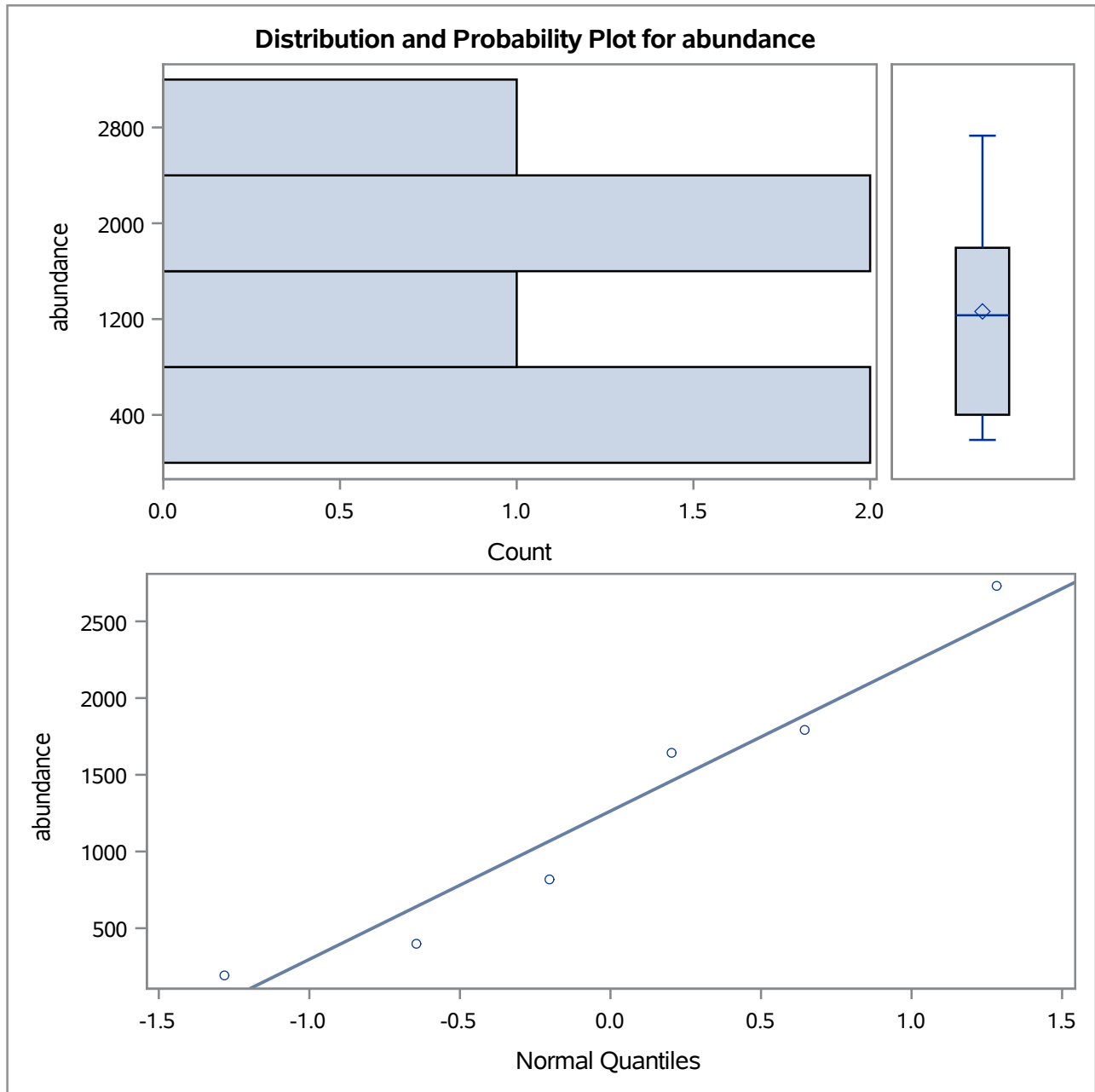
RKM=231.3 Site=KR4

Quantiles (Definition 5)	
Level	Quantile
50% Median	1231.95
25% Q1	401.10
10%	191.00
5%	191.00
1%	191.00
0% Min	191.00

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
191.0	7	401.1	9
401.1	9	821.3	8
821.3	8	1642.6	11
1642.6	11	1795.4	12
1795.4	12	2731.3	10

The UNIVARIATE Procedure

RKM=231.3 Site=KR4



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: Biomass (Biomass)**

RKM=231.3 Site=KR4

Moments			
N	6	Sum Weights	6
Mean	0.28841	Sum Observations	1.73046
Std Deviation	0.27279187	Variance	0.0744154
Skewness	0.78284764	Kurtosis	-0.9749698
Uncorrected SS	0.87115898	Corrected SS	0.37207702
Coeff Variation	94.5847466	Std Error Mean	0.11136681

Basic Statistical Measures			
Location		Variability	
Mean	0.288410	Std Deviation	0.27279
Median	0.204370	Variance	0.07442
Mode	.	Range	0.66086
		Interquartile Range	0.44312

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	2.58973	Pr > t 	0.0489
Sign	M	3	Pr >= M 	0.0313
Signed Rank	S	10.5	Pr >= S 	0.0313

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.868676	Pr < W	0.2210
Kolmogorov-Smirnov	D	0.260269	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.06355	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.397122	Pr > A-Sq	0.2483

Quantiles (Definition 5)	
Level	Quantile
100% Max	0.71243
99%	0.71243
95%	0.71243
90%	0.71243
75% Q3	0.50042

The UNIVARIATE Procedure
Variable: Biomass (Biomass)

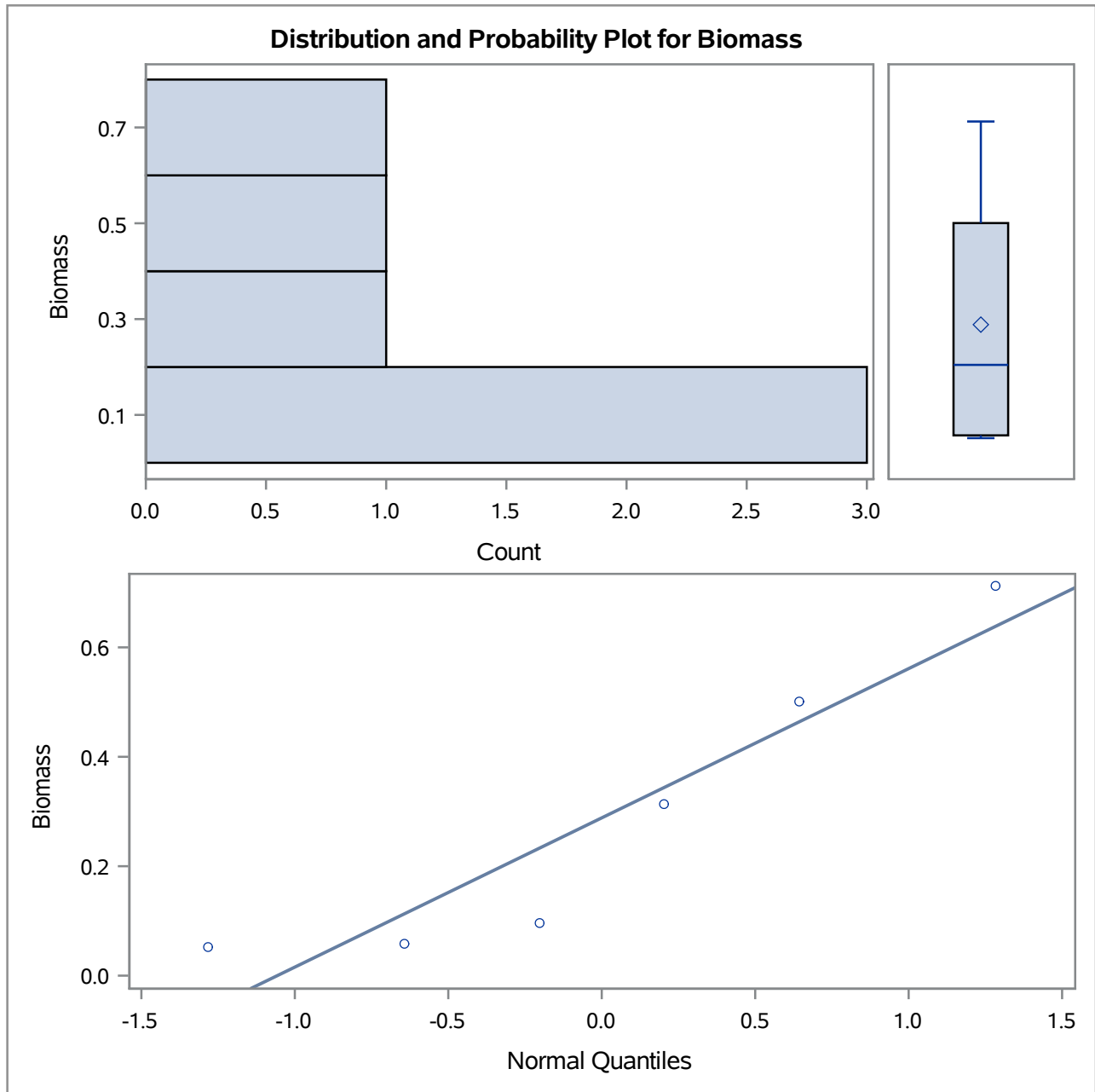
RKM=231.3 Site=KR4

Quantiles (Definition 5)	
Level	Quantile
50% Median	0.20437
25% Q1	0.05730
10%	0.05157
5%	0.05157
1%	0.05157
0% Min	0.05157

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
0.05157	9	0.05730	7
0.05730	7	0.09550	8
0.09550	8	0.31324	11
0.31324	11	0.50042	10
0.50042	10	0.71243	12

The UNIVARIATE Procedure

RKM=231.3 Site=KR4



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: abundance (abundance)**

RKM=250 Site=KR6

Moments			
N	15	Sum Weights	15
Mean	2985.06667	Sum Observations	44776
Std Deviation	1591.4087	Variance	2532581.64
Skewness	0.99713395	Kurtosis	1.41498914
Uncorrected SS	169115488	Corrected SS	35456142.9
Coeff Variation	53.3123335	Std Error Mean	410.899958

Basic Statistical Measures			
Location		Variability	
Mean	2985.067	Std Deviation	1591
Median	3004.000	Variance	2532582
Mode	.	Range	5820
		Interquartile Range	2240

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	7.264704	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.910186	Pr < W	0.1363
Kolmogorov-Smirnov	D	0.123148	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.052248	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.420752	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	6960
99%	6960
95%	6960
90%	4880
75% Q3	3720

The UNIVARIATE Procedure
Variable: abundance (abundance)

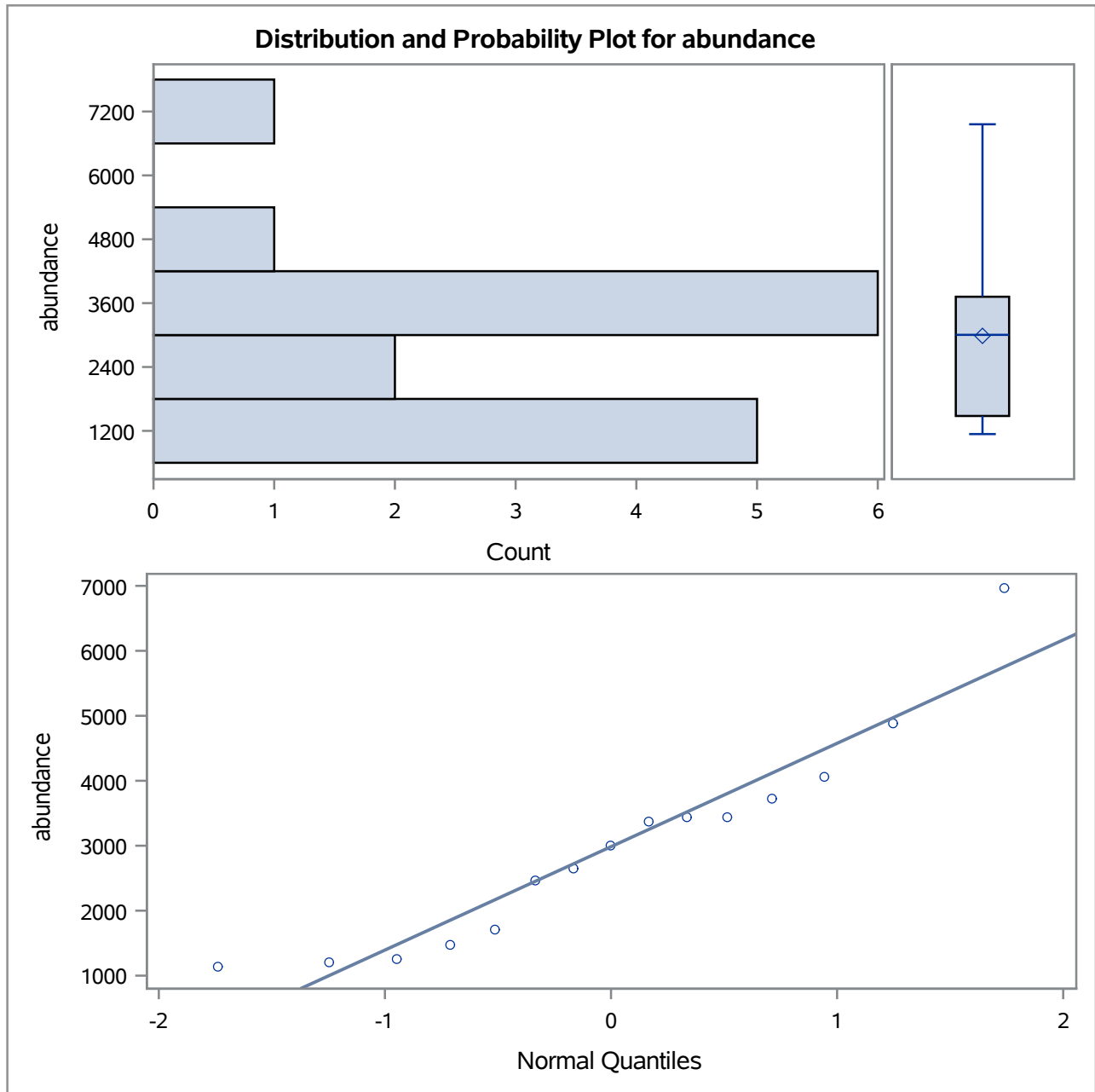
RKM=250 Site=KR6

Quantiles (Definition 5)	
Level	Quantile
50% Median	3004
25% Q1	1480
10%	1212
5%	1140
1%	1140
0% Min	1140

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
1140	13	3440	22
1212	14	3720	21
1252	16	4056	26
1480	24	4880	17
1712	27	6960	15

The UNIVARIATE Procedure

RKM=250 Site=KR6



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: Biomass (Biomass)**

RKM=250 Site=KR6

Moments			
N	15	Sum Weights	15
Mean	1.22522667	Sum Observations	18.3784
Std Deviation	1.331557	Variance	1.77304403
Skewness	2.82498445	Kurtosis	8.75092191
Uncorrected SS	47.3403222	Corrected SS	24.8226165
Coeff Variation	108.678421	Std Error Mean	0.34380654

Basic Statistical Measures			
Location		Variability	
Mean	1.225227	Std Deviation	1.33156
Median	0.768000	Variance	1.77304
Mode	.	Range	5.15800
		Interquartile Range	0.92080

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	3.56371	Pr > t 	0.0031
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.624232	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.292919	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.370763	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	2.069107	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	5.5608
99%	5.5608
95%	5.5608
90%	2.5112
75% Q3	1.4200

The UNIVARIATE Procedure
Variable: Biomass (Biomass)

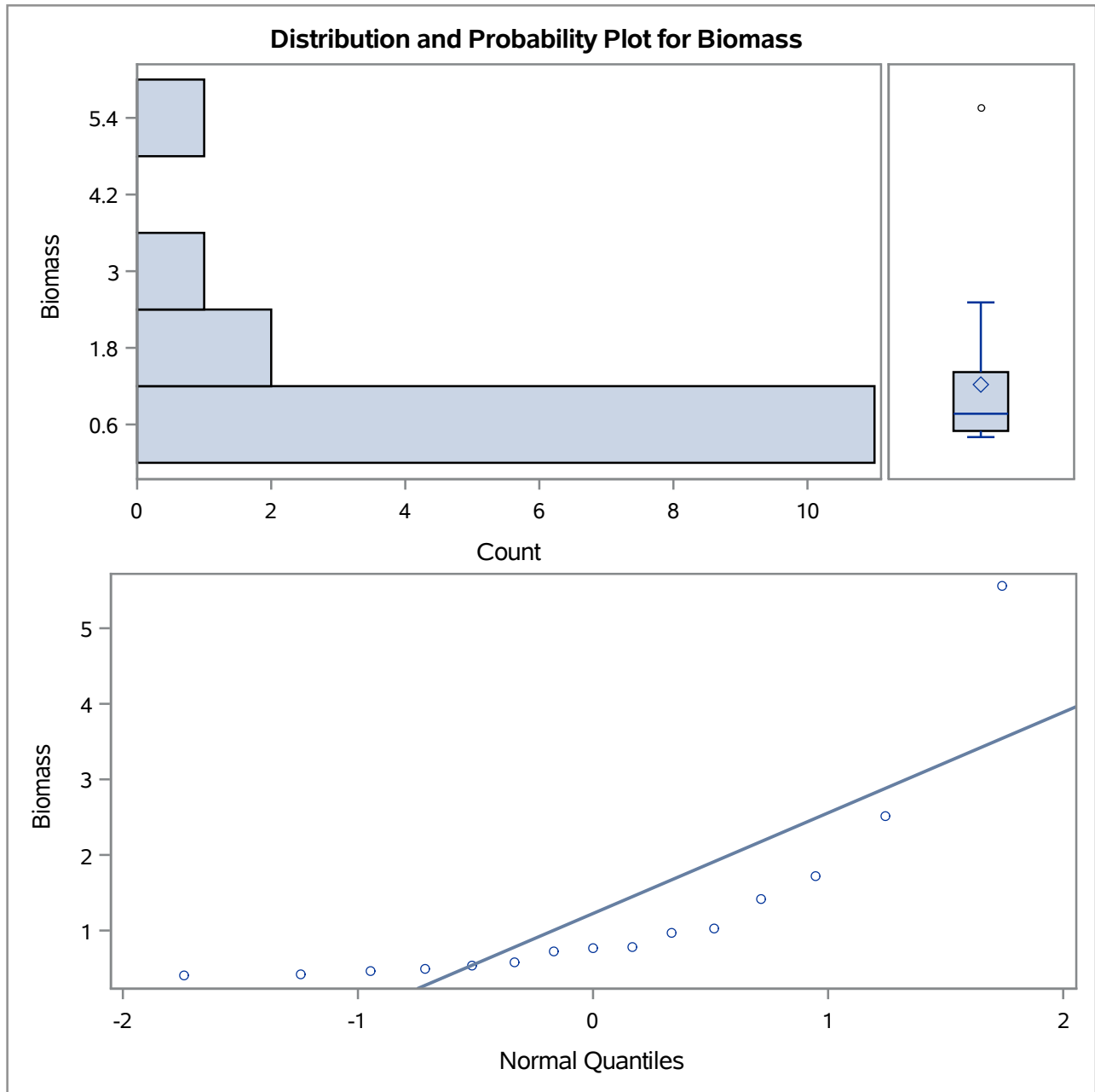
RKM=250 Site=KR6

Quantiles (Definition 5)	
Level	Quantile
50% Median	0.7680
25% Q1	0.4992
10%	0.4212
5%	0.4028
1%	0.4028
0% Min	0.4028

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
0.4028	23	1.0256	25
0.4212	24	1.4200	17
0.4652	16	1.7224	14
0.4992	20	2.5112	13
0.5324	27	5.5608	15

The UNIVARIATE Procedure

RKM=250 Site=KR6



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: abundance (abundance)**

RKM=255.4 Site=KR7

Moments			
N	15	Sum Weights	15
Mean	2626.13333	Sum Observations	39392
Std Deviation	2066.4055	Variance	4270031.7
Skewness	-0.0516951	Kurtosis	-1.7711341
Uncorrected SS	163229088	Corrected SS	59780443.7
Coeff Variation	78.6862371	Std Error Mean	533.543606

Basic Statistical Measures			
Location		Variability	
Mean	2626.133	Std Deviation	2066
Median	3068.000	Variance	4270032
Mode	.	Range	5528
		Interquartile Range	4320

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	4.922059	Pr > t 	0.0002
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.860725	Pr < W	0.0247
Kolmogorov-Smirnov	D	0.24457	Pr > D	0.0169
Cramer-von Mises	W-Sq	0.130184	Pr > W-Sq	0.0403
Anderson-Darling	A-Sq	0.847529	Pr > A-Sq	0.0226

Quantiles (Definition 5)	
Level	Quantile
100% Max	5616
99%	5616
95%	5616
90%	5032
75% Q3	4680

The UNIVARIATE Procedure
Variable: abundance (abundance)

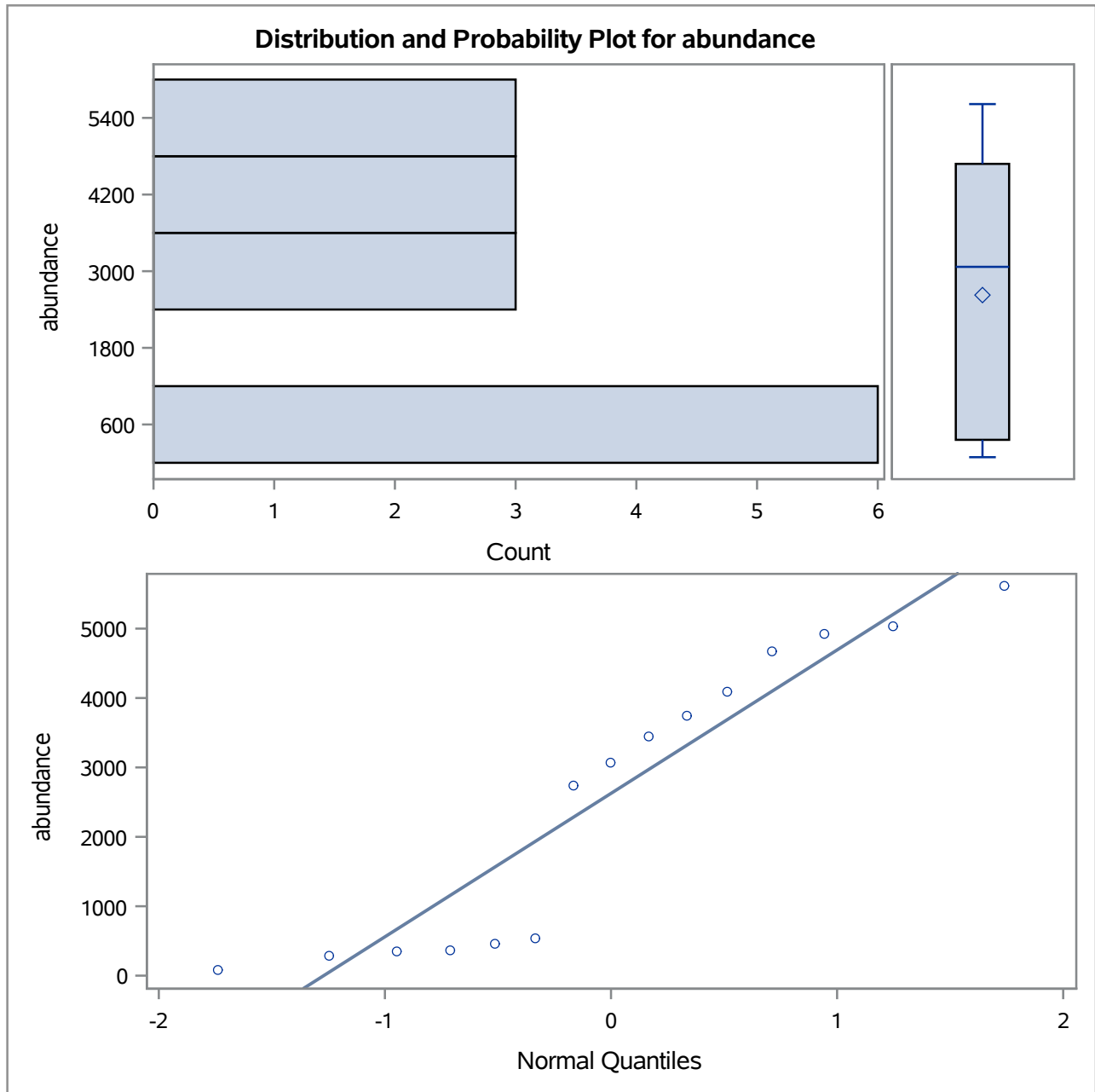
RKM=255.4 Site=KR7

Quantiles (Definition 5)	
Level	Quantile
50% Median	3068
25% Q1	360
10%	280
5%	88
1%	88
0% Min	88

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
88	31	4092	38
280	30	4680	40
348	29	4916	34
360	28	5032	41
464	32	5616	42

The UNIVARIATE Procedure

RKM=255.4 Site=KR7



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: Biomass (Biomass)**

RKM=255.4 Site=KR7

Moments			
N	15	Sum Weights	15
Mean	1.94114667	Sum Observations	29.1172
Std Deviation	1.38588204	Variance	1.92066903
Skewness	0.93845743	Kurtosis	-0.0726934
Uncorrected SS	83.4101221	Corrected SS	26.8893664
Coeff Variation	71.3950194	Std Error Mean	0.3578332

Basic Statistical Measures			
Location		Variability	
Mean	1.941147	Std Deviation	1.38588
Median	1.566800	Variance	1.92067
Mode	.	Range	4.64440
		Interquartile Range	2.73000

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	5.424725	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.88495	Pr < W	0.0563
Kolmogorov-Smirnov	D	0.262653	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.141754	Pr > W-Sq	0.0267
Anderson-Darling	A-Sq	0.757941	Pr > A-Sq	0.0394

Quantiles (Definition 5)	
Level	Quantile
100% Max	4.9460
99%	4.9460
95%	4.9460
90%	3.8512
75% Q3	3.4996

The UNIVARIATE Procedure
Variable: Biomass (Biomass)

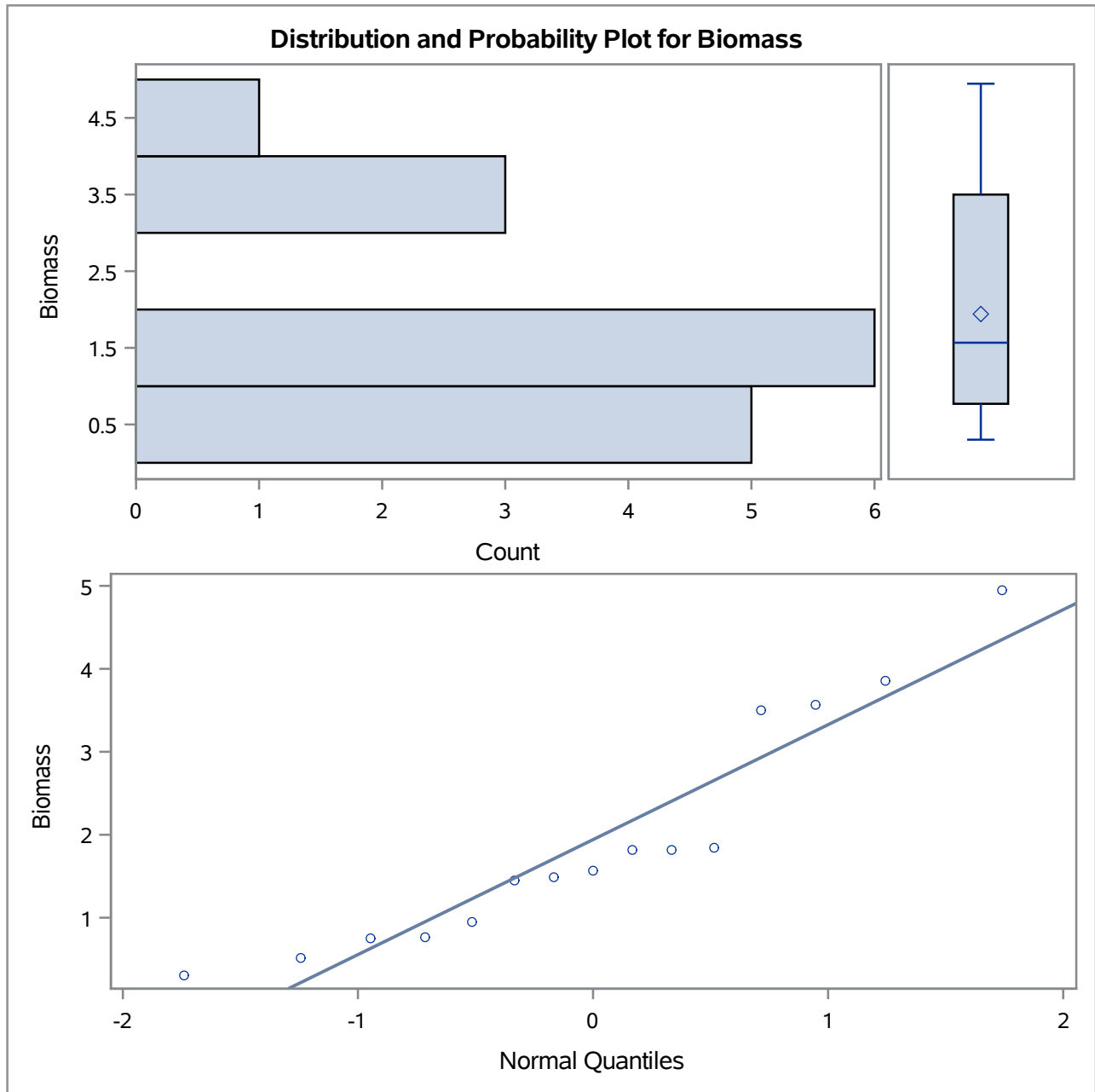
RKM=255.4 Site=KR7

Quantiles (Definition 5)	
Level	Quantile
50% Median	1.5668
25% Q1	0.7696
10%	0.5176
5%	0.3016
1%	0.3016
0% Min	0.3016

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
0.3016	31	1.8392	38
0.5176	30	3.4996	42
0.7456	34	3.5668	32
0.7696	36	3.8512	40
0.9428	35	4.9460	41

The UNIVARIATE Procedure

RKM=255.4 Site=KR7



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: abundance (abundance)**

RKM=262.2 Site=KR9

Moments			
N	15	Sum Weights	15
Mean	4259.2	Sum Observations	63888
Std Deviation	3444.85378	Variance	11867017.6
Skewness	-0.085976	Kurtosis	-1.6464864
Uncorrected SS	438250016	Corrected SS	166138246
Coeff Variation	80.8803011	Std Error Mean	889.457423

Basic Statistical Measures			
Location		Variability	
Mean	4259.200	Std Deviation	3445
Median	4504.000	Variance	11867018
Mode	.	Range	8956
		Interquartile Range	7196

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	4.788537	Pr > t 	0.0003
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.869357	Pr < W	0.0330
Kolmogorov-Smirnov	D	0.211438	Pr > D	0.0709
Cramer-von Mises	W-Sq	0.097002	Pr > W-Sq	0.1145
Anderson-Darling	A-Sq	0.710651	Pr > A-Sq	0.0497

Quantiles (Definition 5)	
Level	Quantile
100% Max	9032
99%	9032
95%	9032
90%	8504
75% Q3	7344

The UNIVARIATE Procedure
Variable: abundance (abundance)

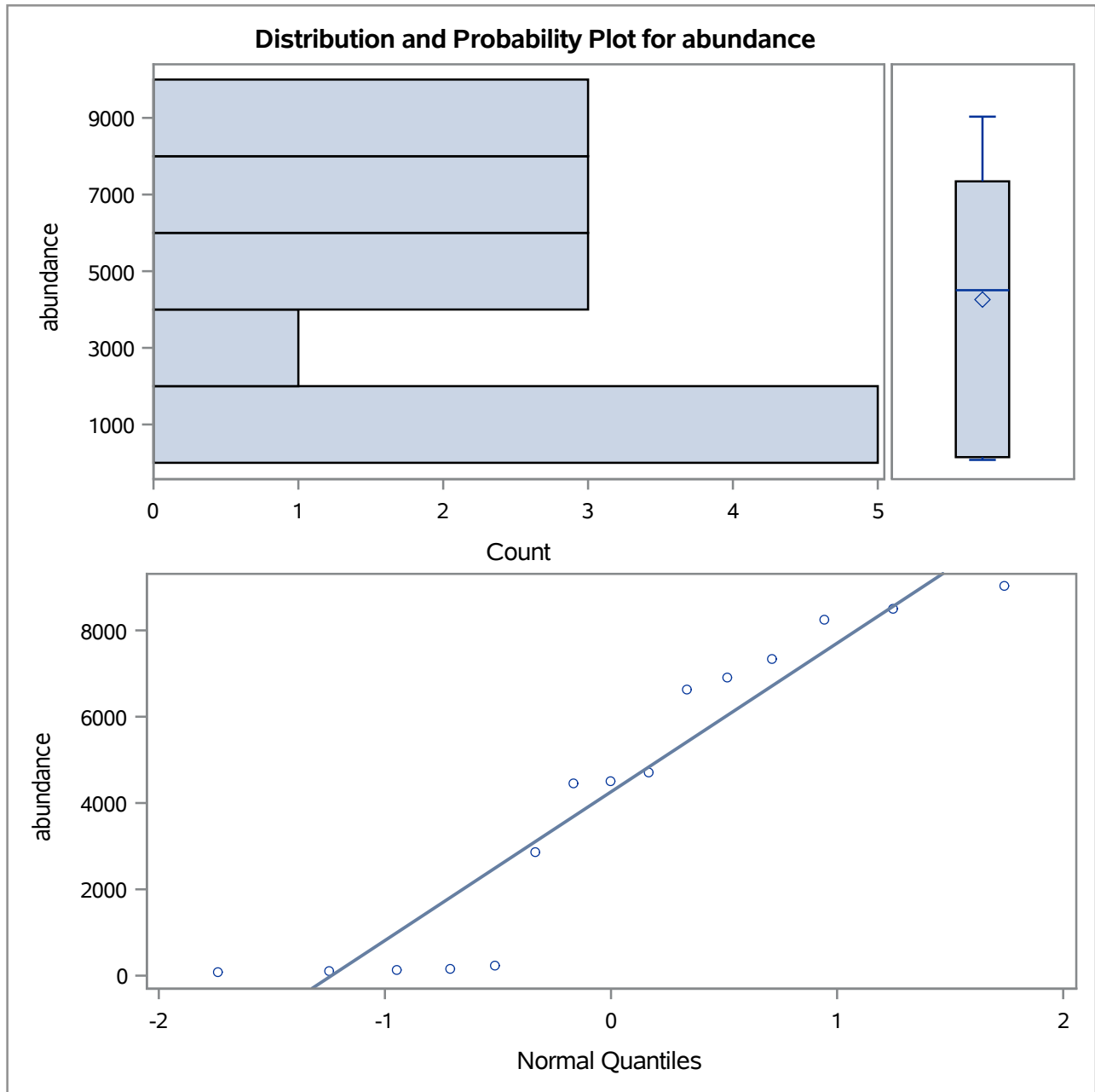
RKM=262.2 Site=KR9

Quantiles (Definition 5)	
Level	Quantile
50% Median	4504
25% Q1	148
10%	96
5%	76
1%	76
0% Min	76

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
76	47	6908	50
96	46	7344	53
120	44	8260	51
148	43	8504	55
244	45	9032	54

The UNIVARIATE Procedure

RKM=262.2 Site=KR9



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: Biomass (Biomass)**

RKM=262.2 Site=KR9

Moments			
N	15	Sum Weights	15
Mean	1.9636	Sum Observations	29.454
Std Deviation	2.3185842	Variance	5.37583269
Skewness	1.56366081	Kurtosis	1.50489935
Uncorrected SS	133.097532	Corrected SS	75.2616576
Coeff Variation	118.078234	Std Error Mean	0.59865587

Basic Statistical Measures			
Location		Variability	
Mean	1.963600	Std Deviation	2.31858
Median	0.878400	Variance	5.37583
Mode	.	Range	7.59880
		Interquartile Range	1.81920

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	3.280015	Pr > t 	0.0055
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.763427	Pr < W	0.0013
Kolmogorov-Smirnov	D	0.273806	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.276828	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	1.50072	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	7.6712
99%	7.6712
95%	7.6712
90%	5.6512
75% Q3	2.3168

The UNIVARIATE Procedure
Variable: Biomass (Biomass)

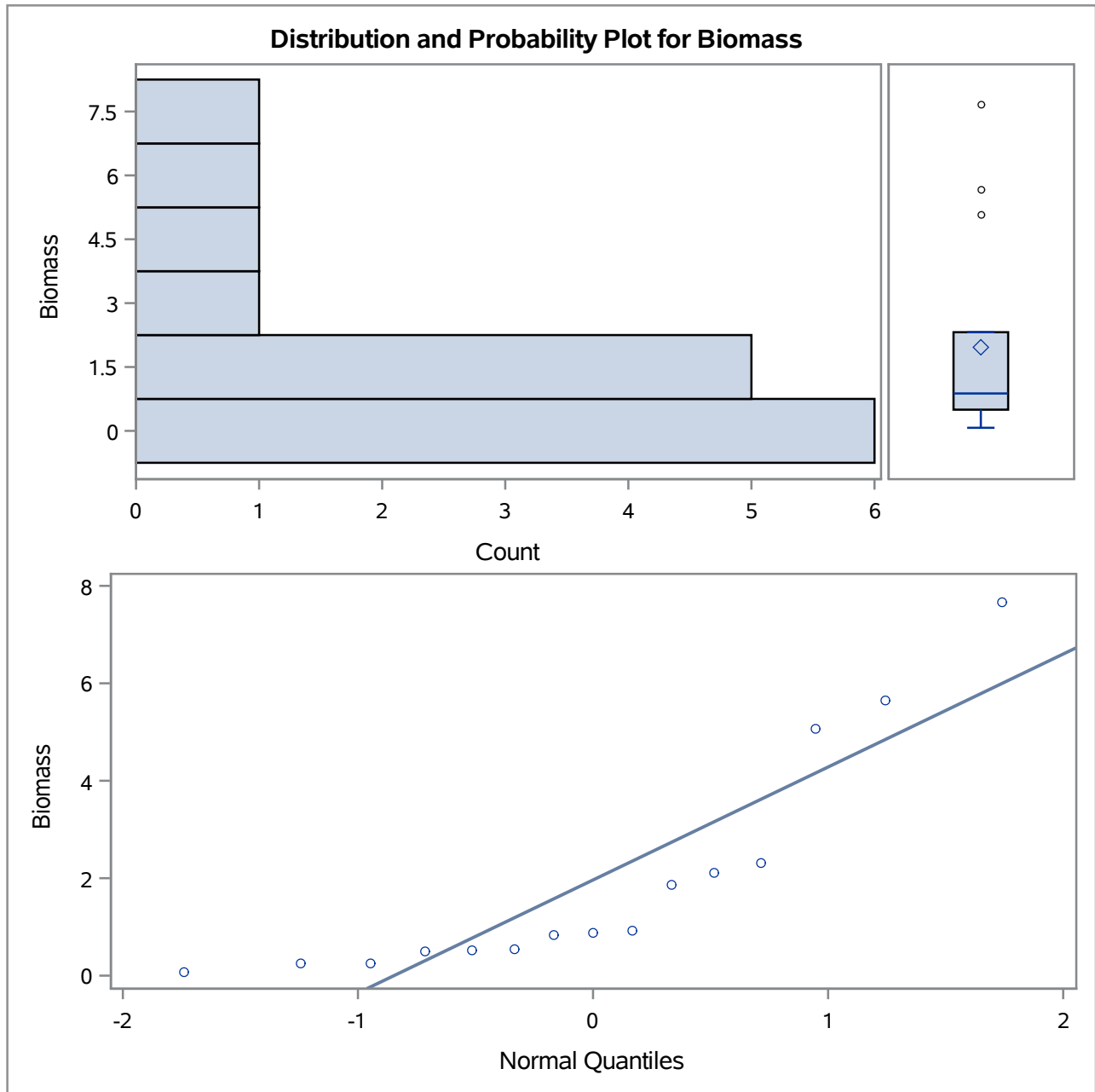
RKM=262.2 Site=KR9

Quantiles (Definition 5)	
Level	Quantile
50% Median	0.8784
25% Q1	0.4976
10%	0.2464
5%	0.0724
1%	0.0724
0% Min	0.0724

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
0.0724	45	2.1184	55
0.2464	47	2.3168	50
0.2528	44	5.0736	53
0.4976	46	5.6512	49
0.5276	52	7.6712	54

The UNIVARIATE Procedure

RKM=262.2 Site=KR9



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: abundance (abundance)**

RKM=276.1 Site=KR9.1

Moments			
N	15	Sum Weights	15
Mean	7620	Sum Observations	114300
Std Deviation	5889.66863	Variance	34688196.6
Skewness	1.45317861	Kurtosis	2.67471206
Uncorrected SS	1356600752	Corrected SS	485634752
Coeff Variation	77.2922392	Std Error Mean	1520.7059

Basic Statistical Measures			
Location		Variability	
Mean	7620.000	Std Deviation	5890
Median	5900.000	Variance	34688197
Mode	.	Range	22644
		Interquartile Range	8740

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	5.010831	Pr > t 	0.0002
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.869772	Pr < W	0.0335
Kolmogorov-Smirnov	D	0.179662	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.087592	Pr > W-Sq	0.1529
Anderson-Darling	A-Sq	0.625915	Pr > A-Sq	0.0866

Quantiles (Definition 5)	
Level	Quantile
100% Max	23568
99%	23568
95%	23568
90%	12984
75% Q3	11756

The UNIVARIATE Procedure
Variable: abundance (abundance)

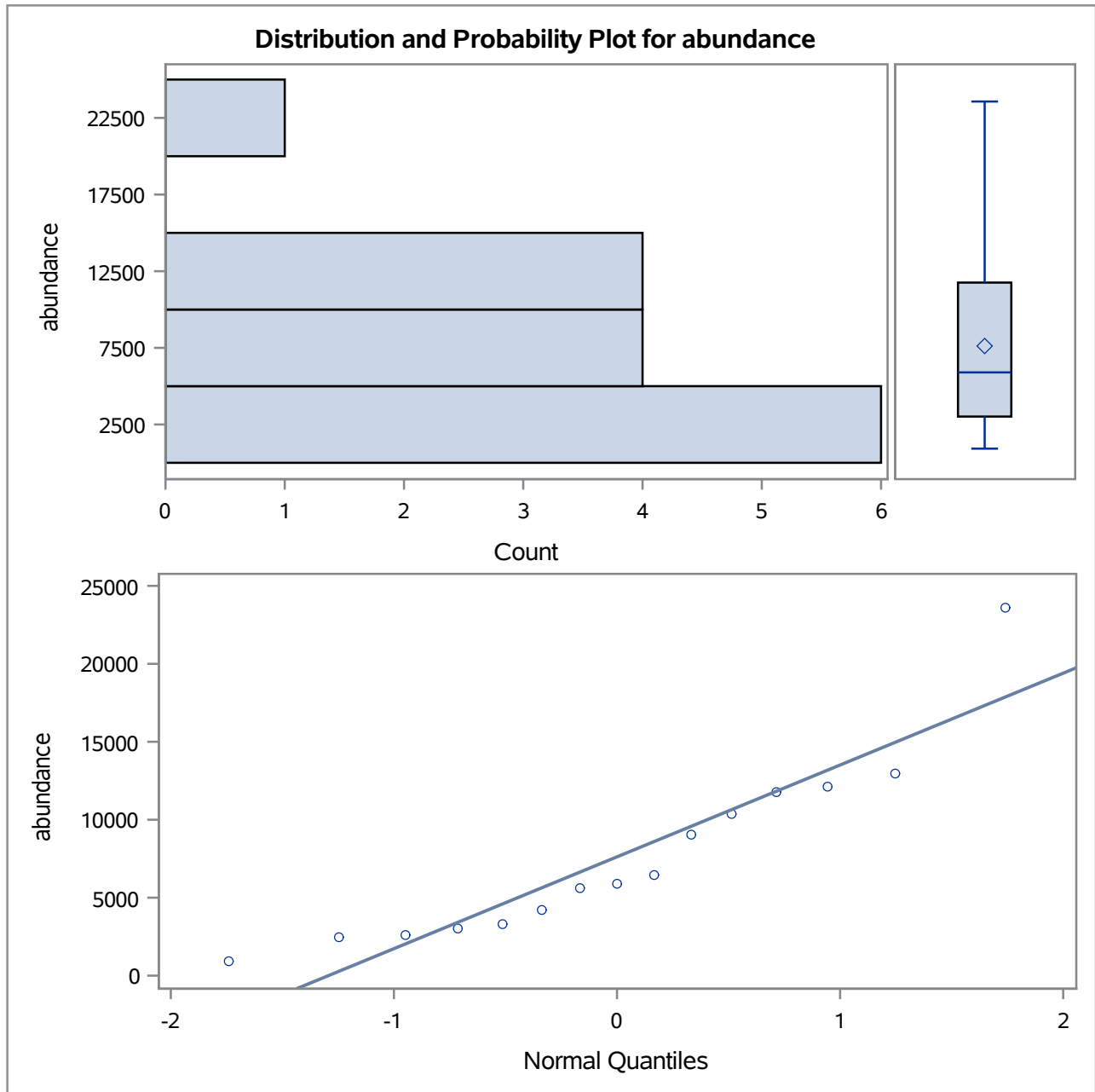
RKM=276.1 Site=KR9.1

Quantiles (Definition 5)	
Level	Quantile
50% Median	5900
25% Q1	3016
10%	2480
5%	924
1%	924
0% Min	924

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
924	58	10344	72
2480	63	11756	68
2616	61	12108	65
3016	62	12984	69
3312	59	23568	71

The UNIVARIATE Procedure

RKM=276.1 Site=KR9.1



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: Biomass (Biomass)**

RKM=276.1 Site=KR9.1

Moments			
N	15	Sum Weights	15
Mean	3.96458667	Sum Observations	59.4688
Std Deviation	2.98449424	Variance	8.90720587
Skewness	1.00062664	Kurtosis	0.29116112
Uncorrected SS	360.470094	Corrected SS	124.700882
Coeff Variation	75.2788245	Std Error Mean	0.7705931

Basic Statistical Measures			
Location		Variability	
Mean	3.964587	Std Deviation	2.98449
Median	3.703200	Variance	8.90721
Mode	.	Range	9.61240
		Interquartile Range	4.19960

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	5.144851	Pr > t 	0.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.884294	Pr < W	0.0550
Kolmogorov-Smirnov	D	0.188727	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.086593	Pr > W-Sq	0.1589
Anderson-Darling	A-Sq	0.620566	Pr > A-Sq	0.0889

Quantiles (Definition 5)	
Level	Quantile
100% Max	10.2132
99%	10.2132
95%	10.2132
90%	9.6488
75% Q3	5.6776

The UNIVARIATE Procedure
Variable: Biomass (Biomass)

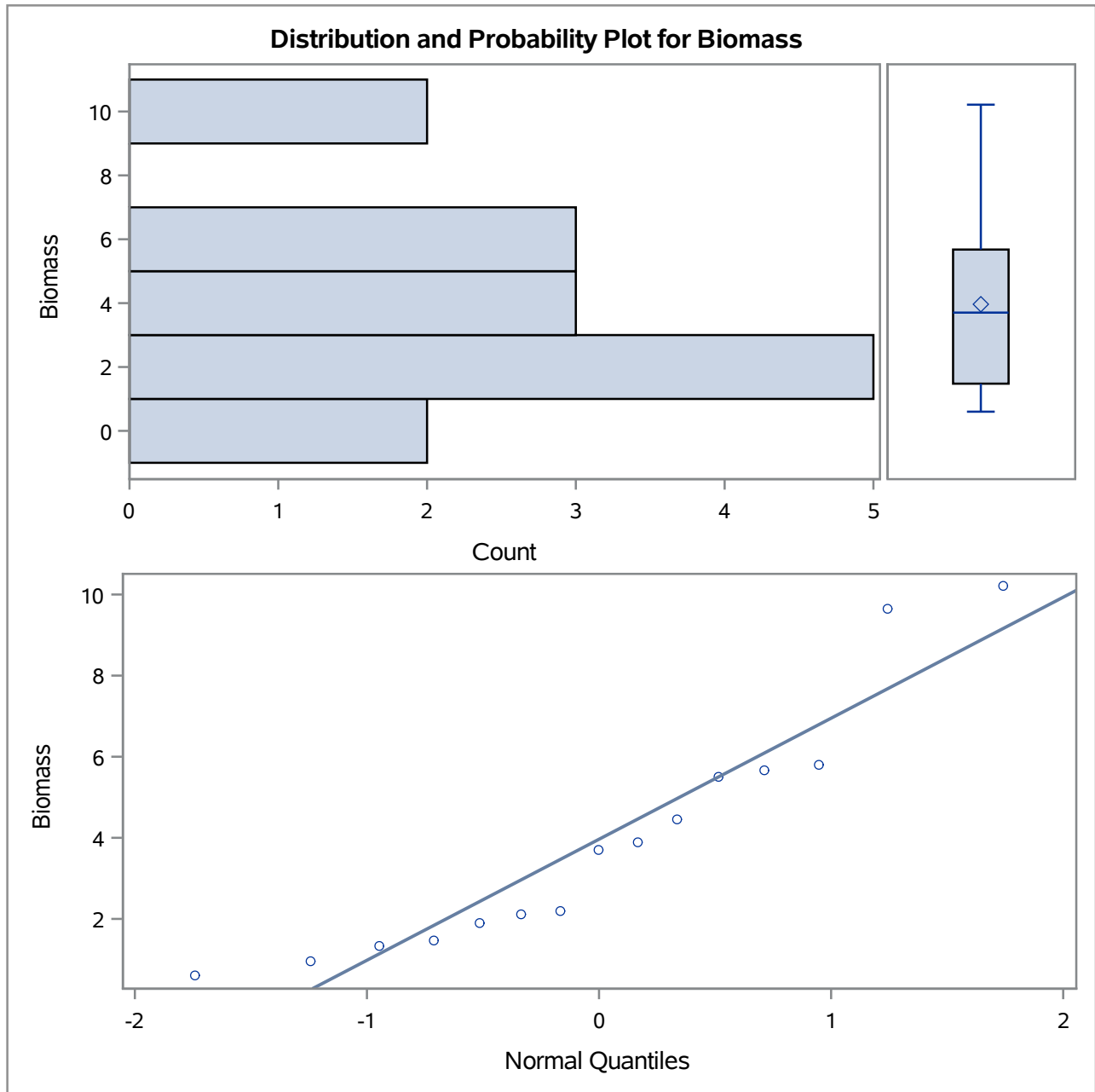
RKM=276.1 Site=KR9.1

Quantiles (Definition 5)	
Level	Quantile
50% Median	3.7032
25% Q1	1.4780
10%	0.9468
5%	0.6008
1%	0.6008
0% Min	0.6008

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
0.6008	58	5.5164	60
0.9468	64	5.6776	70
1.3204	66	5.7968	61
1.4780	63	9.6488	72
1.9056	67	10.2132	71

The UNIVARIATE Procedure

RKM=276.1 Site=KR9.1



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: abundance (abundance)**

RKM=285.6 Site=KR10

Moments			
N	10	Sum Weights	10
Mean	1862.4	Sum Observations	18624
Std Deviation	1135.38512	Variance	1289099.38
Skewness	1.0042321	Kurtosis	1.57356118
Uncorrected SS	46287232	Corrected SS	11601894.4
Coeff Variation	60.9635483	Std Error Mean	359.040301

Basic Statistical Measures			
Location		Variability	
Mean	1862.400	Std Deviation	1135
Median	1648.000	Variance	1289099
Mode	.	Range	4036
		Interquartile Range	1392

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	5.187161	Pr > t 	0.0006
Sign	M	5	Pr >= M 	0.0020
Signed Rank	S	27.5	Pr >= S 	0.0020

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.938996	Pr < W	0.5419
Kolmogorov-Smirnov	D	0.152302	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.04054	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.296645	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	4332
99%	4332
95%	4332
90%	3476
75% Q3	2576

The UNIVARIATE Procedure
Variable: abundance (abundance)

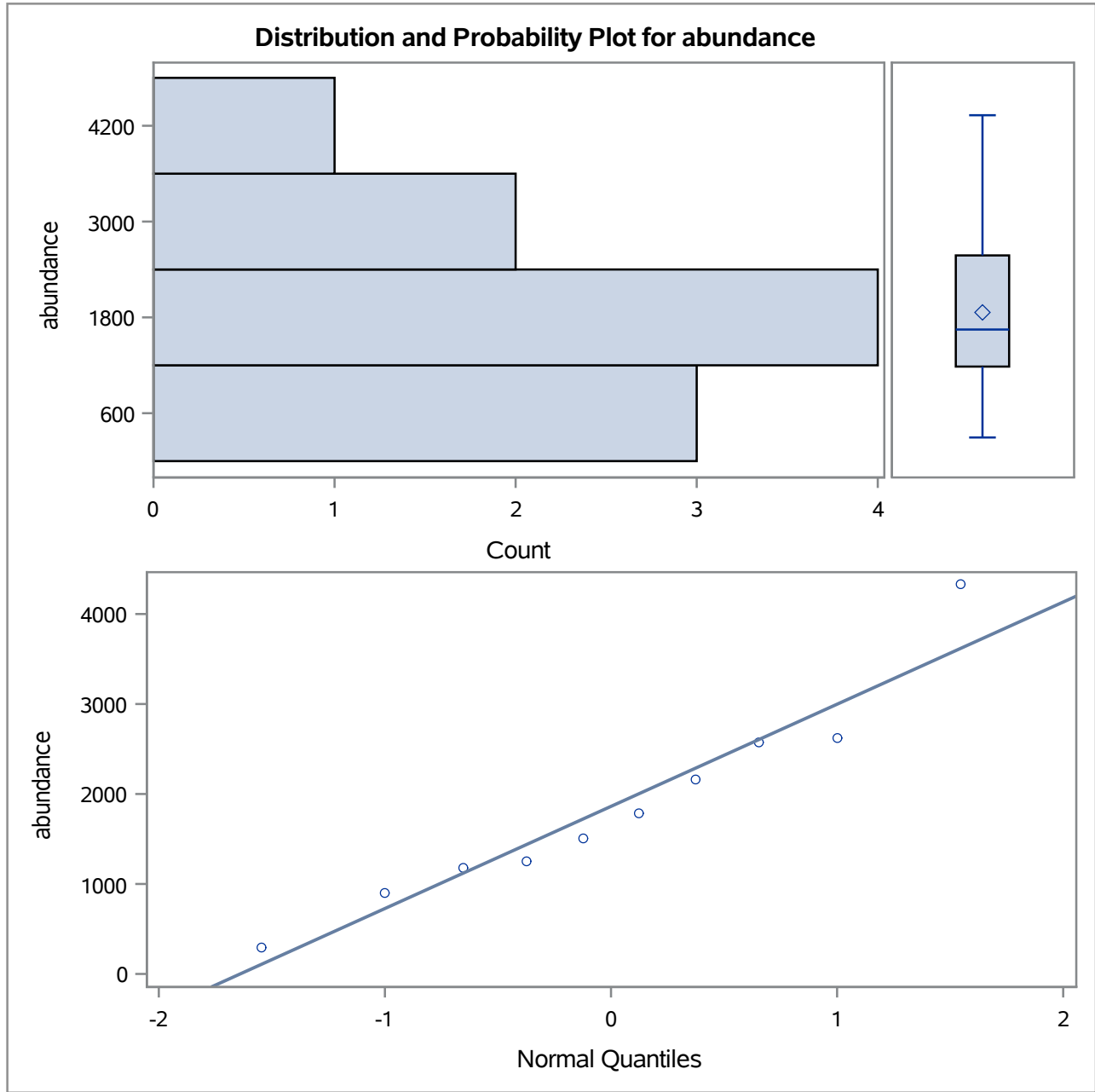
RKM=285.6 Site=KR10

Quantiles (Definition 5)	
Level	Quantile
50% Median	1648
25% Q1	1184
10%	600
5%	296
1%	296
0% Min	296

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
296	77	1788	82
904	76	2160	79
1184	73	2576	81
1256	74	2620	78
1508	75	4332	80

The UNIVARIATE Procedure

RKM=285.6 Site=KR10



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: Biomass (Biomass)**

RKM=285.6 Site=KR10

Moments			
N	10	Sum Weights	10
Mean	1.3166	Sum Observations	13.166
Std Deviation	0.71358172	Variance	0.50919887
Skewness	0.3229879	Kurtosis	-0.1561434
Uncorrected SS	21.9171454	Corrected SS	4.58278984
Coeff Variation	54.1988242	Std Error Mean	0.22565435

Basic Statistical Measures			
Location		Variability	
Mean	1.316600	Std Deviation	0.71358
Median	1.297200	Variance	0.50920
Mode	.	Range	2.27840
		Interquartile Range	0.74760

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	5.834587	Pr > t 	0.0002
Sign	M	5	Pr >= M 	0.0020
Signed Rank	S	27.5	Pr >= S 	0.0020

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.961499	Pr < W	0.8028
Kolmogorov-Smirnov	D	0.152591	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.031912	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.213673	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	2.5824
99%	2.5824
95%	2.5824
90%	2.3860
75% Q3	1.6768

The UNIVARIATE Procedure
Variable: Biomass (Biomass)

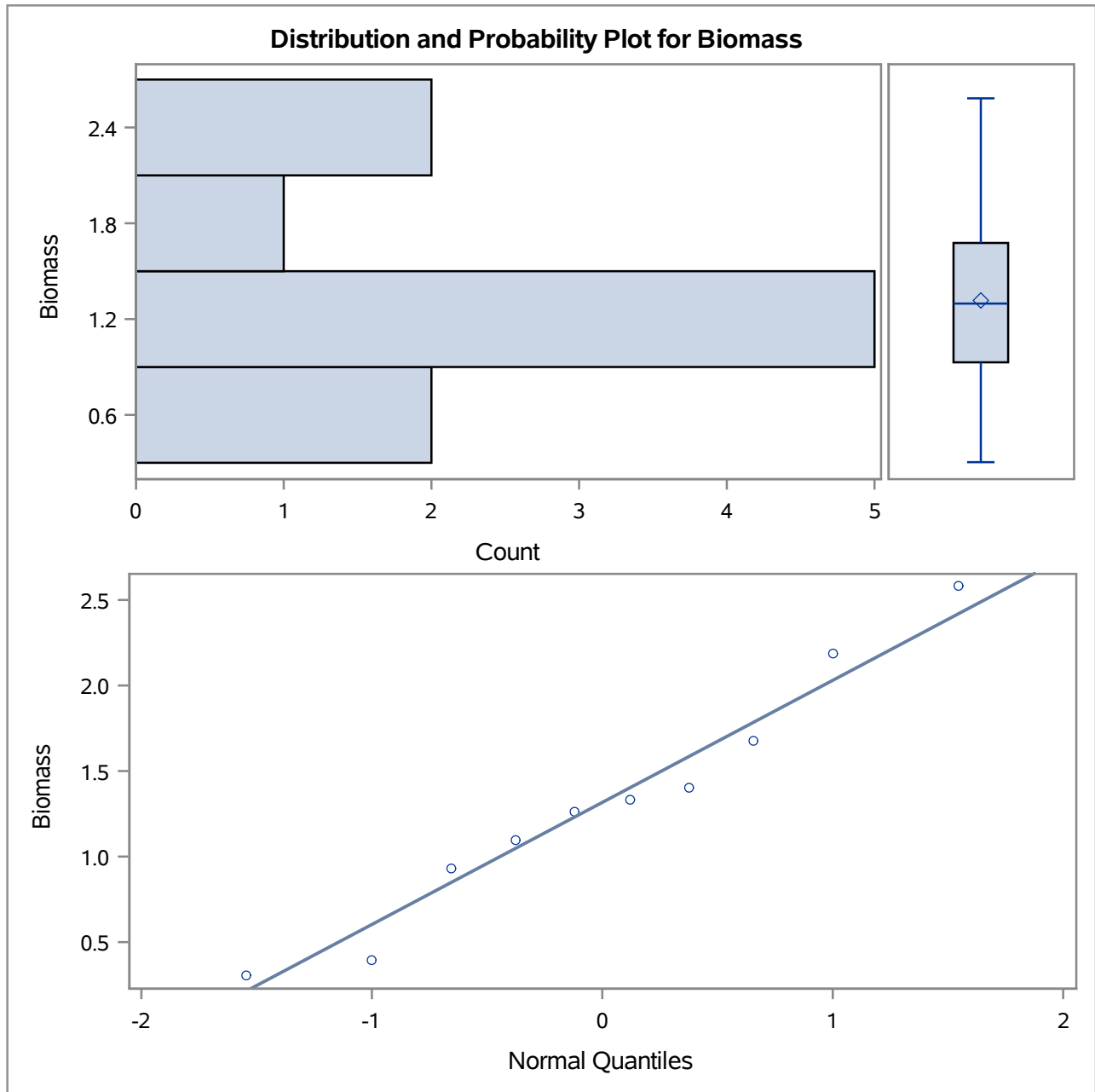
RKM=285.6 Site=KR10

Quantiles (Definition 5)	
Level	Quantile
50% Median	1.2972
25% Q1	0.9292
10%	0.3484
5%	0.3040
1%	0.3040
0% Min	0.3040

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
0.3040	79	1.3348	75
0.3928	78	1.4016	74
0.9292	77	1.6768	80
1.0952	82	2.1896	81
1.2596	76	2.5824	73

The UNIVARIATE Procedure

RKM=285.6 Site=KR10



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: abundance (abundance)**

RKM=299.2 Site=KR10.5

Moments			
N	15	Sum Weights	15
Mean	3810.13333	Sum Observations	57152
Std Deviation	1473.6271	Variance	2171576.84
Skewness	1.08627665	Kurtosis	1.04240238
Uncorrected SS	248158816	Corrected SS	30402075.7
Coeff Variation	38.6765232	Std Error Mean	380.488882

Basic Statistical Measures			
Location		Variability	
Mean	3810.133	Std Deviation	1474
Median	3368.000	Variance	2171577
Mode	.	Range	5356
		Interquartile Range	1476

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	10.01378	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.8747	Pr < W	0.0396
Kolmogorov-Smirnov	D	0.209615	Pr > D	0.0758
Cramer-von Mises	W-Sq	0.136974	Pr > W-Sq	0.0323
Anderson-Darling	A-Sq	0.832996	Pr > A-Sq	0.0241

Quantiles (Definition 5)	
Level	Quantile
100% Max	6876
99%	6876
95%	6876
90%	6844
75% Q3	4356

The UNIVARIATE Procedure
Variable: abundance (abundance)

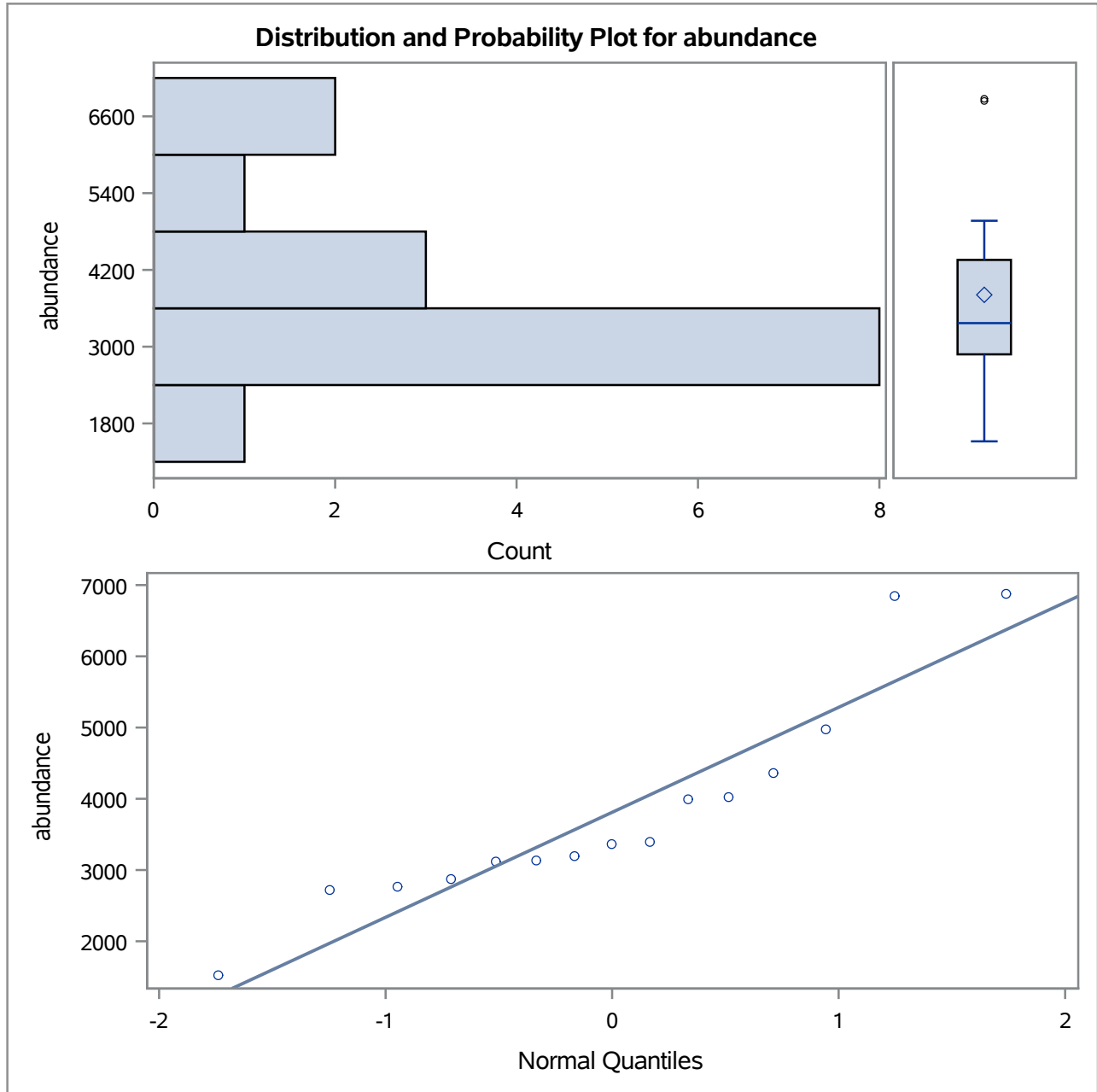
RKM=299.2 Site=KR10.5

Quantiles (Definition 5)	
Level	Quantile
50% Median	3368
25% Q1	2880
10%	2724
5%	1520
1%	1520
0% Min	1520

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
1520	95	4020	88
2724	91	4356	89
2760	86	4968	84
2880	83	6844	96
3112	93	6876	90

The UNIVARIATE Procedure

RKM=299.2 Site=KR10.5



**2017 Macroinvertebrate Data
Univariate Analyses for Original data**

**The UNIVARIATE Procedure
Variable: Biomass (Biomass)**

RKM=299.2 Site=KR10.5

Moments			
N	15	Sum Weights	15
Mean	1.22613333	Sum Observations	18.392
Std Deviation	0.67602013	Variance	0.45700322
Skewness	0.15341187	Kurtosis	-1.0406999
Uncorrected SS	28.9490893	Corrected SS	6.39804501
Coeff Variation	55.1343081	Std Error Mean	0.17454765

Basic Statistical Measures			
Location		Variability	
Mean	1.226133	Std Deviation	0.67602
Median	1.138400	Variance	0.45700
Mode	.	Range	2.10960
		Interquartile Range	1.08360

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	7.024634	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.951094	Pr < W	0.5418
Kolmogorov-Smirnov	D	0.134735	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.040129	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.267097	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	2.2668
99%	2.2668
95%	2.2668
90%	2.2132
75% Q3	1.8872

The UNIVARIATE Procedure
Variable: Biomass (Biomass)

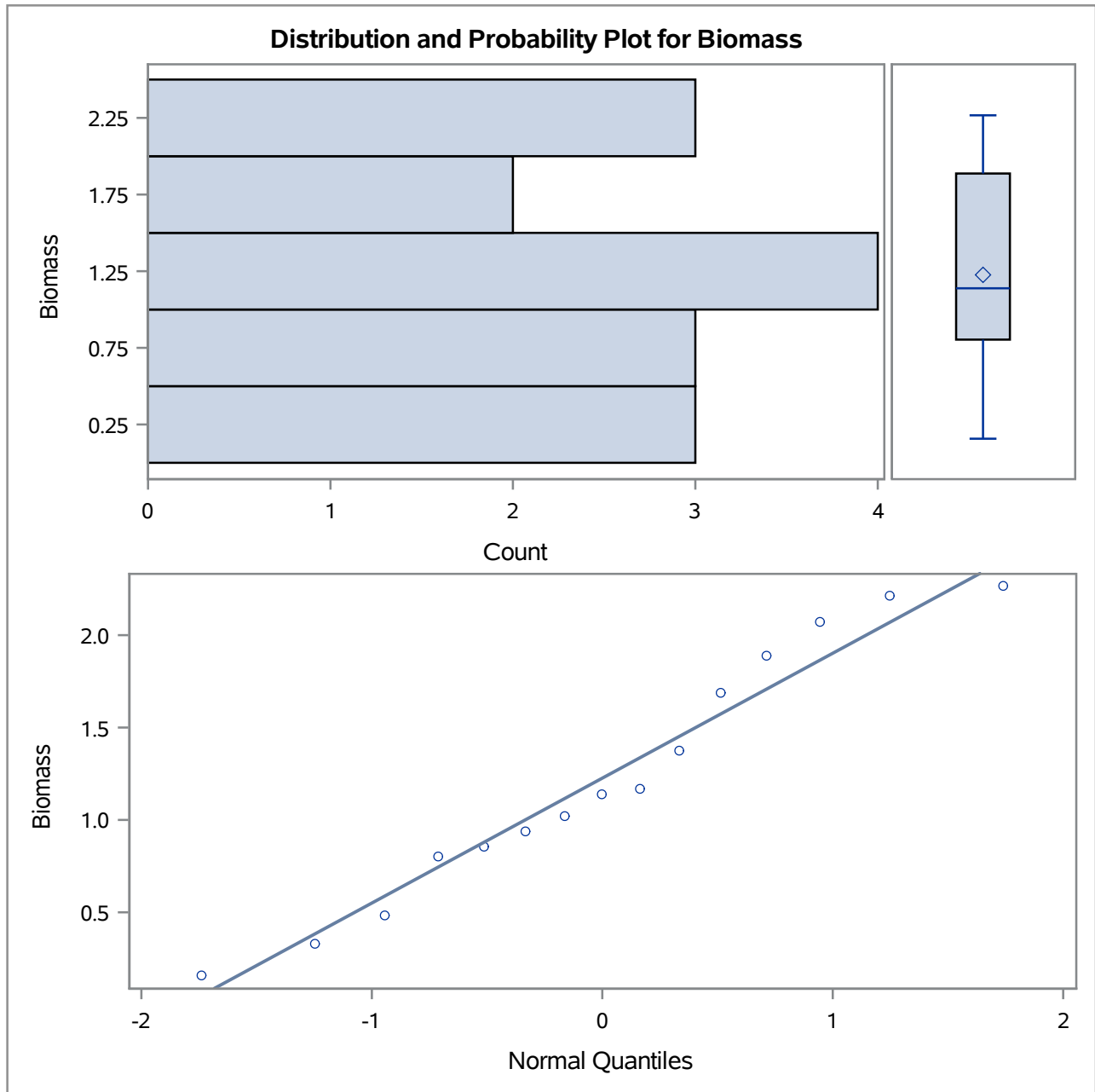
RKM=299.2 Site=KR10.5

Quantiles (Definition 5)	
Level	Quantile
50% Median	1.1384
25% Q1	0.8036
10%	0.3320
5%	0.1572
1%	0.1572
0% Min	0.1572

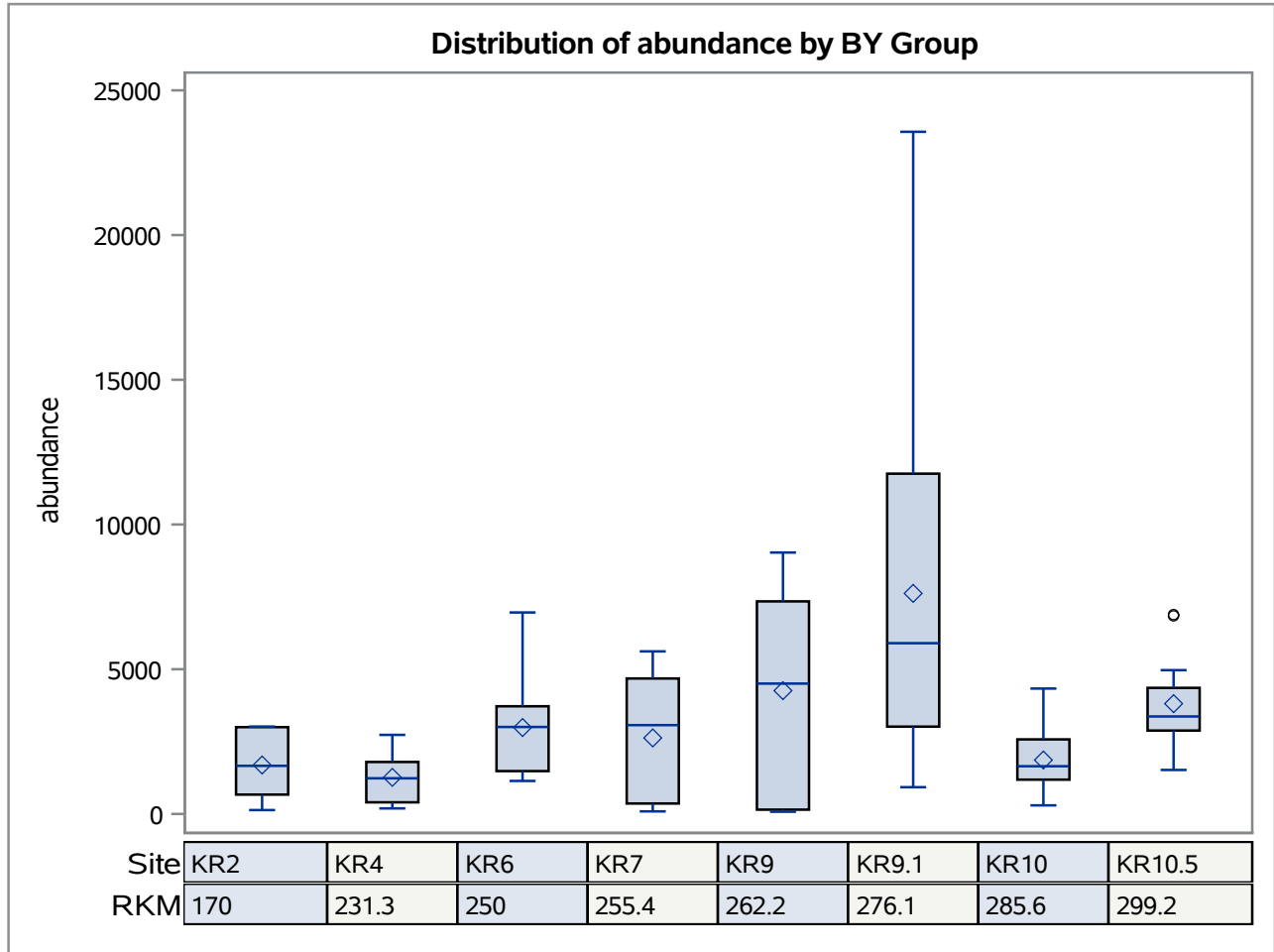
Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
0.1572	95	1.6876	83
0.3320	94	1.8872	85
0.4812	97	2.0728	84
0.8036	88	2.2132	91
0.8528	93	2.2668	87

The UNIVARIATE Procedure

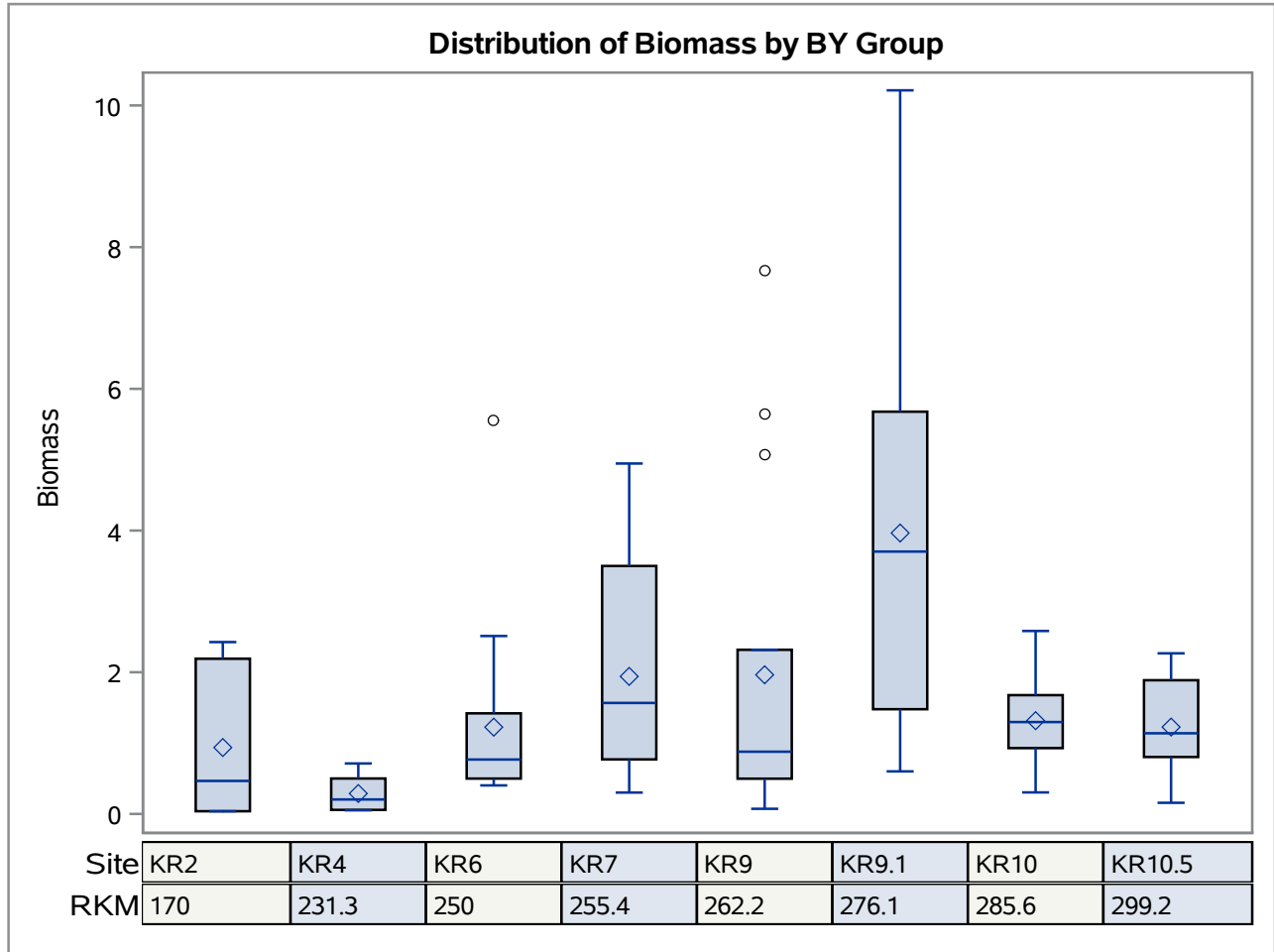
RKM=299.2 Site=KR10.5



The UNIVARIATE Procedure



The UNIVARIATE Procedure



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_abun**

RKM=170 Site=KR2

Moments			
N	6	Sum Weights	6
Mean	6.98702504	Sum Observations	41.9221503
Std Deviation	1.22704215	Variance	1.50563244
Skewness	-1.0616261	Kurtosis	0.51541159
Uncorrected SS	300.439276	Corrected SS	7.52816222
Coeff Variation	17.5617254	Std Error Mean	0.50093786

Basic Statistical Measures			
Location		Variability	
Mean	6.987025	Std Deviation	1.22704
Median	7.251649	Variance	1.50563
Mode	.	Range	3.11668
		Interquartile Range	1.50090

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	13.94789	Pr > t 	<.0001
Sign	M	3	Pr >= M 	0.0313
Signed Rank	S	10.5	Pr >= S 	0.0313

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.849665	Pr < W	0.1564
Kolmogorov-Smirnov	D	0.256528	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.071509	Pr > W-Sq	0.2296
Anderson-Darling	A-Sq	0.451839	Pr > A-Sq	0.1769

Quantiles (Definition 5)	
Level	Quantile
100% Max	8.01228
99%	8.01228
95%	8.01228
90%	8.01228
75% Q3	8.00593

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: I_abun

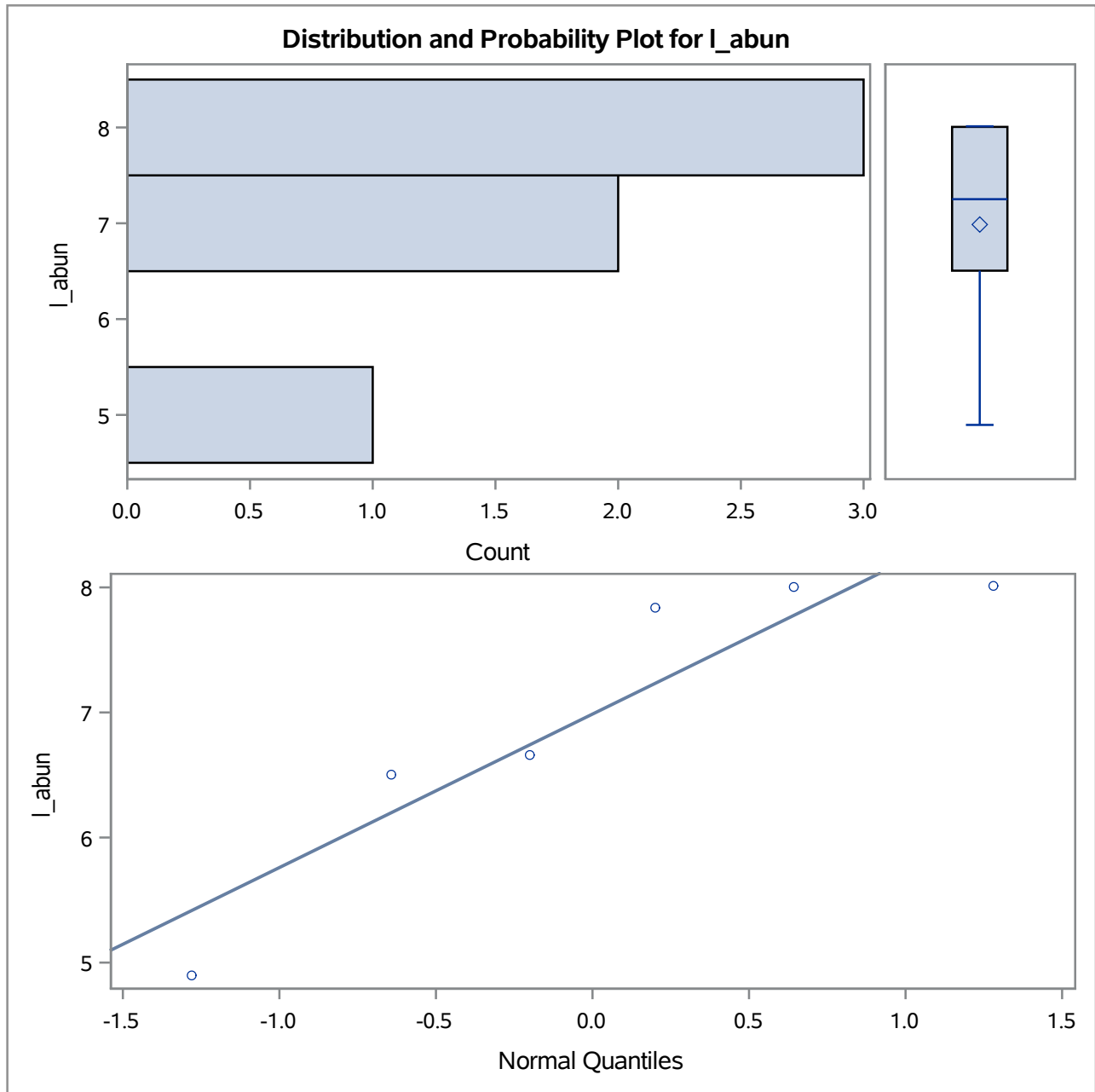
RKM=170 Site=KR2

Quantiles (Definition 5)	
Level	Quantile
50% Median	7.25165
25% Q1	6.50504
10%	4.89560
5%	4.89560
1%	4.89560
0% Min	4.89560

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
4.89560	5	6.50504	3
6.50504	3	6.66326	6
6.66326	6	7.84004	4
7.84004	4	8.00593	1
8.00593	1	8.01228	2

The UNIVARIATE Procedure

RKM=170 Site=KR2



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

RKM=170 Site=KR2

Moments			
N	6	Sum Weights	6
Mean	-1.1088074	Sum Observations	-6.6528443
Std Deviation	1.87125296	Variance	3.50158764
Skewness	-0.2266308	Kurtosis	-2.1272515
Uncorrected SS	24.884661	Corrected SS	17.5079382
Coeff Variation	-168.76267	Std Error Mean	0.76393582

Basic Statistical Measures			
Location		Variability	
Mean	-1.10881	Std Deviation	1.87125
Median	-0.89669	Variance	3.50159
Mode	-3.26492	Range	4.15104
		Interquartile Range	4.04917

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	-1.45144	Pr > t 	0.2064
Sign	M	-1	Pr >= M 	0.6875
Signed Rank	S	-5.5	Pr >= S 	0.2813

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.86821	Pr < W	0.2192
Kolmogorov-Smirnov	D	0.20872	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.048982	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.361963	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	0.886120
99%	0.886120
95%	0.886120
90%	0.886120
75% Q3	0.784253

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: I_bio

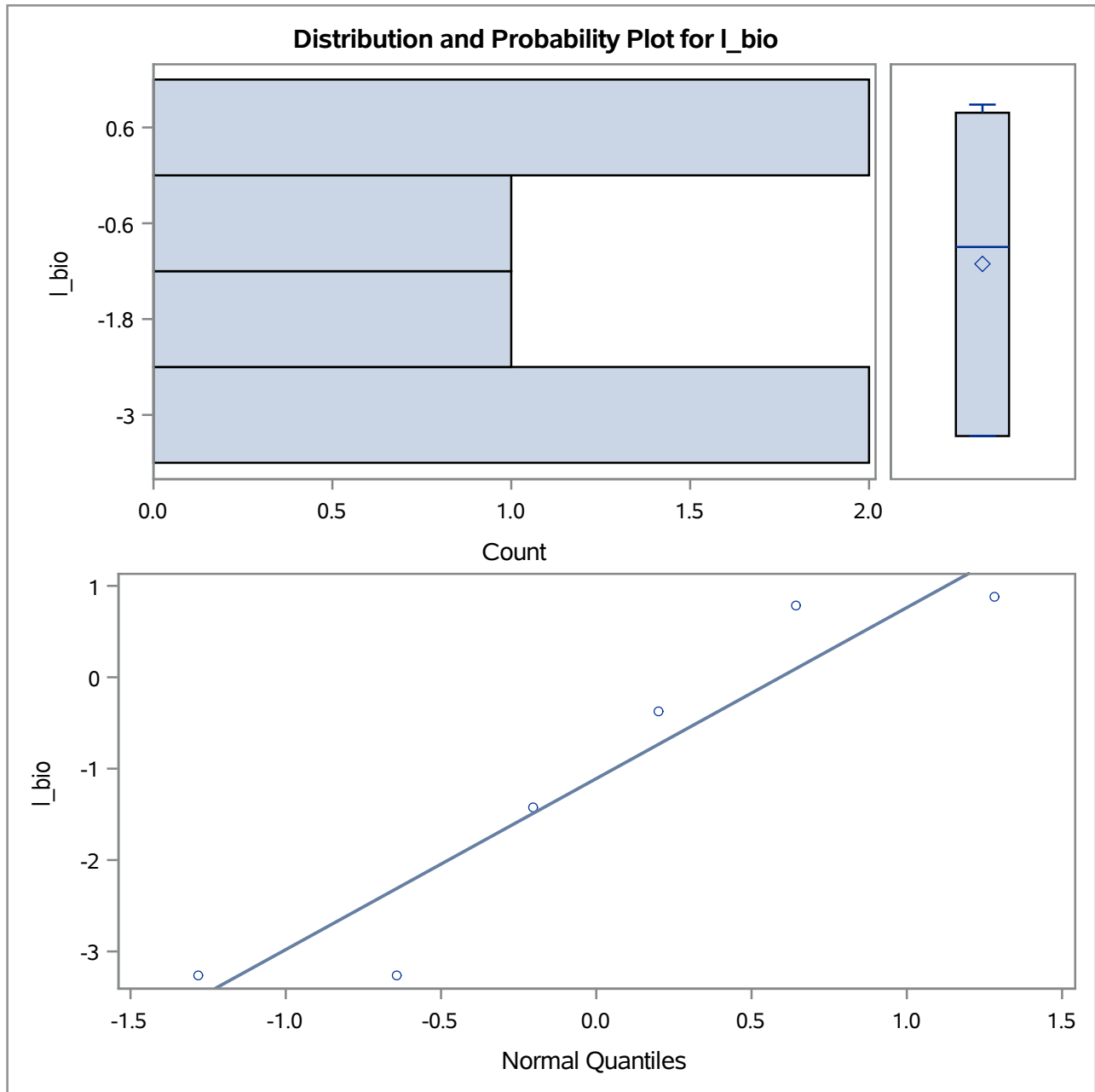
RKM=170 Site=KR2

Quantiles (Definition 5)	
Level	Quantile
50% Median	-0.896689
25% Q1	-3.264920
10%	-3.264920
5%	-3.264920
1%	-3.264920
0% Min	-3.264920

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
-3.264920	5	-3.264920	5
-3.264920	3	-1.424370	6
-1.424370	6	-0.369008	4
-0.369008	4	0.784253	1
0.784253	1	0.886120	2

The UNIVARIATE Procedure

RKM=170 Site=KR2



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_abun**

RKM=231.3 Site=KR4

Moments			
N	6	Sum Weights	6
Mean	6.79448739	Sum Observations	40.7669244
Std Deviation	1.01344231	Variance	1.02706532
Skewness	-0.6387814	Kurtosis	-0.9374242
Uncorrected SS	282.12568	Corrected SS	5.1353266
Coeff Variation	14.9156552	Std Error Mean	0.41373609

Basic Statistical Measures			
Location		Variability	
Mean	6.794487	Std Deviation	1.01344
Median	7.057462	Variance	1.02707
Mode	.	Range	2.66026
		Interquartile Range	1.49877

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	16.42227	Pr > t 	<.0001
Sign	M	3	Pr >= M 	0.0313
Signed Rank	S	10.5	Pr >= S 	0.0313

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.935962	Pr < W	0.6269
Kolmogorov-Smirnov	D	0.226234	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.041151	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.256932	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	7.91253
99%	7.91253
95%	7.91253
90%	7.91253
75% Q3	7.49298

The UNIVARIATE Procedure
Variable: I_abun

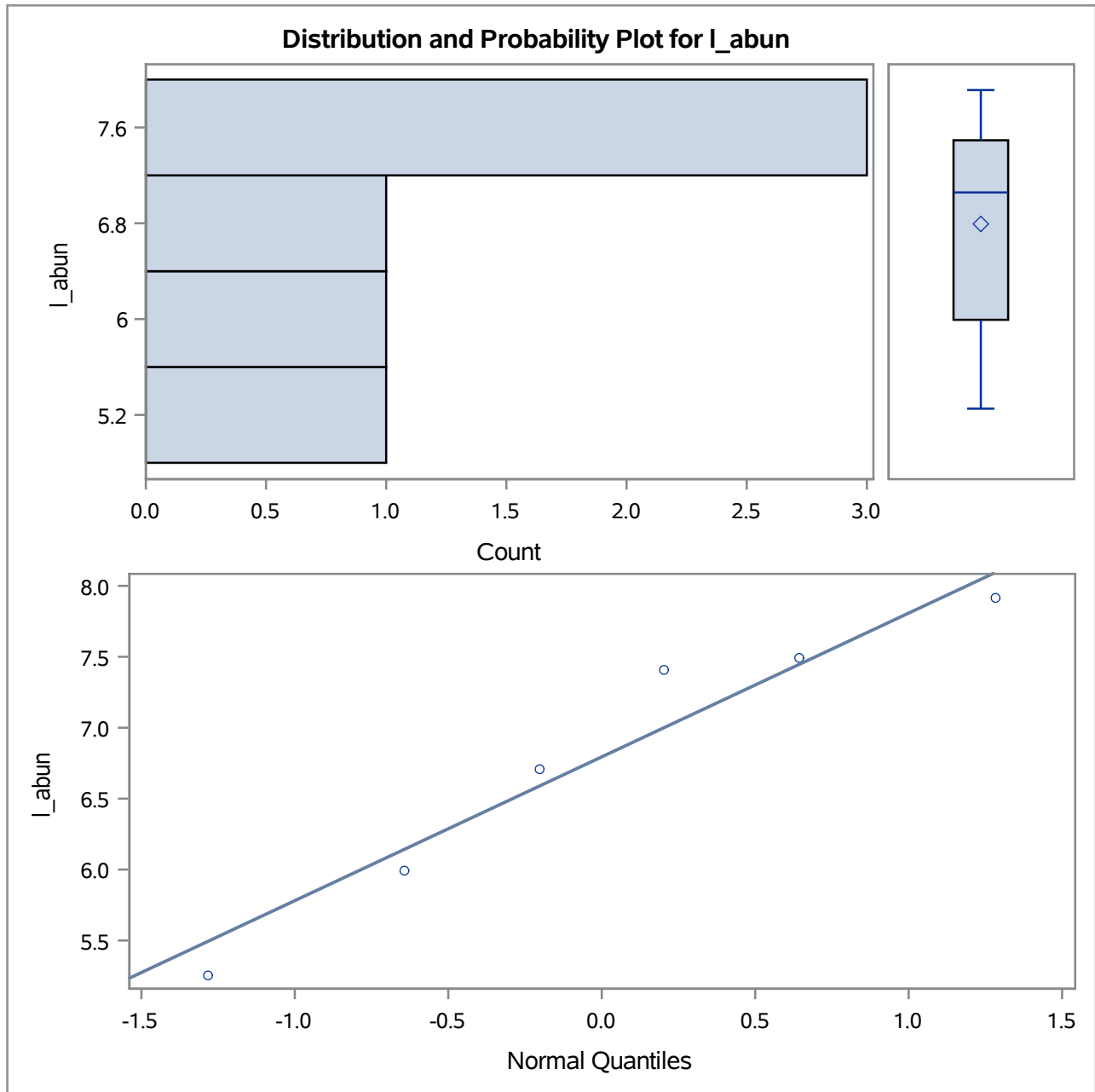
RKM=231.3 Site=KR4

Quantiles (Definition 5)	
Level	Quantile
50% Median	7.05746
25% Q1	5.99421
10%	5.25227
5%	5.25227
1%	5.25227
0% Min	5.25227

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
5.25227	7	5.99421	9
5.99421	9	6.71089	8
6.71089	8	7.40404	11
7.40404	11	7.49298	12
7.49298	12	7.91253	10

The UNIVARIATE Procedure

RKM=231.3 Site=KR4



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

RKM=231.3 Site=KR4

Moments			
N	6	Sum Weights	6
Mean	-1.7275109	Sum Observations	-10.365066
Std Deviation	1.14180453	Variance	1.30371758
Skewness	0.07734253	Kurtosis	-2.5013671
Uncorrected SS	24.4243521	Corrected SS	6.51858791
Coeff Variation	-66.095357	Std Error Mean	0.46613975

Basic Statistical Measures			
Location		Variability	
Mean	-1.72751	Std Deviation	1.14180
Median	-1.75471	Variance	1.30372
Mode	.	Range	2.62574
		Interquartile Range	2.16715

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	-3.70599	Pr > t 	0.0139
Sign	M	-3	Pr >= M 	0.0313
Signed Rank	S	-10.5	Pr >= S 	0.0313

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.884697	Pr < W	0.2913
Kolmogorov-Smirnov	D	0.206772	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.057038	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.352195	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	-0.339074
99%	-0.339074
95%	-0.339074
90%	-0.339074
75% Q3	-0.692308

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: I_bio

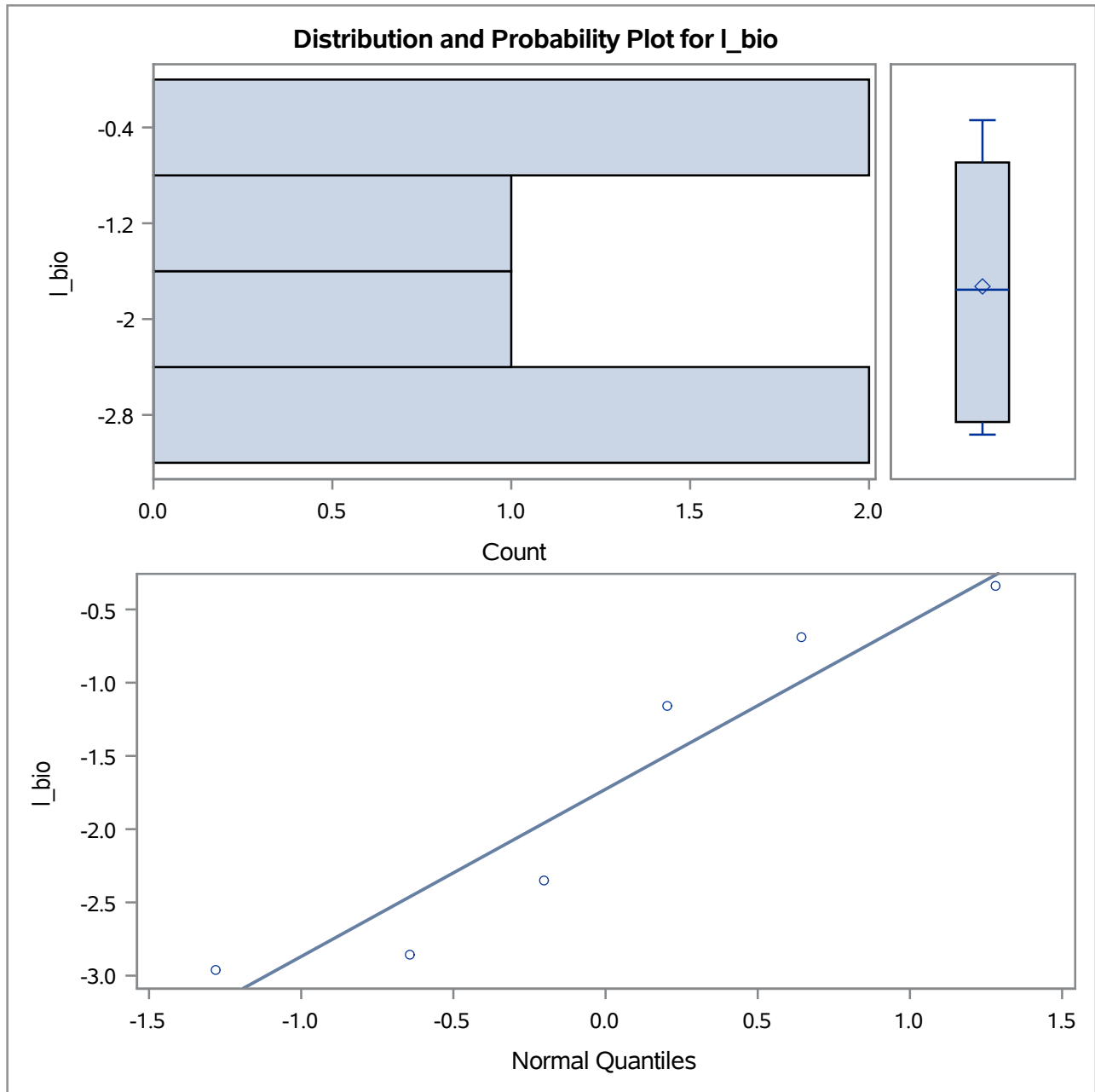
RKM=231.3 Site=KR4

Quantiles (Definition 5)	
Level	Quantile
50% Median	-1.754707
25% Q1	-2.859455
10%	-2.964815
5%	-2.964815
1%	-2.964815
0% Min	-2.964815

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
-2.964815	9	-2.859455	7
-2.859455	7	-2.348629	8
-2.348629	8	-1.160786	11
-1.160786	11	-0.692308	10
-0.692308	10	-0.339074	12

The UNIVARIATE Procedure

RKM=231.3 Site=KR4



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_abun**

RKM=250 Site=KR6

Moments			
N	15	Sum Weights	15
Mean	7.86629131	Sum Observations	117.99437
Std Deviation	0.54953184	Variance	0.30198524
Skewness	-0.1408244	Kurtosis	-0.8880693
Uncorrected SS	932.405877	Corrected SS	4.22779334
Coeff Variation	6.98590752	Std Error Mean	0.14188851

Basic Statistical Measures			
Location		Variability	
Mean	7.866291	Std Deviation	0.54953
Median	8.007700	Variance	0.30199
Mode	.	Range	1.80915
		Interquartile Range	0.92168

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	55.43995	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.939201	Pr < W	0.3724
Kolmogorov-Smirnov	D	0.146637	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.070137	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.413661	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	8.84793
99%	8.84793
95%	8.84793
90%	8.49290
75% Q3	8.22148

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: I_abun

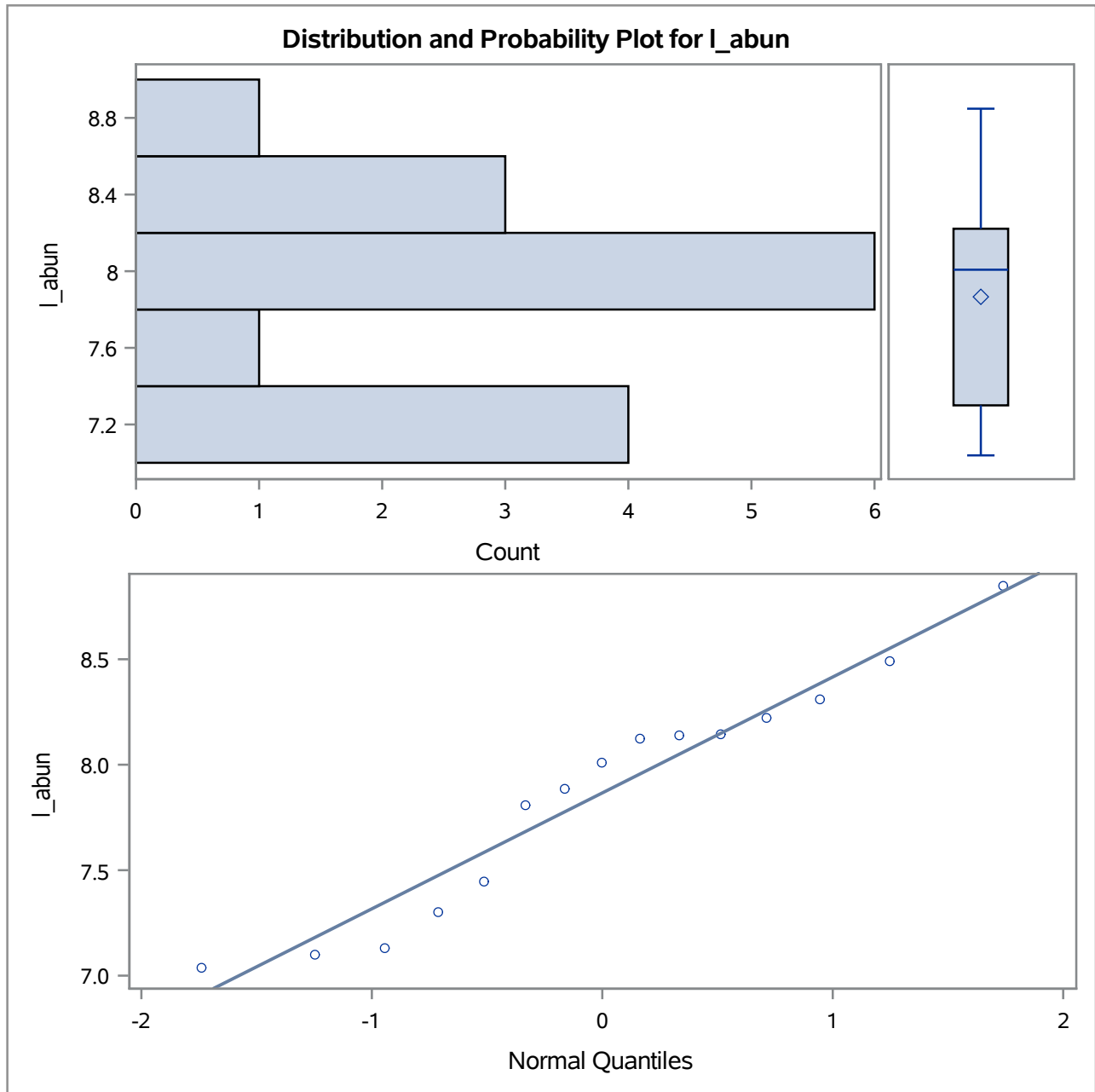
RKM=250 Site=KR6

Quantiles (Definition 5)	
Level	Quantile
50% Median	8.00770
25% Q1	7.29980
10%	7.10003
5%	7.03878
1%	7.03878
0% Min	7.03878

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
7.03878	13	8.14323	22
7.10003	14	8.22148	21
7.13250	16	8.30795	26
7.29980	24	8.49290	17
7.44542	27	8.84793	15

The UNIVARIATE Procedure

RKM=250 Site=KR6



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

RKM=250 Site=KR6

Moments			
N	15	Sum Weights	15
Mean	-0.1147009	Sum Observations	-1.7205131
Std Deviation	0.73581256	Variance	0.54142012
Skewness	1.24357463	Kurtosis	1.37538996
Uncorrected SS	7.77722605	Corrected SS	7.5798817
Coeff Variation	-641.50564	Std Error Mean	0.18998599

Basic Statistical Measures			
Location		Variability	
Mean	-0.11470	Std Deviation	0.73581
Median	-0.26397	Variance	0.54142
Mode	.	Range	2.62506
		Interquartile Range	1.04541

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	-0.60373	Pr > t 	0.5557
Sign	M	-2.5	Pr >= M 	0.3018
Signed Rank	S	-16	Pr >= S 	0.3894

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.892516	Pr < W	0.0732
Kolmogorov-Smirnov	D	0.171851	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.085245	Pr > W-Sq	0.1671
Anderson-Darling	A-Sq	0.548742	Pr > A-Sq	0.1352

Quantiles (Definition 5)	
Level	Quantile
100% Max	1.715742
99%	1.715742
95%	1.715742
90%	0.920761
75% Q3	0.350657

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: I_bio

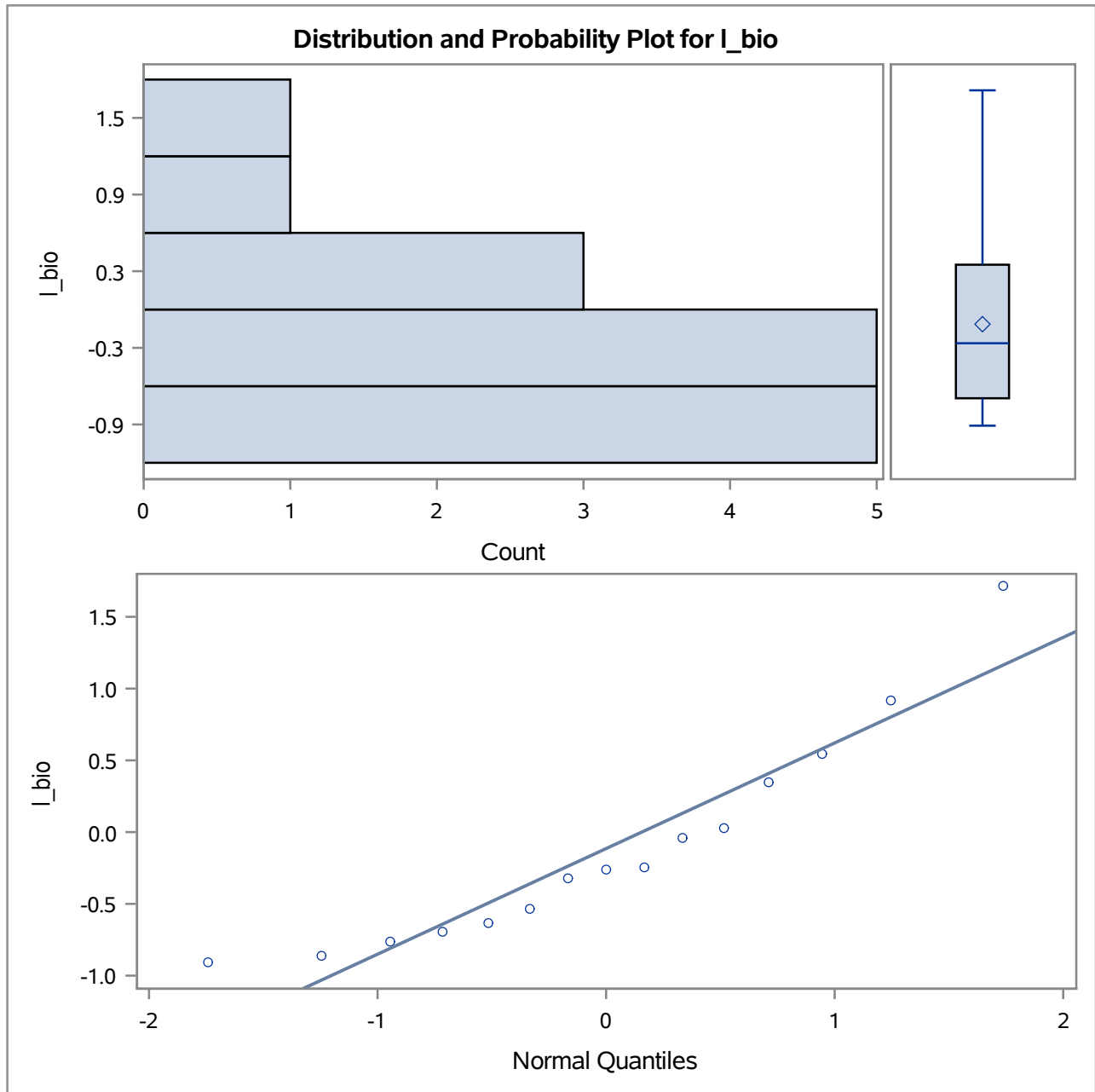
RKM=250 Site=KR6

Quantiles (Definition 5)	
Level	Quantile
50% Median	-0.263966
25% Q1	-0.694748
10%	-0.864647
5%	-0.909315
1%	-0.909315
0% Min	-0.909315

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
-0.909315	23	0.0252778	25
-0.864647	24	0.3506569	17
-0.765288	16	0.5437187	14
-0.694748	20	0.9207607	13
-0.630360	27	1.7157420	15

The UNIVARIATE Procedure

RKM=250 Site=KR6



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_abun**

RKM=255.4 Site=KR7

Moments			
N	15	Sum Weights	15
Mean	7.26700685	Sum Observations	109.005103
Std Deviation	1.38268033	Variance	1.91180488
Skewness	-0.6993044	Kurtosis	-1.0241636
Uncorrected SS	818.906097	Corrected SS	26.7652684
Coeff Variation	19.0268202	Std Error Mean	0.35700653

Basic Statistical Measures			
Location		Variability	
Mean	7.267007	Std Deviation	1.38268
Median	8.028781	Variance	1.91180
Mode	.	Range	4.15604
		Interquartile Range	2.56495

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	20.35539	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.830318	Pr < W	0.0093
Kolmogorov-Smirnov	D	0.280147	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.216583	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	1.15786	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	8.63337
99%	8.63337
95%	8.63337
90%	8.52357
75% Q3	8.45105

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: l_abun

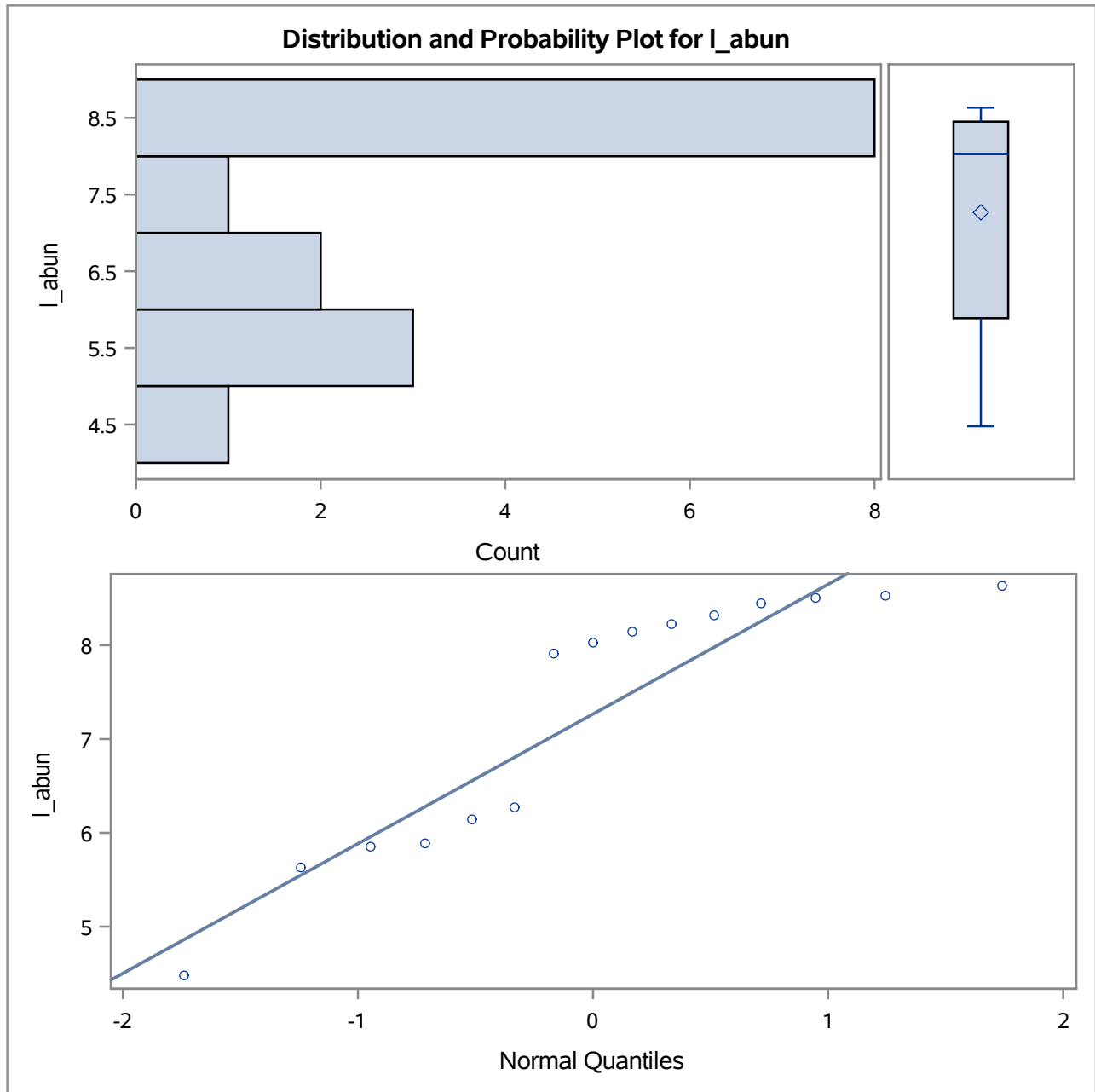
RKM=255.4 Site=KR7

Quantiles (Definition 5)	
Level	Quantile
50% Median	8.02878
25% Q1	5.88610
10%	5.63479
5%	4.47734
1%	4.47734
0% Min	4.47734

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
4.47734	31	8.31679	38
5.63479	30	8.45105	40
5.85220	29	8.50025	34
5.88610	28	8.52357	41
6.13988	32	8.63337	42

The UNIVARIATE Procedure

RKM=255.4 Site=KR7



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

RKM=255.4 Site=KR7

Moments			
N	15	Sum Weights	15
Mean	0.40138544	Sum Observations	6.02078166
Std Deviation	0.79069776	Variance	0.62520294
Skewness	-0.3579417	Kurtosis	-0.3252709
Uncorrected SS	11.1694954	Corrected SS	8.75284123
Coeff Variation	196.992135	Std Error Mean	0.20415728

Basic Statistical Measures			
Location		Variability	
Mean	0.401385	Std Deviation	0.79070
Median	0.449035	Variance	0.62520
Mode	.	Range	2.79723
		Interquartile Range	1.51453

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	1.96606	Pr > t	0.0694
Sign	M	2.5	Pr >= M	0.3018
Signed Rank	S	33	Pr >= S	0.0637

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.959418	Pr < W	0.6823
Kolmogorov-Smirnov	D	0.151902	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.048758	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.290555	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	1.598579
99%	1.598579
95%	1.598579
90%	1.348385
75% Q3	1.252649

**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

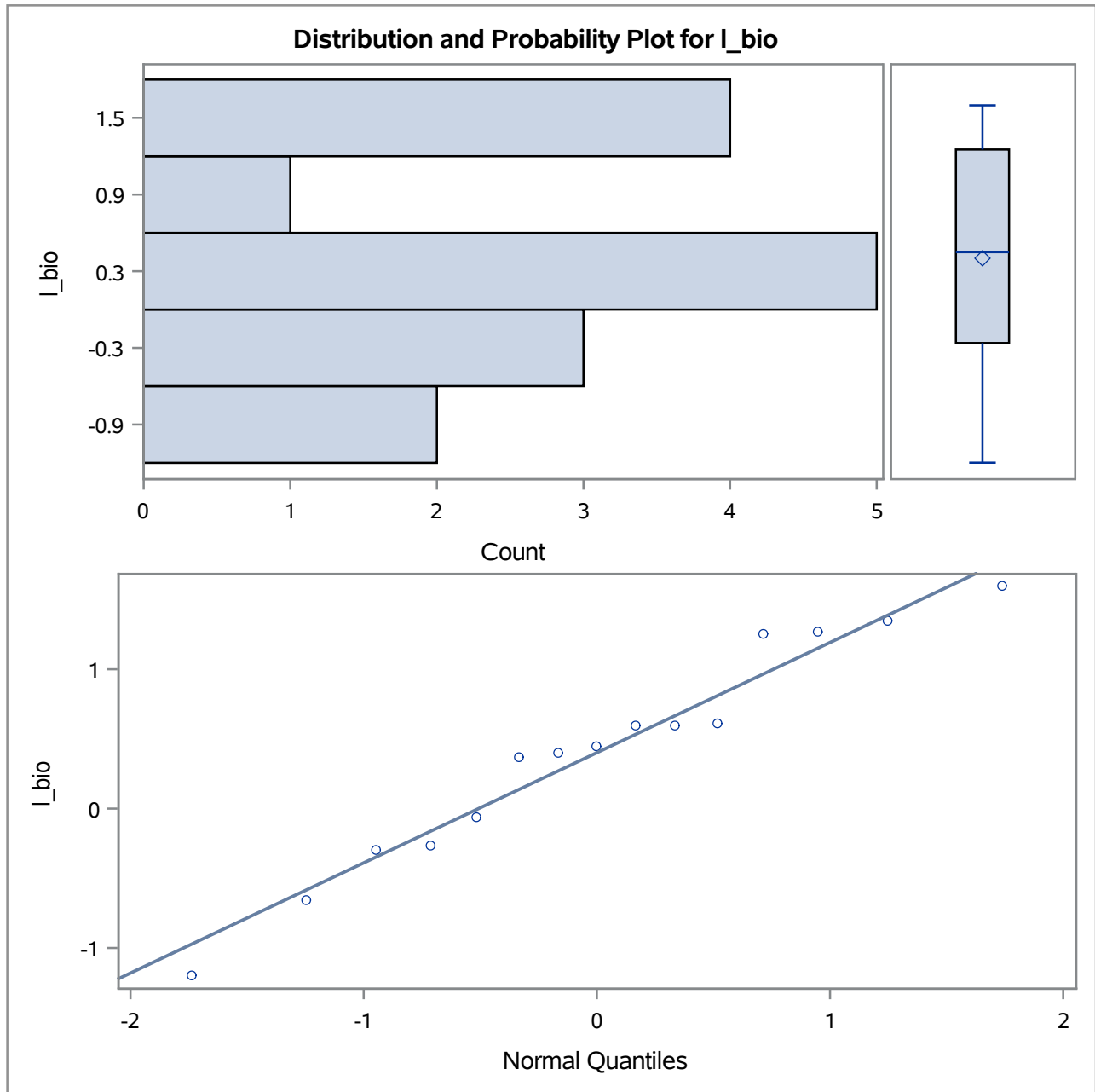
RKM=255.4 Site=KR7

Quantiles (Definition 5)	
Level	Quantile
50% Median	0.449035
25% Q1	-0.261884
10%	-0.658553
5%	-1.198654
1%	-1.198654
0% Min	-1.198654

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
-1.1986536	31	0.609331	38
-0.6585525	30	1.252649	42
-0.2935660	34	1.271669	32
-0.2618844	36	1.348385	40
-0.0589011	35	1.598579	41

The UNIVARIATE Procedure

RKM=255.4 Site=KR7



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_abun**

RKM=262.2 Site=KR9

Moments			
N	15	Sum Weights	15
Mean	7.40841314	Sum Observations	111.126197
Std Deviation	1.92136038	Variance	3.69162572
Skewness	-0.7598498	Kurtosis	-1.4469774
Uncorrected SS	874.95154	Corrected SS	51.6827601
Coeff Variation	25.9348439	Std Error Mean	0.49609312

Basic Statistical Measures			
Location		Variability	
Mean	7.408413	Std Deviation	1.92136
Median	8.412721	Variance	3.69163
Mode	.	Range	4.77780
		Interquartile Range	3.90443

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	14.93351	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.758357	Pr < W	0.0011
Kolmogorov-Smirnov	D	0.297141	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.296955	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	1.626053	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	9.10853
99%	9.10853
95%	9.10853
90%	9.04829
75% Q3	8.90164

The UNIVARIATE Procedure
Variable: I_abun

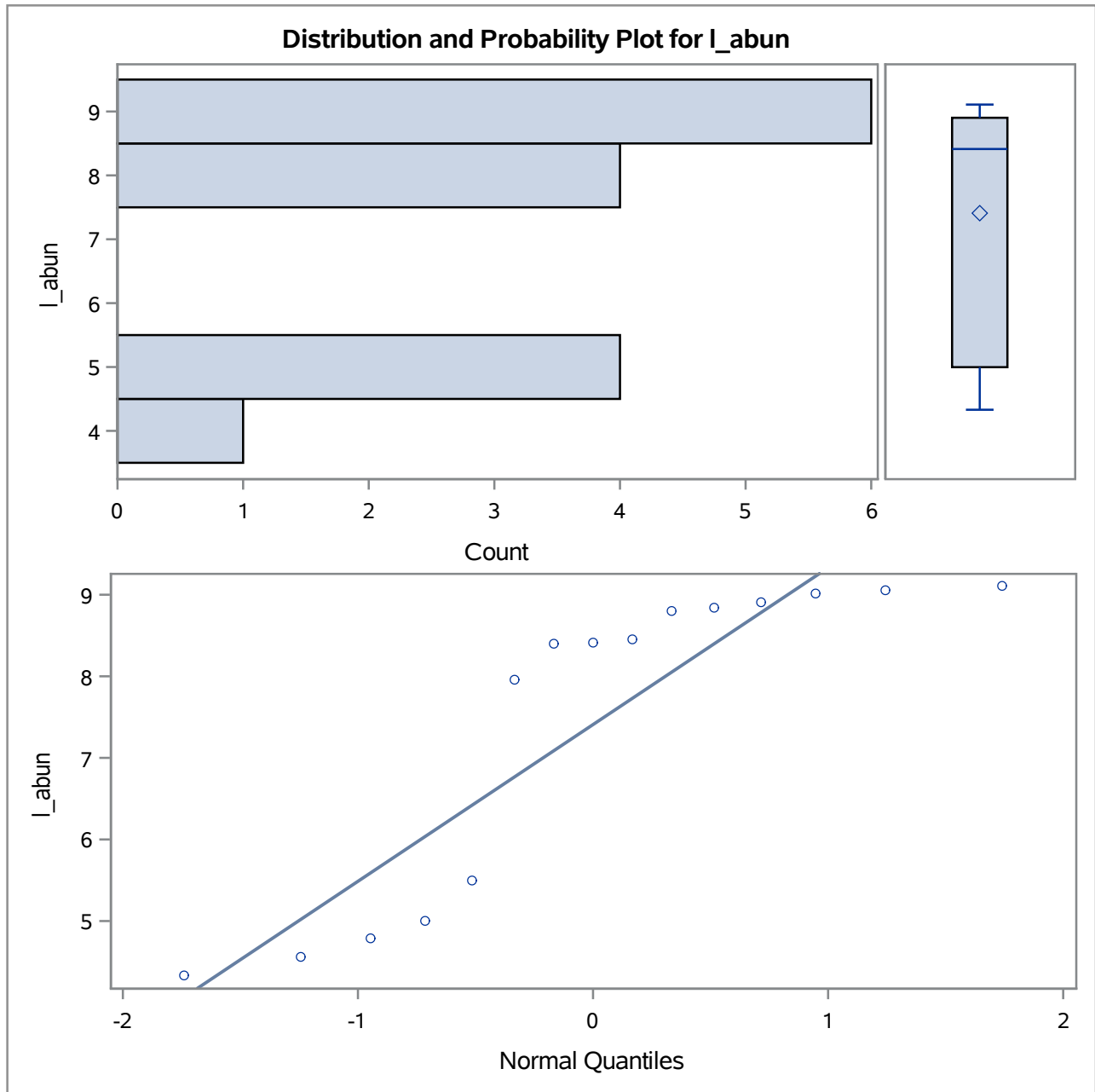
RKM=262.2 Site=KR9

Quantiles (Definition 5)	
Level	Quantile
50% Median	8.41272
25% Q1	4.99721
10%	4.56435
5%	4.33073
1%	4.33073
0% Min	4.33073

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
4.33073	47	8.84044	50
4.56435	46	8.90164	53
4.78749	44	9.01918	51
4.99721	43	9.04829	55
5.49717	45	9.10853	54

The UNIVARIATE Procedure

RKM=262.2 Site=KR9



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

RKM=262.2 Site=KR9

Moments			
N	15	Sum Weights	15
Mean	-0.0103904	Sum Observations	-0.1558555
Std Deviation	1.29642951	Variance	1.68072949
Skewness	-0.1653299	Kurtosis	-0.2892986
Uncorrected SS	23.5318322	Corrected SS	23.5302128
Coeff Variation	-12477.23	Std Error Mean	0.33473666

Basic Statistical Measures			
Location		Variability	
Mean	-0.01039	Std Deviation	1.29643
Median	-0.12965	Variance	1.68073
Mode	.	Range	4.66302
		Interquartile Range	1.53815

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	-0.03104	Pr > t 	0.9757
Sign	M	-1.5	Pr >= M 	0.6072
Signed Rank	S	1	Pr >= S 	0.9780

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.969431	Pr < W	0.8495
Kolmogorov-Smirnov	D	0.122717	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.032451	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.218173	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	2.037473
99%	2.037473
95%	2.037473
90%	1.731868
75% Q3	0.840187

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: I_bio

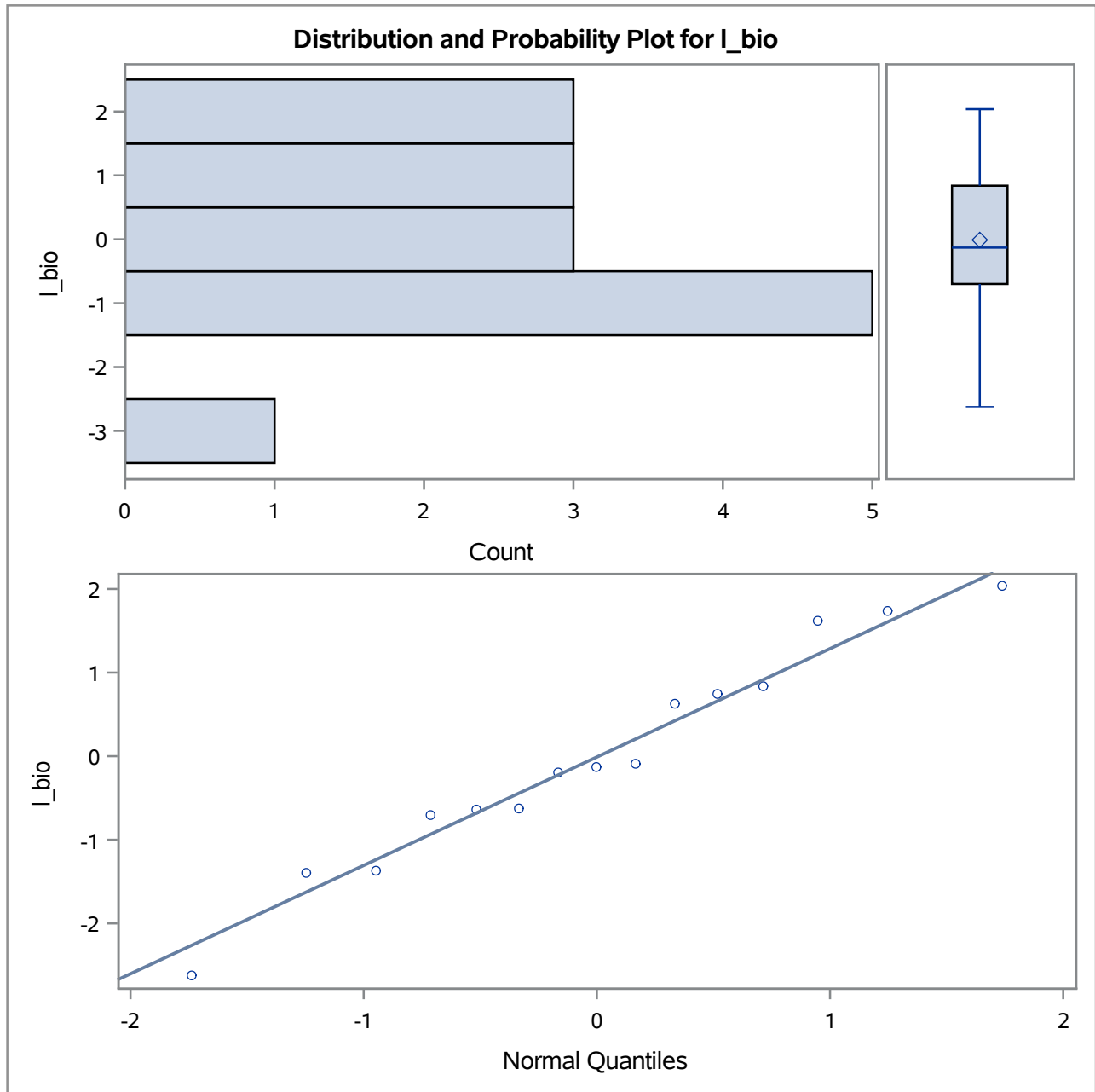
RKM=262.2 Site=KR9

Quantiles (Definition 5)	
Level	Quantile
50% Median	-0.129653
25% Q1	-0.697959
10%	-1.400799
5%	-2.625549
1%	-2.625549
0% Min	-2.625549

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
-2.625549	45	0.750661	55
-1.400799	47	0.840187	50
-1.375157	44	1.624051	53
-0.697959	46	1.731868	49
-0.639417	52	2.037473	54

The UNIVARIATE Procedure

RKM=262.2 Site=KR9



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_abun**

RKM=276.1 Site=KR9.1

Moments			
N	15	Sum Weights	15
Mean	8.64868918	Sum Observations	129.730338
Std Deviation	0.83505757	Variance	0.69732114
Skewness	-0.4239231	Kurtosis	0.15351346
Uncorrected SS	1131.75987	Corrected SS	9.76249598
Coeff Variation	9.65530787	Std Error Mean	0.21561094

Basic Statistical Measures			
Location		Variability	
Mean	8.648689	Std Deviation	0.83506
Median	8.682708	Variance	0.69732
Mode	.	Range	3.23893
		Interquartile Range	1.36043

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	40.11248	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.971501	Pr < W	0.8796
Kolmogorov-Smirnov	D	0.108341	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.03049	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.221597	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	10.06765
99%	10.06765
95%	10.06765
90%	9.47147
75% Q3	9.37212

The UNIVARIATE Procedure
Variable: I_abun

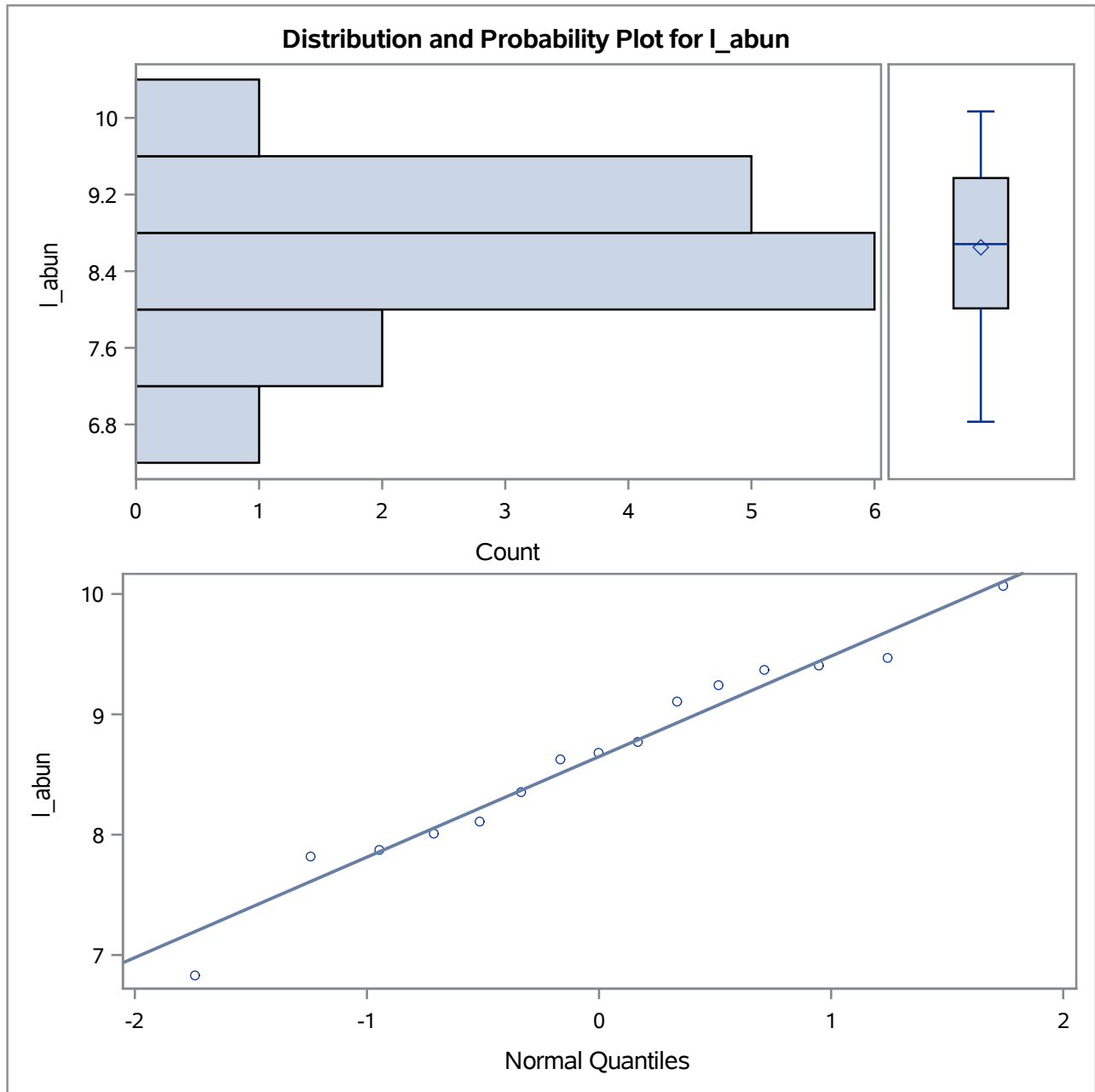
RKM=276.1 Site=KR9.1

Quantiles (Definition 5)	
Level	Quantile
50% Median	8.68271
25% Q1	8.01169
10%	7.81601
5%	6.82871
1%	6.82871
0% Min	6.82871

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
6.82871	58	9.24416	72
7.81601	63	9.37212	68
7.86940	61	9.40162	65
8.01169	62	9.47147	69
8.10531	59	10.06765	71

The UNIVARIATE Procedure

RKM=276.1 Site=KR9.1



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

RKM=276.1 Site=KR9.1

Moments			
N	15	Sum Weights	15
Mean	1.08284177	Sum Observations	16.2426265
Std Deviation	0.83894187	Variance	0.70382346
Skewness	-0.280128	Kurtosis	-0.7250069
Uncorrected SS	27.4417229	Corrected SS	9.85352849
Coeff Variation	77.4759431	Std Error Mean	0.21661386

Basic Statistical Measures			
Location		Variability	
Mean	1.082842	Std Deviation	0.83894
Median	1.309197	Variance	0.70382
Mode	.	Range	2.83317
		Interquartile Range	1.34584

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	4.99895	Pr > t 	0.0002
Sign	M	5.5	Pr >= M 	0.0074
Signed Rank	S	55	Pr >= S 	0.0006

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.964326	Pr < W	0.7670
Kolmogorov-Smirnov	D	0.13968	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.038994	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.232527	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	2.3236810
99%	2.3236810
95%	2.3236810
90%	2.2668336
75% Q3	1.7365286

The UNIVARIATE Procedure
Variable: I_bio

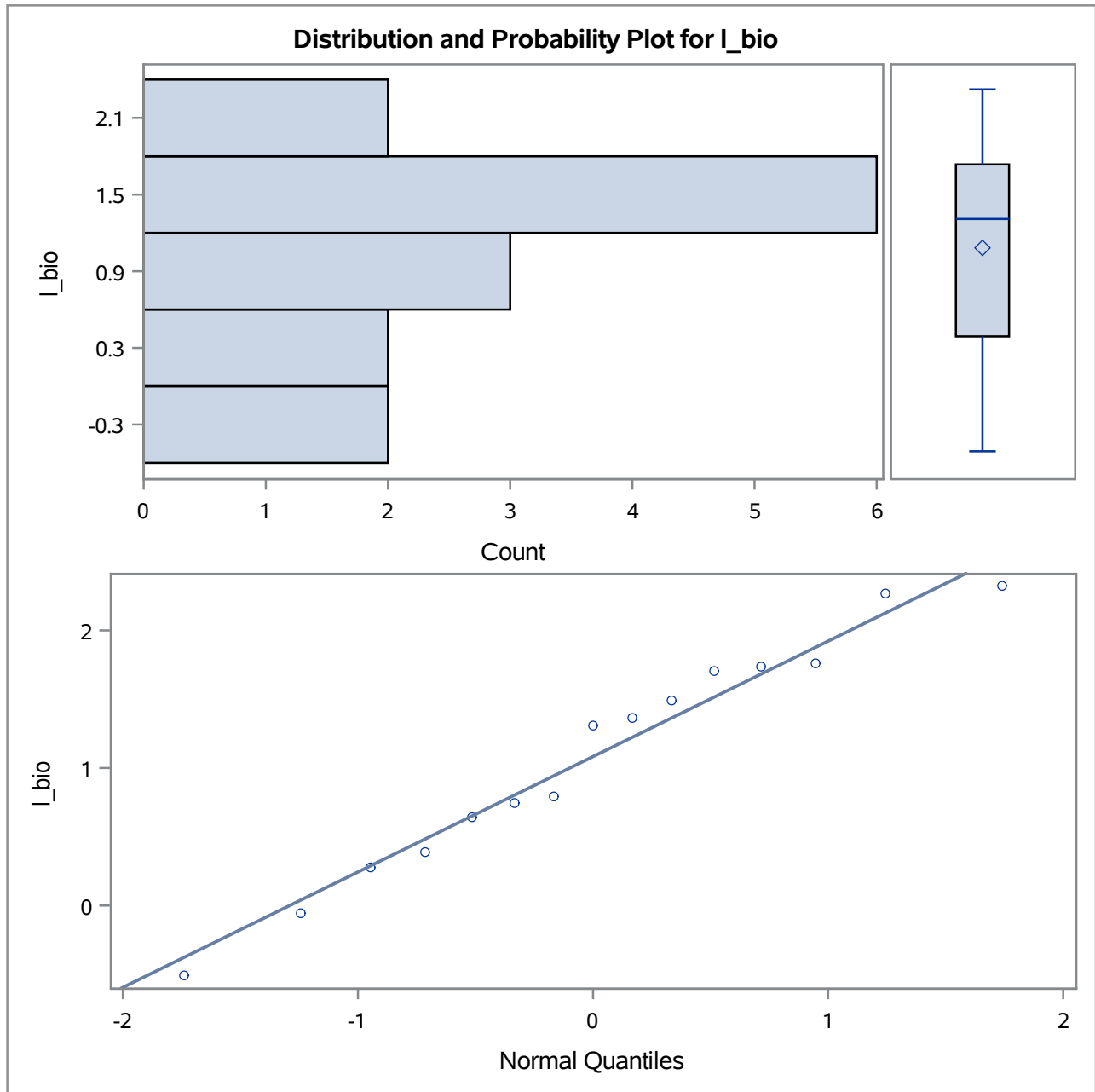
RKM=276.1 Site=KR9.1

Quantiles (Definition 5)	
Level	Quantile
50% Median	1.3091973
25% Q1	0.3906898
10%	-0.0546674
5%	-0.5094932
1%	-0.5094932
0% Min	-0.5094932

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
-0.5094932	58	1.70773	60
-0.0546674	64	1.73653	70
0.2779347	66	1.75731	61
0.3906898	63	2.26683	72
0.6447969	67	2.32368	71

The UNIVARIATE Procedure

RKM=276.1 Site=KR9.1



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_abun**

RKM=285.6 Site=KR10

Moments			
N	10	Sum Weights	10
Mean	7.32934933	Sum Observations	73.2934933
Std Deviation	0.73538354	Variance	0.54078896
Skewness	-1.0756272	Kurtosis	2.12603707
Uncorrected SS	542.060716	Corrected SS	4.86710061
Coeff Variation	10.0334083	Std Error Mean	0.2325487

Basic Statistical Measures			
Location		Variability	
Mean	7.329349	Std Deviation	0.73538
Median	7.403696	Variance	0.54079
Mode	.	Range	2.68343
		Interquartile Range	0.77734

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	31.51748	Pr > t 	<.0001
Sign	M	5	Pr >= M 	0.0020
Signed Rank	S	27.5	Pr >= S 	0.0020

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.931808	Pr < W	0.4659
Kolmogorov-Smirnov	D	0.165564	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.044766	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.328446	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Level	Quantile
100% Max	8.37378
99%	8.37378
95%	8.37378
90%	8.12236
75% Q3	7.85399

The UNIVARIATE Procedure
Variable: I_abun

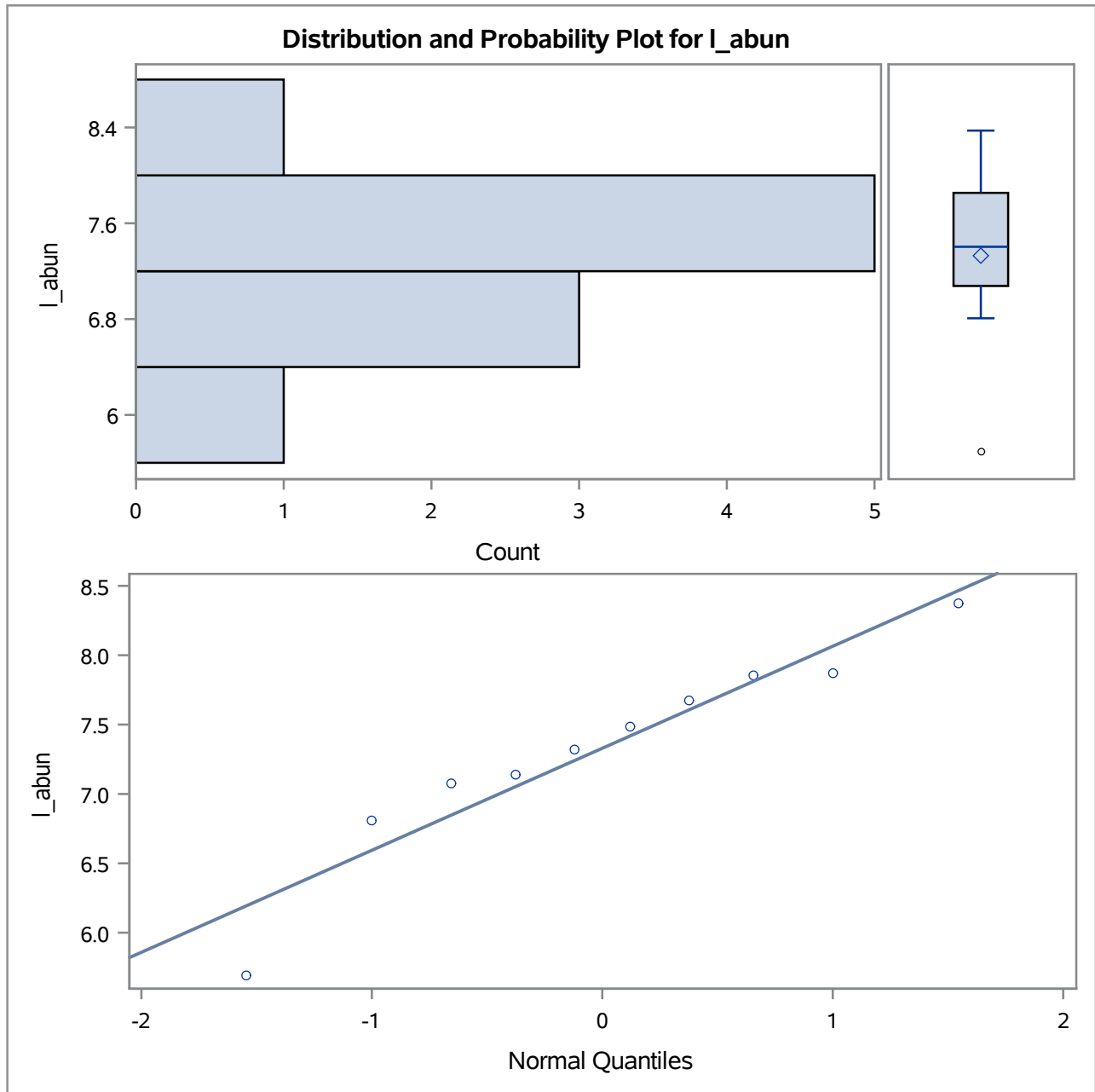
RKM=285.6 Site=KR10

Quantiles (Definition 5)	
Level	Quantile
50% Median	7.40370
25% Q1	7.07665
10%	6.24859
5%	5.69036
1%	5.69036
0% Min	5.69036

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
5.69036	77	7.48885	82
6.80683	76	7.67786	79
7.07665	73	7.85399	81
7.13569	74	7.87093	78
7.31854	75	8.37378	80

The UNIVARIATE Procedure

RKM=285.6 Site=KR10



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

RKM=285.6 Site=KR10

Moments			
N	10	Sum Weights	10
Mean	0.09988388	Sum Observations	0.99883885
Std Deviation	0.68613503	Variance	0.47078128
Skewness	-0.9610808	Kurtosis	0.28193173
Uncorrected SS	4.33679945	Corrected SS	4.23703155
Coeff Variation	686.932665	Std Error Mean	0.21697495

Basic Statistical Measures			
Location		Variability	
Mean	0.099884	Std Deviation	0.68614
Median	0.259788	Variance	0.47078
Mode	.	Range	2.13945
		Interquartile Range	0.59032

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	0.460348	Pr > t 	0.6562
Sign	M	2	Pr >= M 	0.3438
Signed Rank	S	8.5	Pr >= S 	0.4316

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.899109	Pr < W	0.2142
Kolmogorov-Smirnov	D	0.20029	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.082713	Pr > W-Sq	0.1744
Anderson-Darling	A-Sq	0.484471	Pr > A-Sq	0.1822

Quantiles (Definition 5)	
Level	Quantile
100% Max	0.9487192
99%	0.9487192
95%	0.9487192
90%	0.8662190
75% Q3	0.5168872

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: I_bio

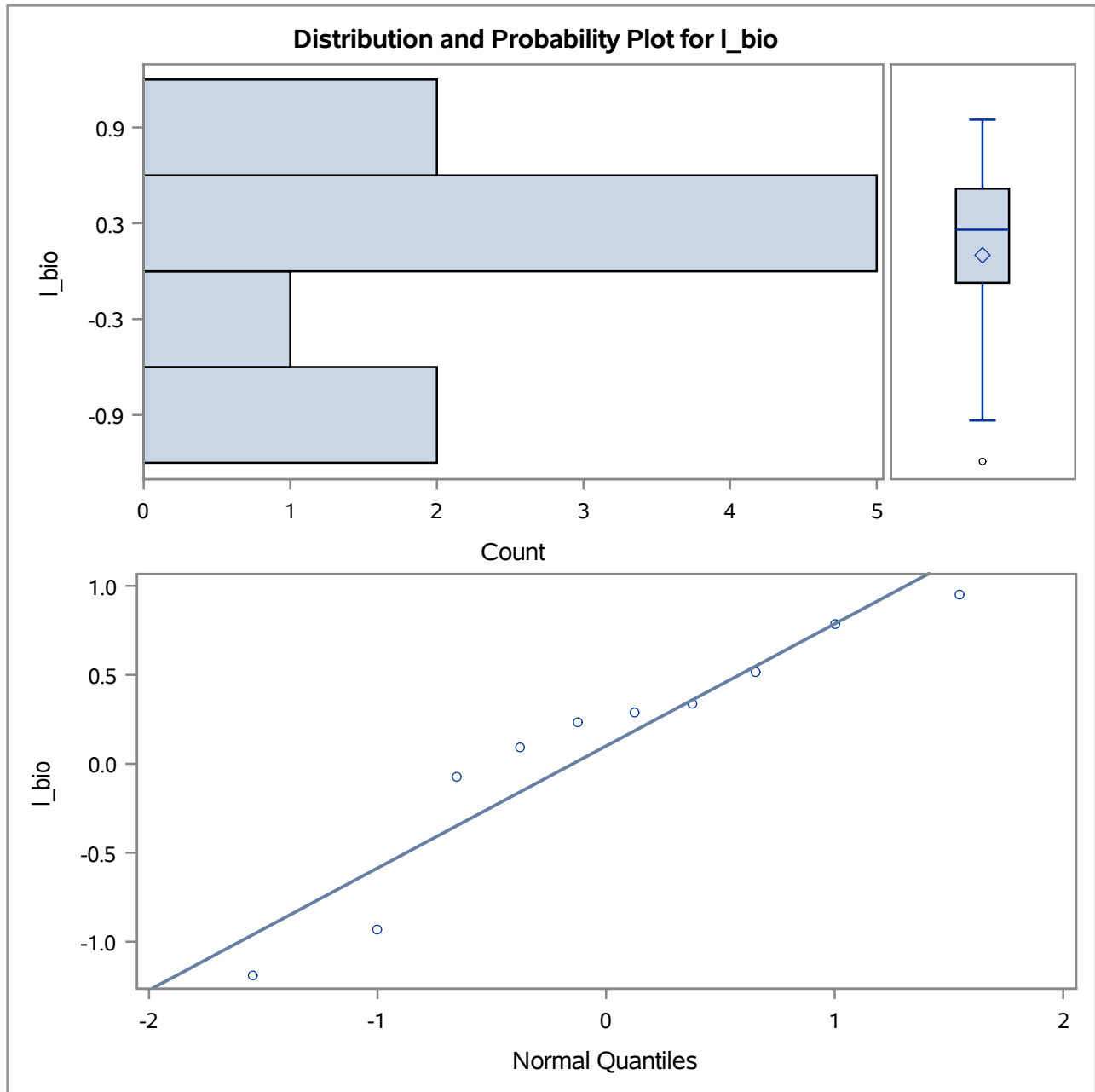
RKM=285.6 Site=KR10

Quantiles (Definition 5)	
Level	Quantile
50% Median	0.2597878
25% Q1	-0.0734313
10%	-1.0625911
5%	-1.1907276
1%	-1.1907276
0% Min	-1.1907276

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
-1.1907276	79	0.288781	75
-0.9344547	78	0.337614	74
-0.0734313	77	0.516887	80
0.0909370	82	0.783719	81
0.2307942	76	0.948719	73

The UNIVARIATE Procedure

RKM=285.6 Site=KR10



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_abun**

RKM=299.2 Site=KR10.5

Moments			
N	15	Sum Weights	15
Mean	8.17930823	Sum Observations	122.689623
Std Deviation	0.37771945	Variance	0.14267198
Skewness	-0.0999715	Kurtosis	1.20713922
Uncorrected SS	1005.51365	Corrected SS	1.99740776
Coeff Variation	4.61798773	Std Error Mean	0.09752674

Basic Statistical Measures			
Location		Variability	
Mean	8.179308	Std Deviation	0.37772
Median	8.122074	Variance	0.14267
Mode	.	Range	1.50933
		Interquartile Range	0.41376

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	83.86734	Pr > t 	<.0001
Sign	M	7.5	Pr >= M 	<.0001
Signed Rank	S	60	Pr >= S 	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.932967	Pr < W	0.3021
Kolmogorov-Smirnov	D	0.171144	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.071539	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.4679	Pr > A-Sq	0.2215

Quantiles (Definition 5)	
Level	Quantile
100% Max	8.83579
99%	8.83579
95%	8.83579
90%	8.83113
75% Q3	8.37931

2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data

The UNIVARIATE Procedure
Variable: l_abun

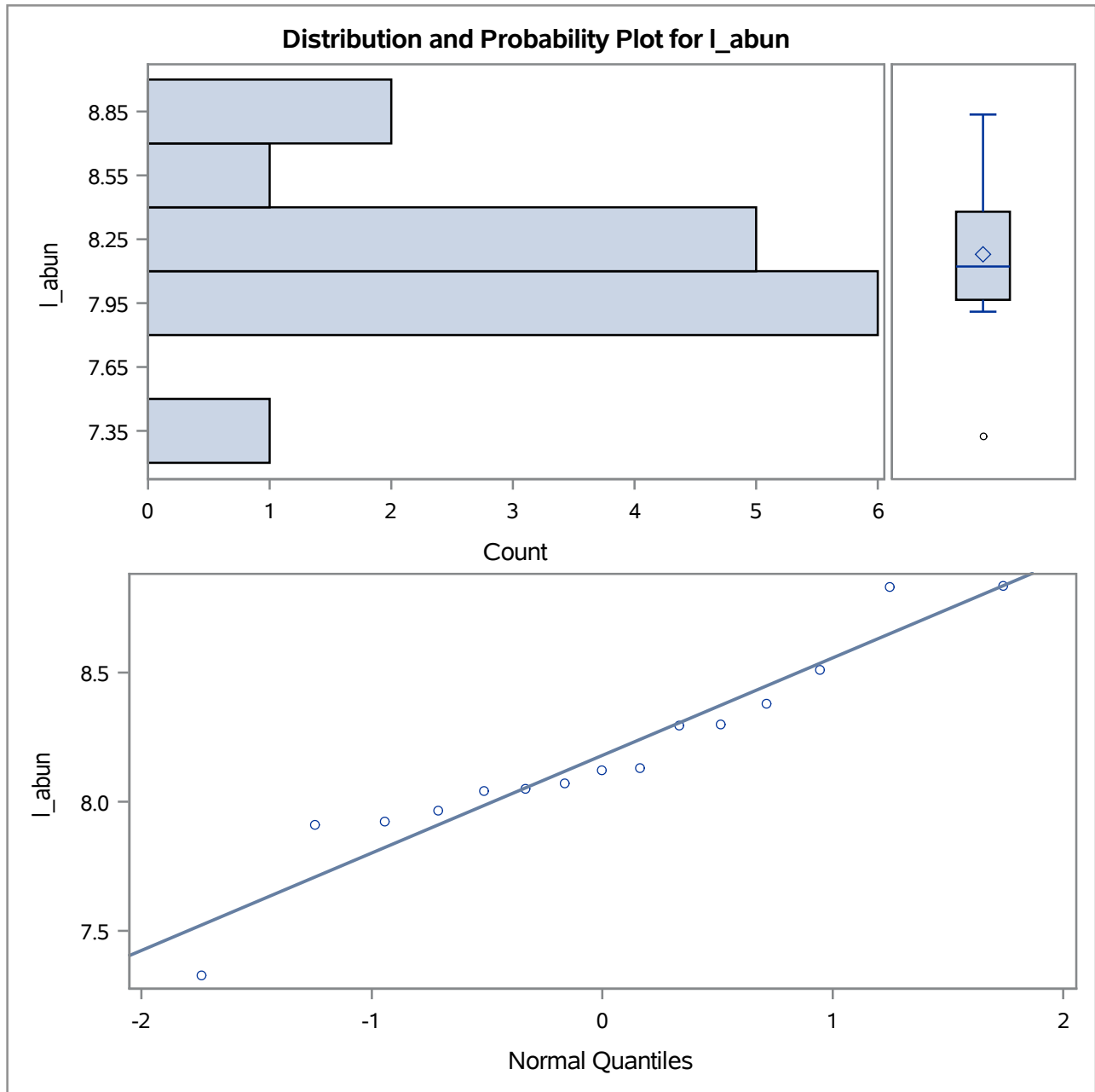
RKM=299.2 Site=KR10.5

Quantiles (Definition 5)	
Level	Quantile
50% Median	8.12207
25% Q1	7.96555
10%	7.90986
5%	7.32647
1%	7.32647
0% Min	7.32647

Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
7.32647	95	8.29904	88
7.90986	91	8.37931	89
7.92299	86	8.51077	84
7.96555	83	8.83113	96
8.04302	93	8.83579	90

The UNIVARIATE Procedure

RKM=299.2 Site=KR10.5



**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

RKM=299.2 Site=KR10.5

Moments			
N	15	Sum Weights	15
Mean	-0.0003064	Sum Observations	-0.0045955
Std Deviation	0.75134954	Variance	0.56452612
Skewness	-1.2045854	Kurtosis	1.35376806
Uncorrected SS	7.90336716	Corrected SS	7.90336575
Coeff Variation	-245244.02	Std Error Mean	0.19399762

Basic Statistical Measures			
Location		Variability	
Mean	-0.00031	Std Deviation	0.75135
Median	0.12962	Variance	0.56453
Mode	.	Range	2.66861
		Interquartile Range	0.85375

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	-0.00158	Pr > t 	0.9988
Sign	M	1.5	Pr >= M 	0.6072
Signed Rank	S	7	Pr >= S 	0.7197

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.89401	Pr < W	0.0771
Kolmogorov-Smirnov	D	0.185676	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.082911	Pr > W-Sq	0.1813
Anderson-Darling	A-Sq	0.5396	Pr > A-Sq	0.1422

Quantiles (Definition 5)	
Level	Quantile
100% Max	0.818369
99%	0.818369
95%	0.818369
90%	0.794439
75% Q3	0.635094

**2017 Macroinvertebrate Data
Univariate Analyses for Log Transformed data**

**The UNIVARIATE Procedure
Variable: I_bio**

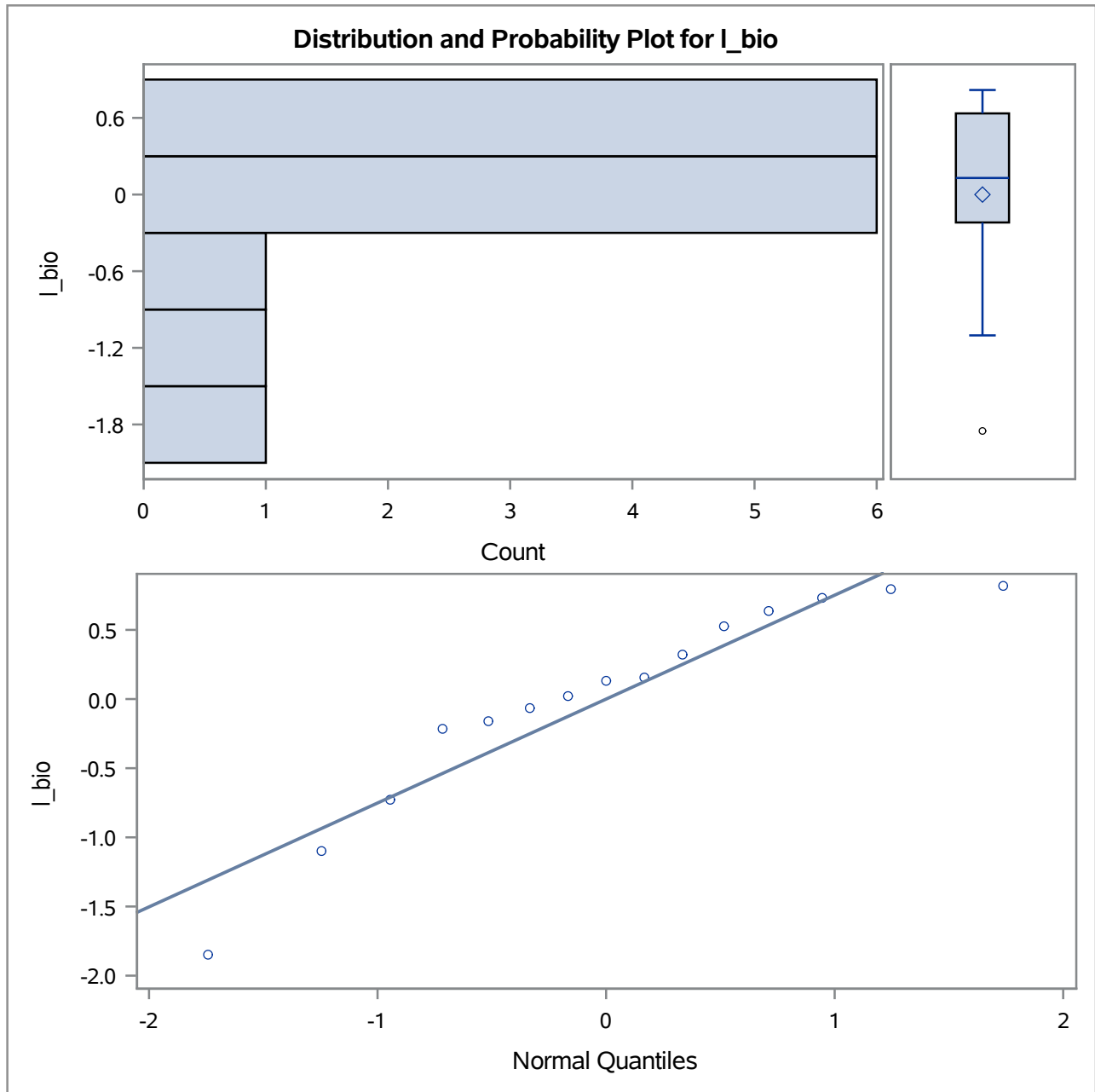
RKM=299.2 Site=KR10.5

Quantiles (Definition 5)	
Level	Quantile
50% Median	0.129624
25% Q1	-0.218654
10%	-1.102620
5%	-1.850236
1%	-1.850236
0% Min	-1.850236

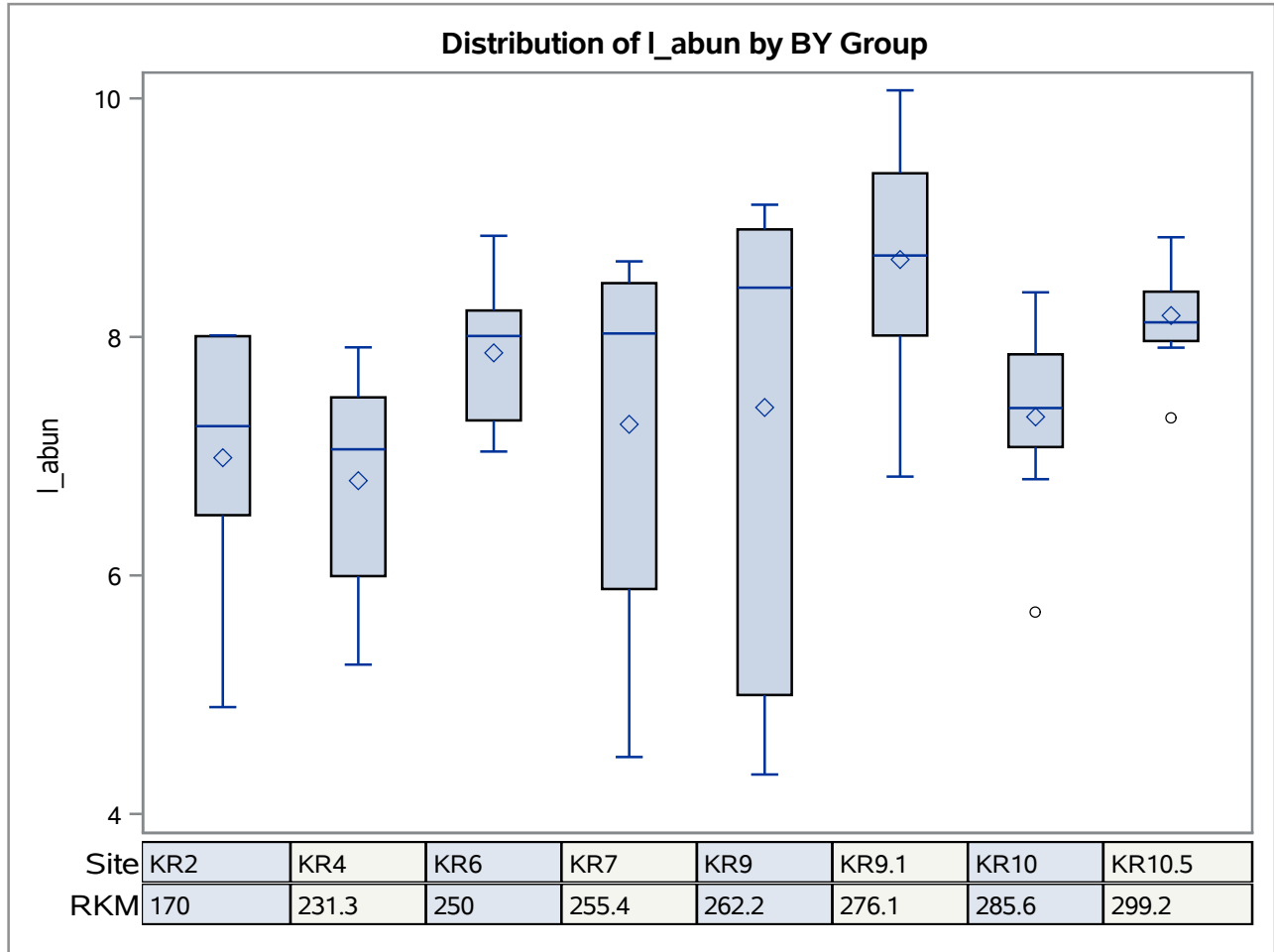
Extreme Observations			
Lowest		Highest	
Value	Obs	Value	Obs
-1.850236	95	0.523307	83
-1.102620	94	0.635094	85
-0.731472	97	0.728900	84
-0.218654	88	0.794439	91
-0.159230	93	0.818369	87

The UNIVARIATE Procedure

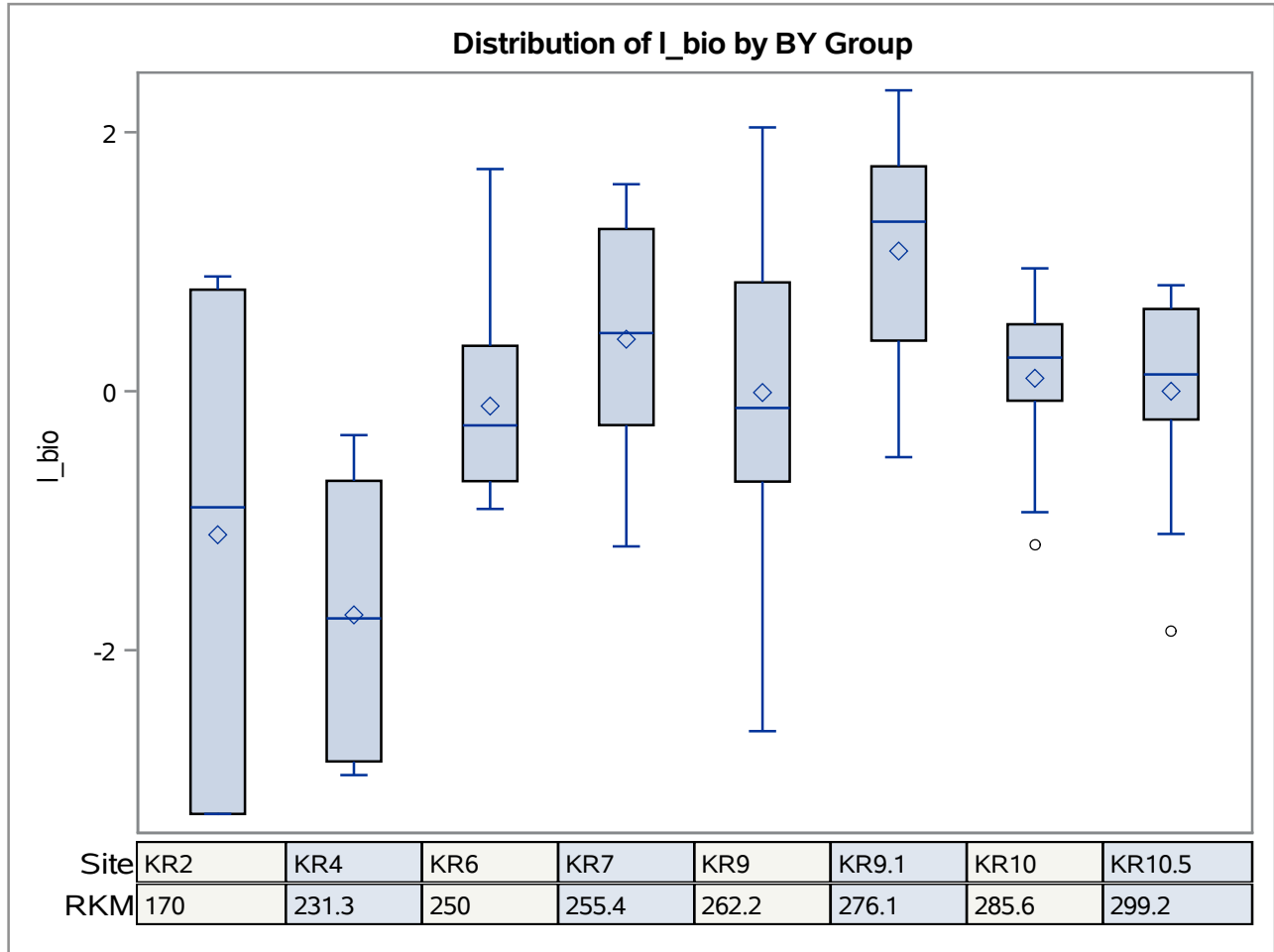
RKM=299.2 Site=KR10.5



The UNIVARIATE Procedure



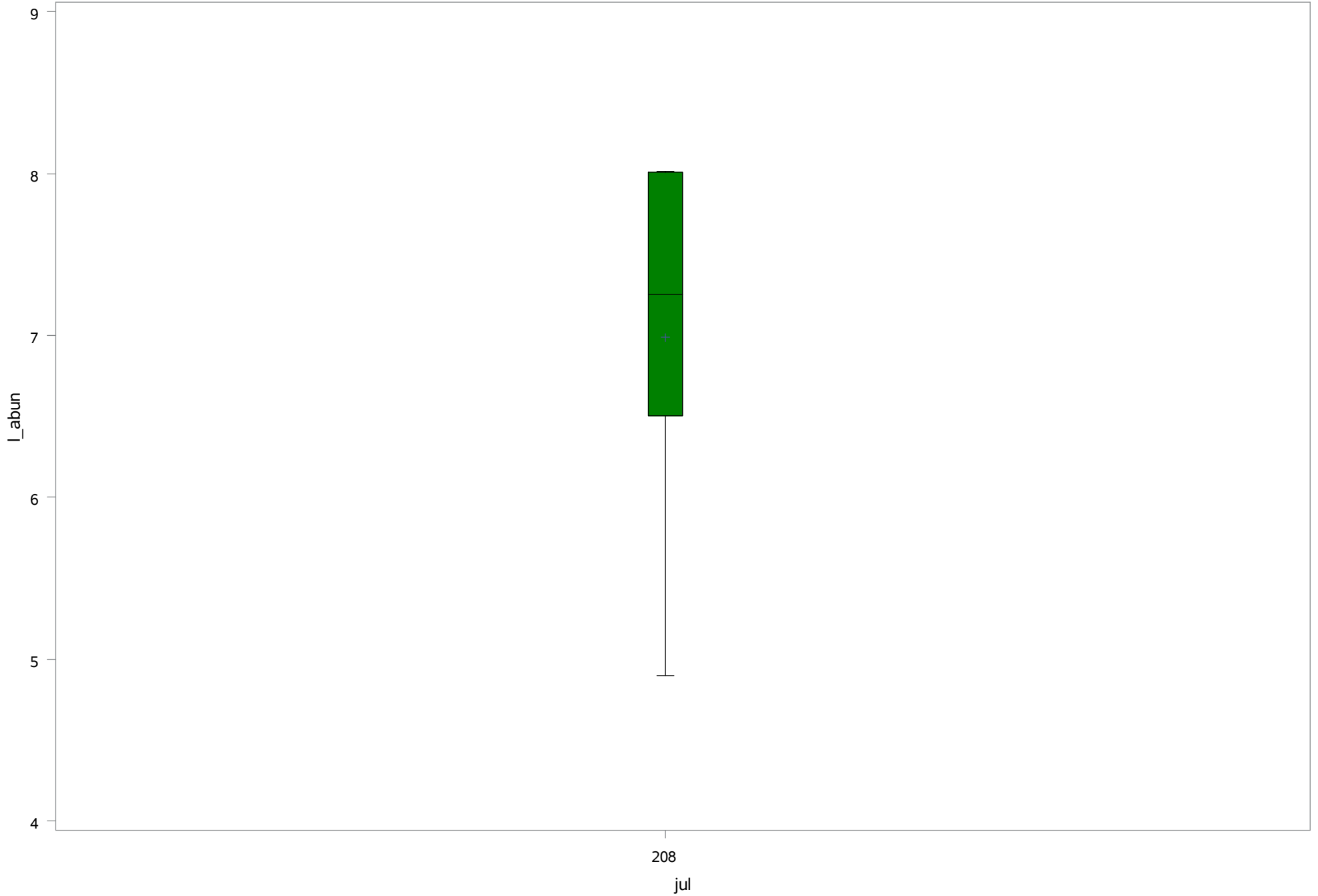
The UNIVARIATE Procedure



2017 Macroinvertebrate Data

Log Trends over Sampling Date

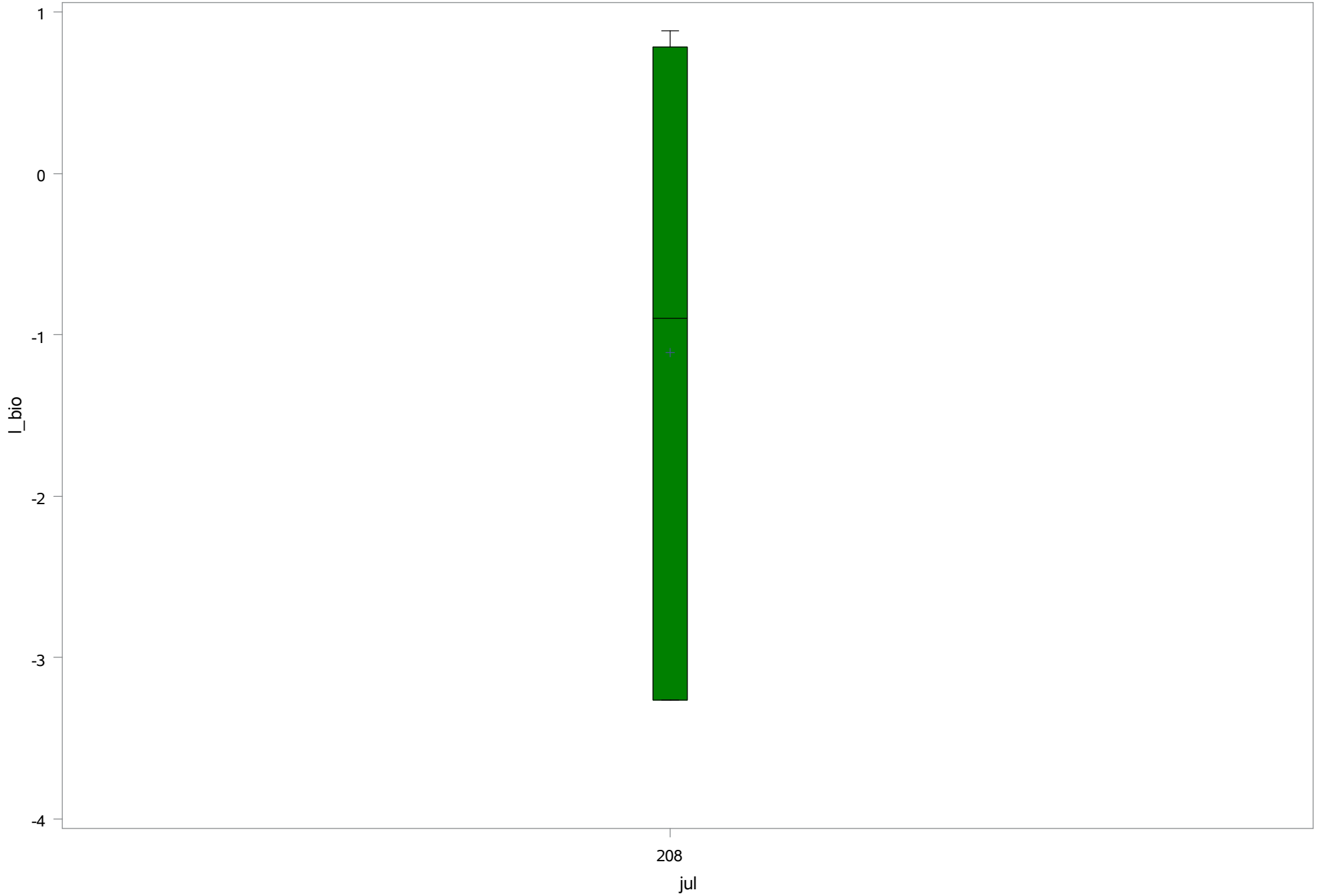
RKM=170 Site=KR2



2017 Macroinvertebrate Data

Log Trends over Sampling Date

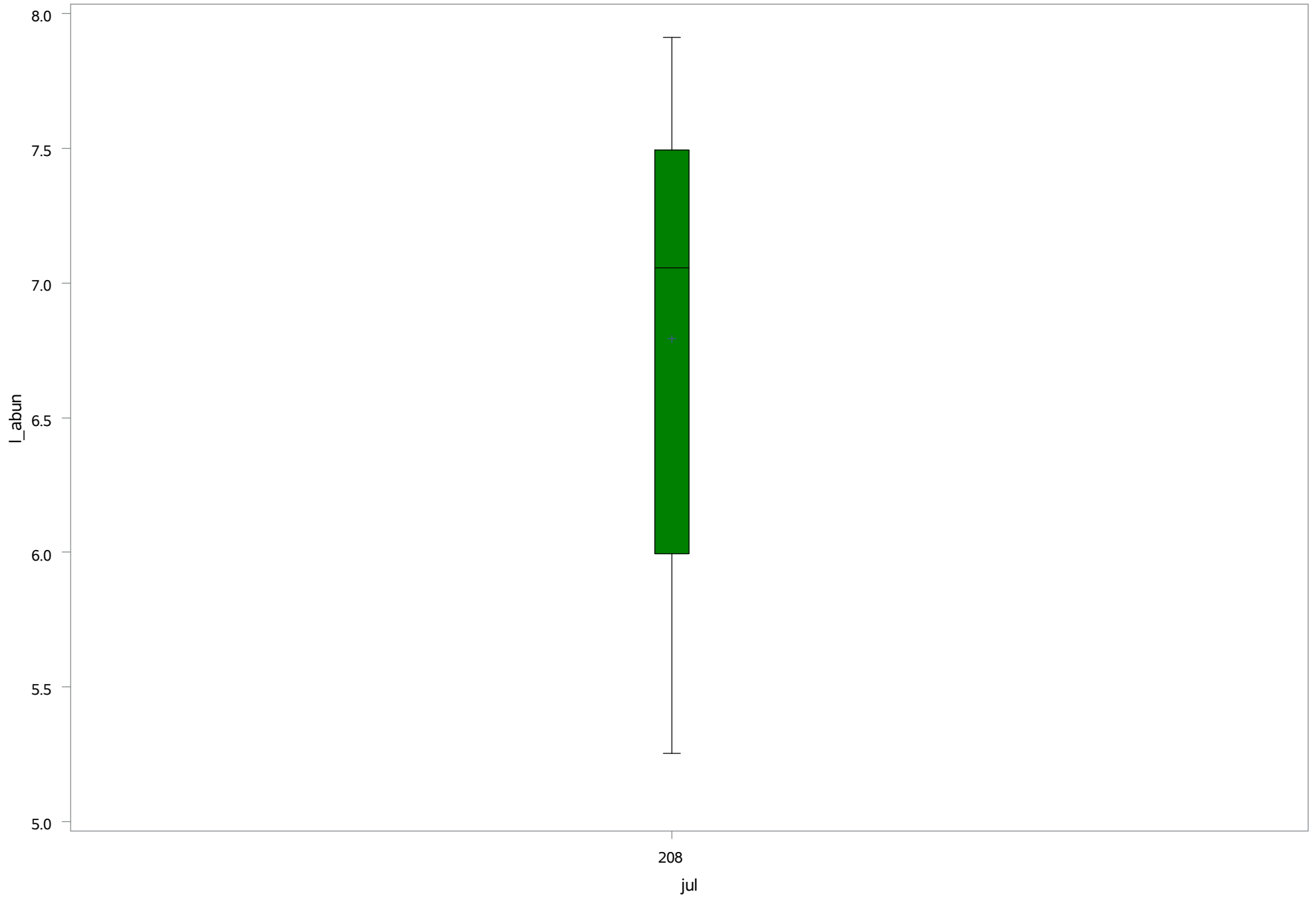
RKM=170 Site=KR2



2017 Macroinvertebrate Data

Log Trends over Sampling Date

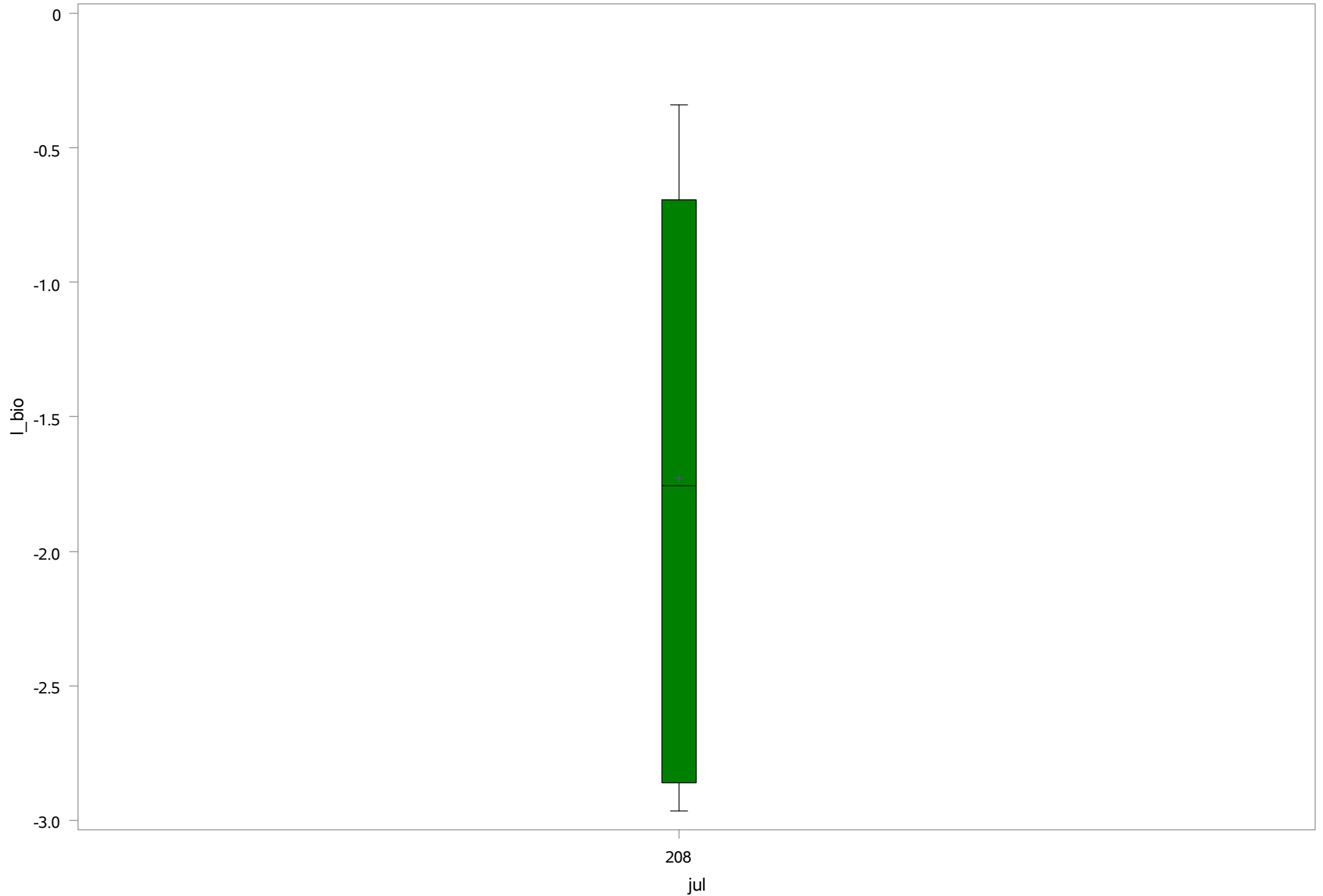
RKM=231.3 Site=KR4



2017 Macroinvertebrate Data

Log Trends over Sampling Date

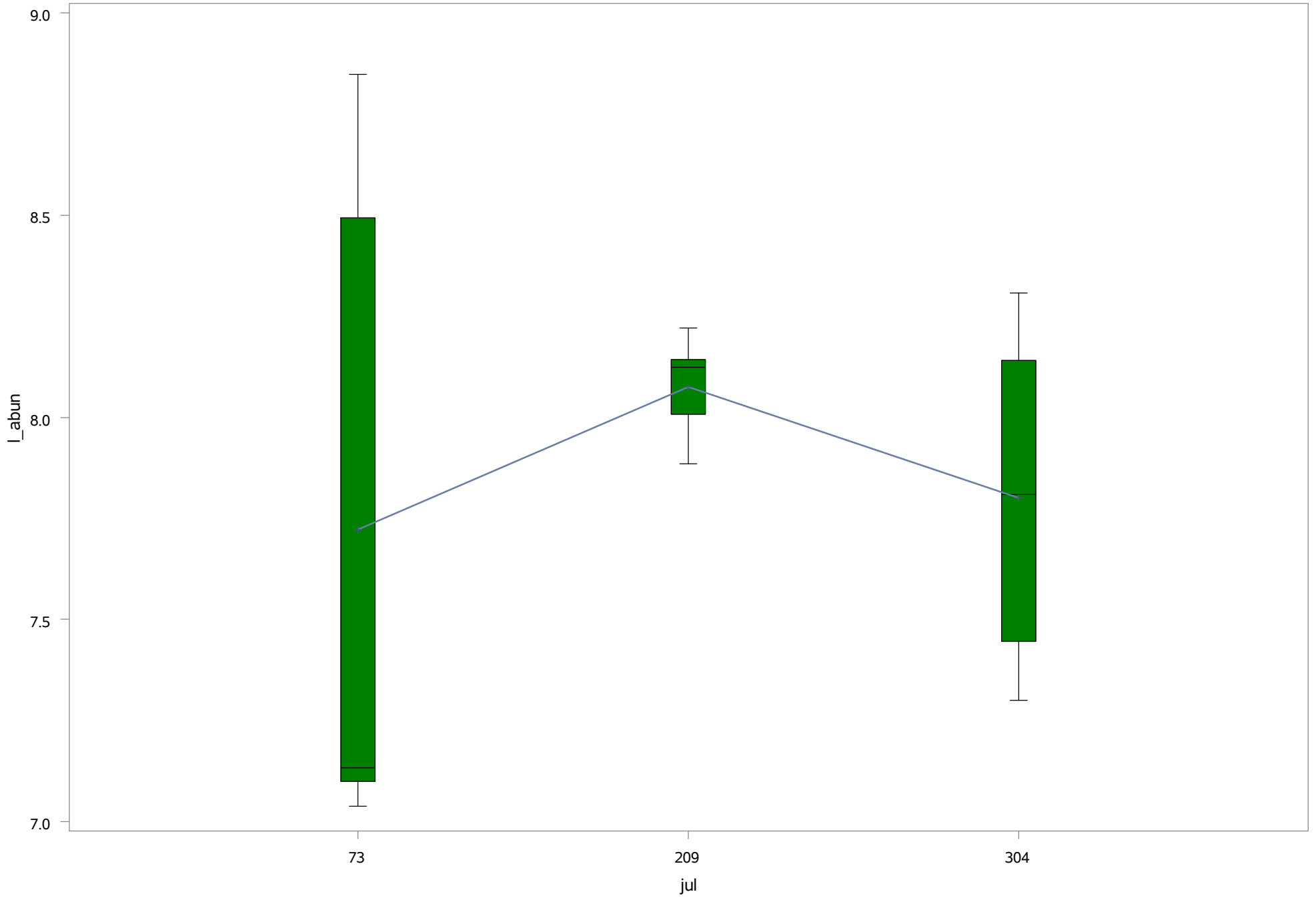
RKM=231.3 Site=KR4



2017 Macroinvertebrate Data

Log Trends over Sampling Date

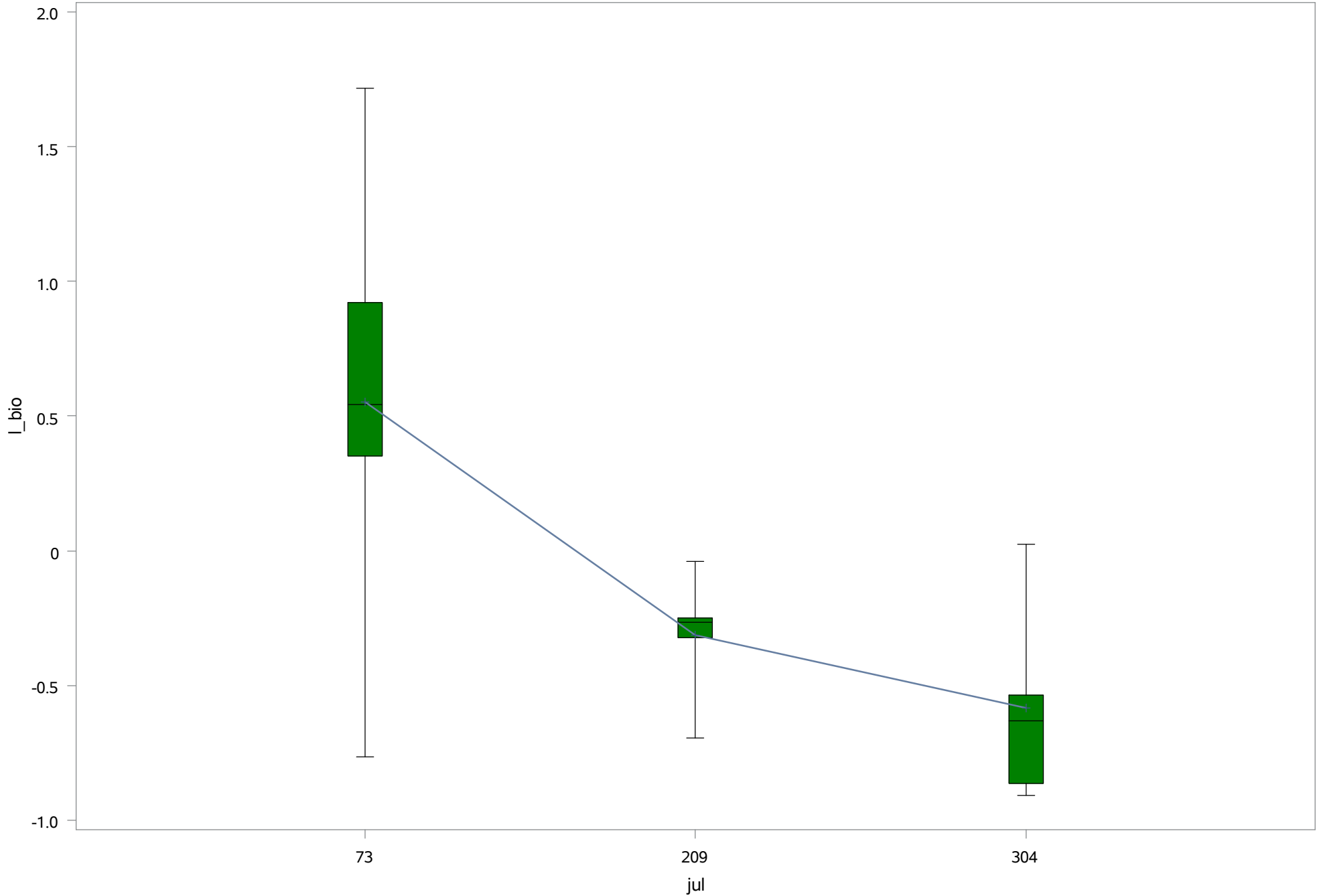
RKM=250 Site=KR6



2017 Macroinvertebrate Data

Log Trends over Sampling Date

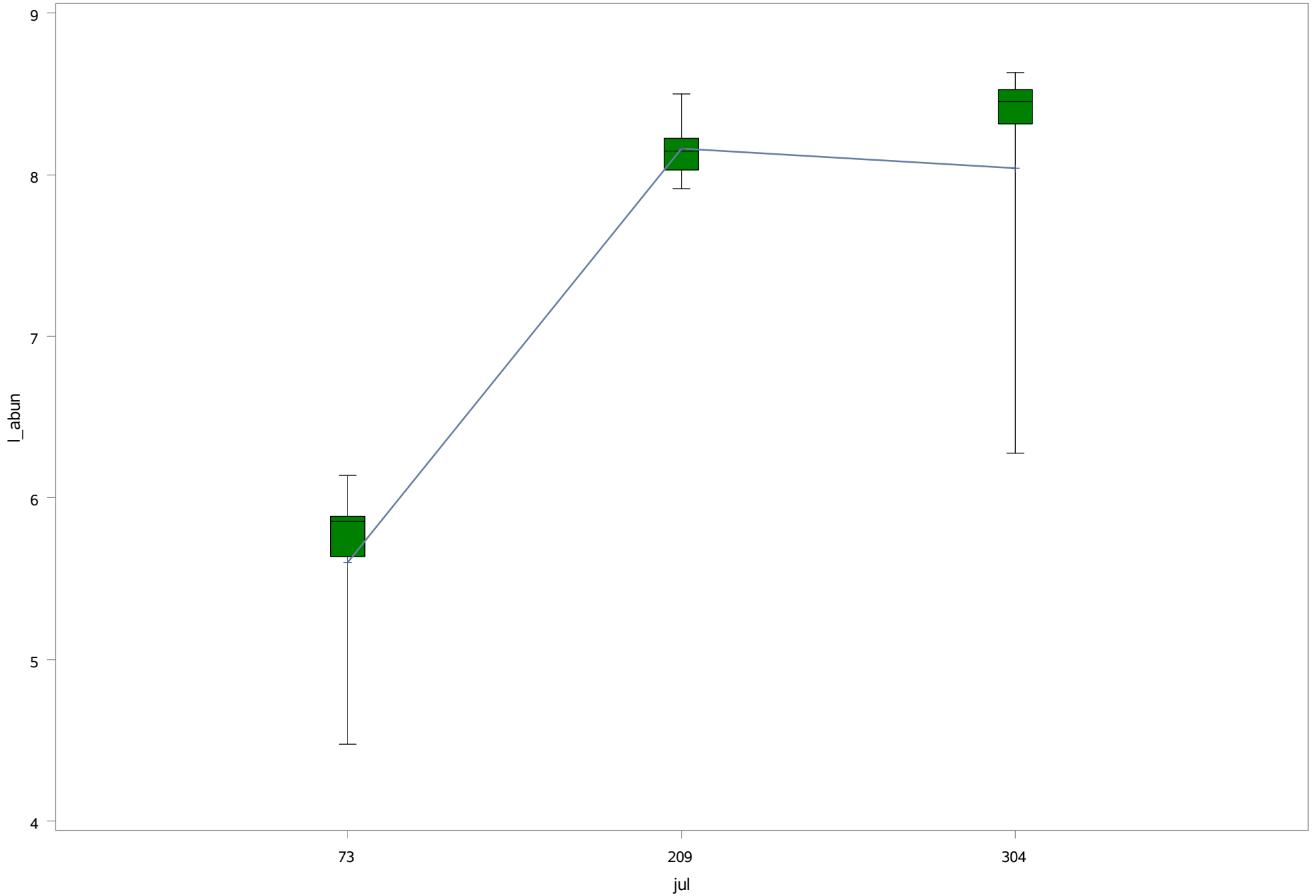
RKM=250 Site=KR6



2017 Macroinvertebrate Data

Log Trends over Sampling Date

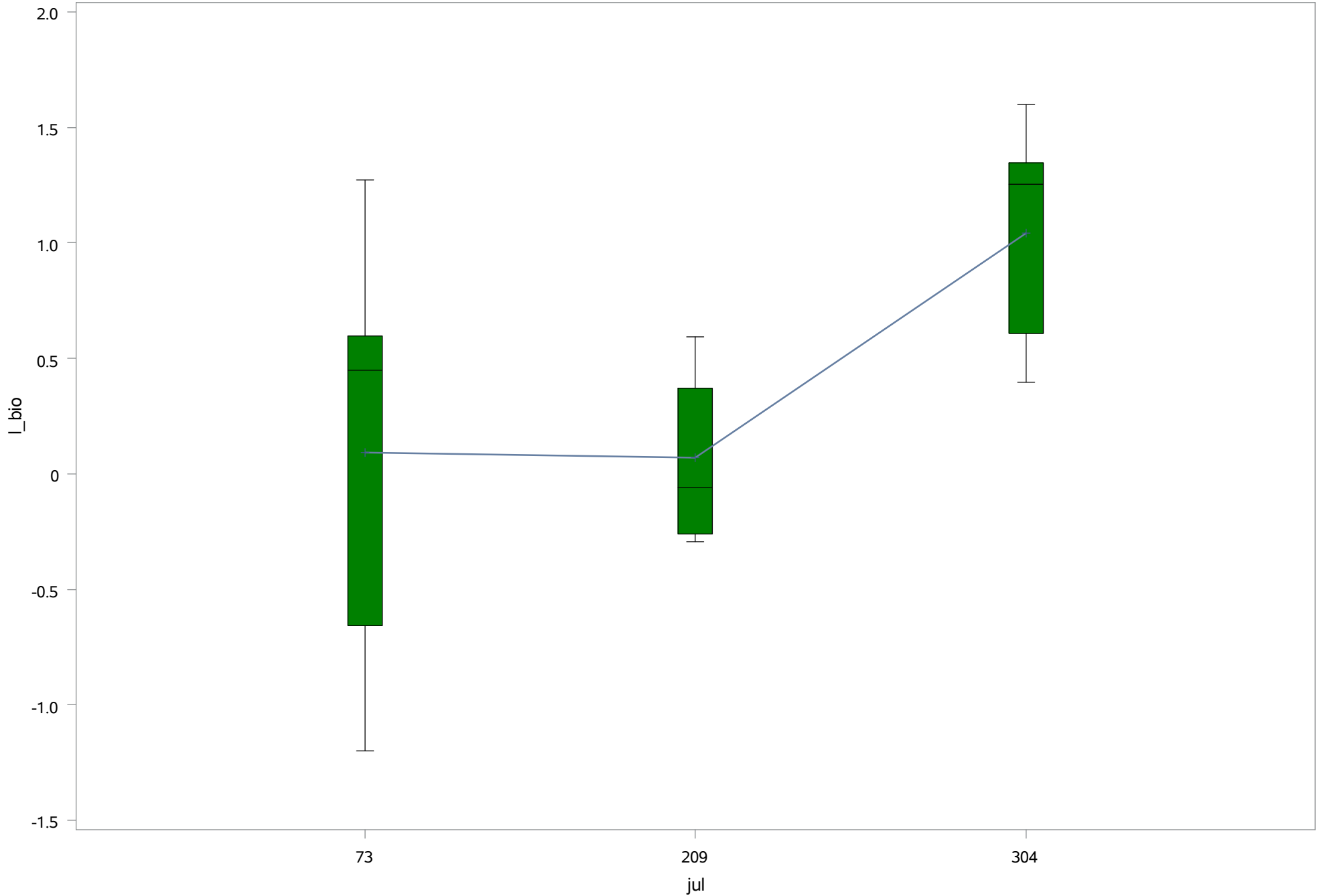
RKM=255.4 Site=KR7



2017 Macroinvertebrate Data

Log Trends over Sampling Date

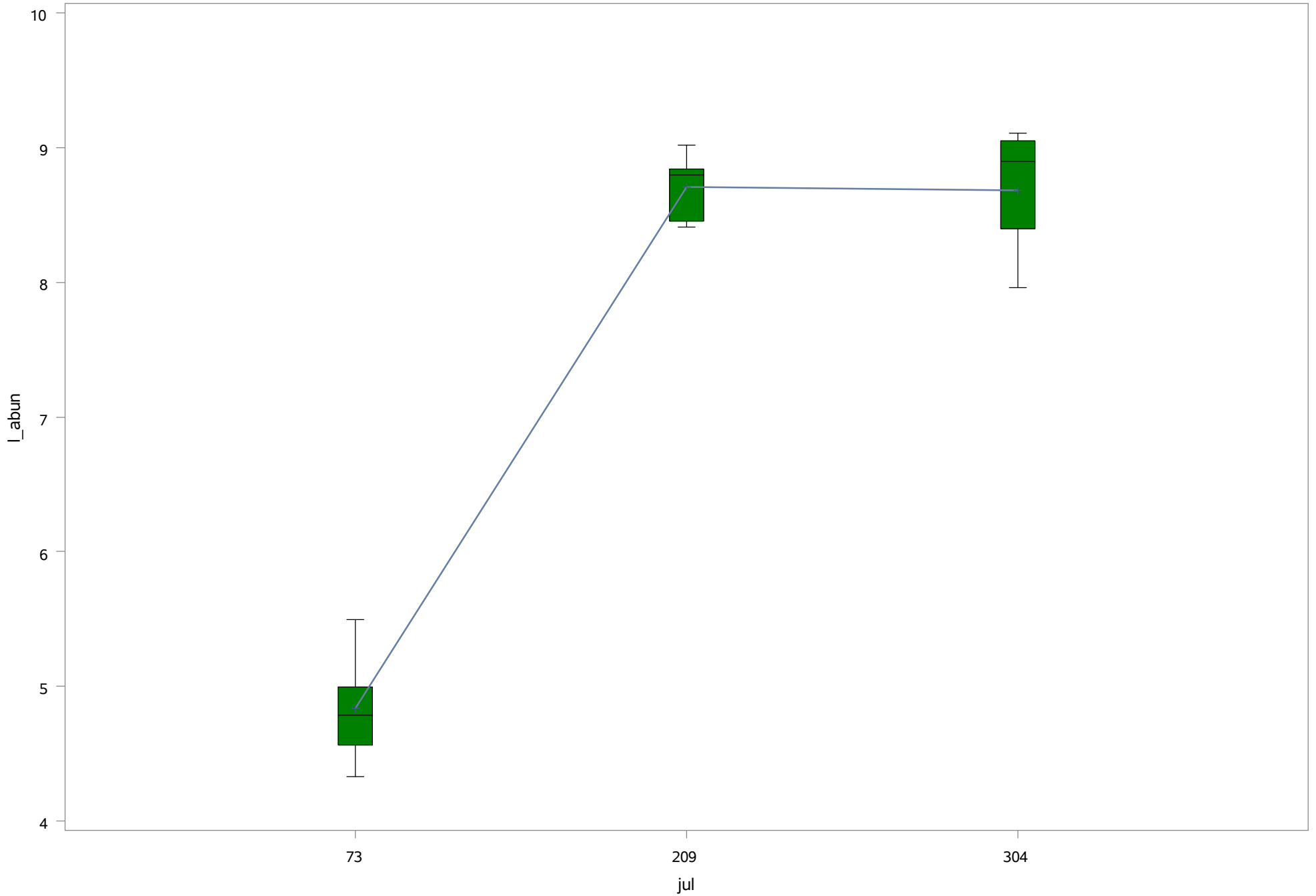
RKM=255.4 Site=KR7



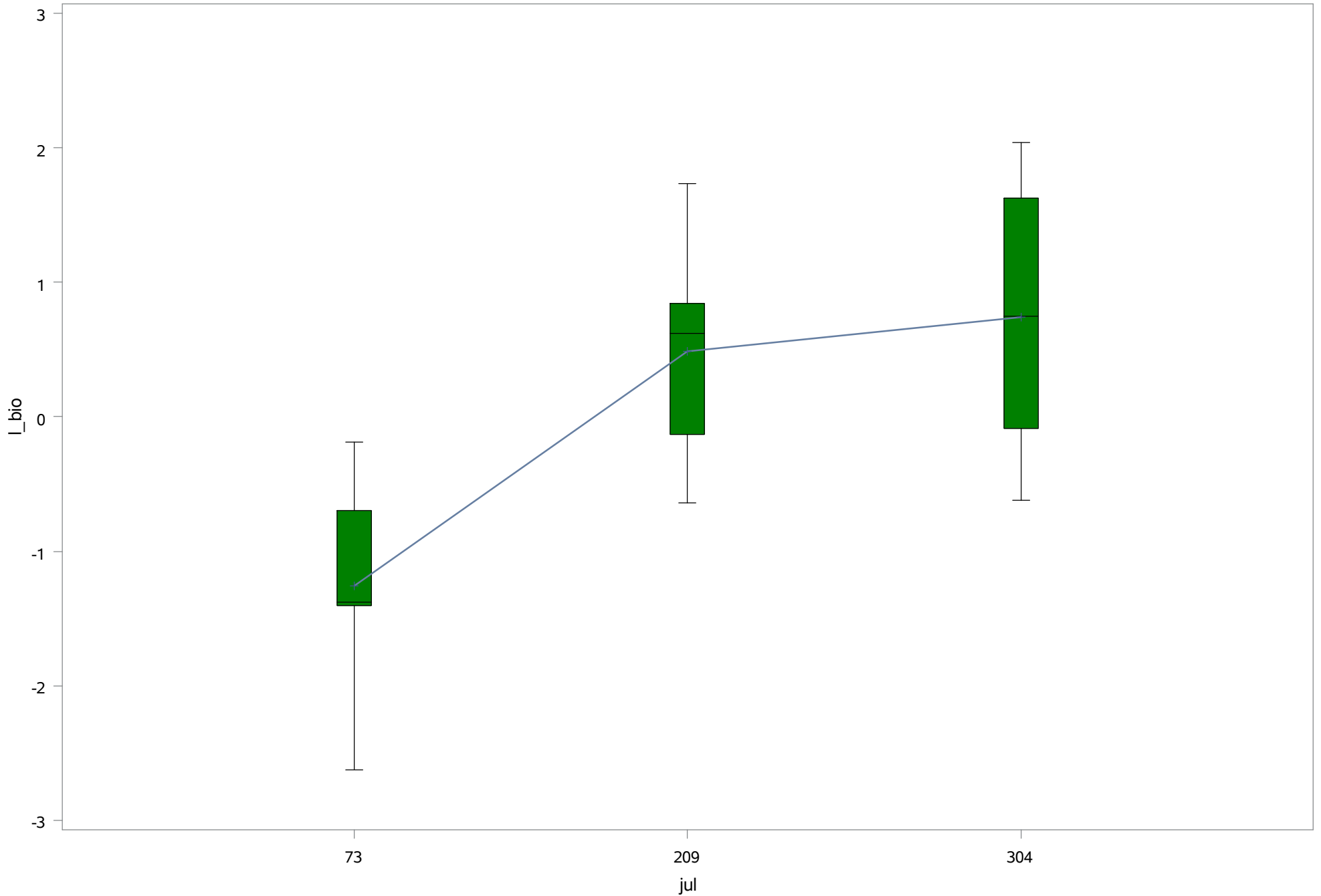
2017 Macroinvertebrate Data

Log Trends over Sampling Date

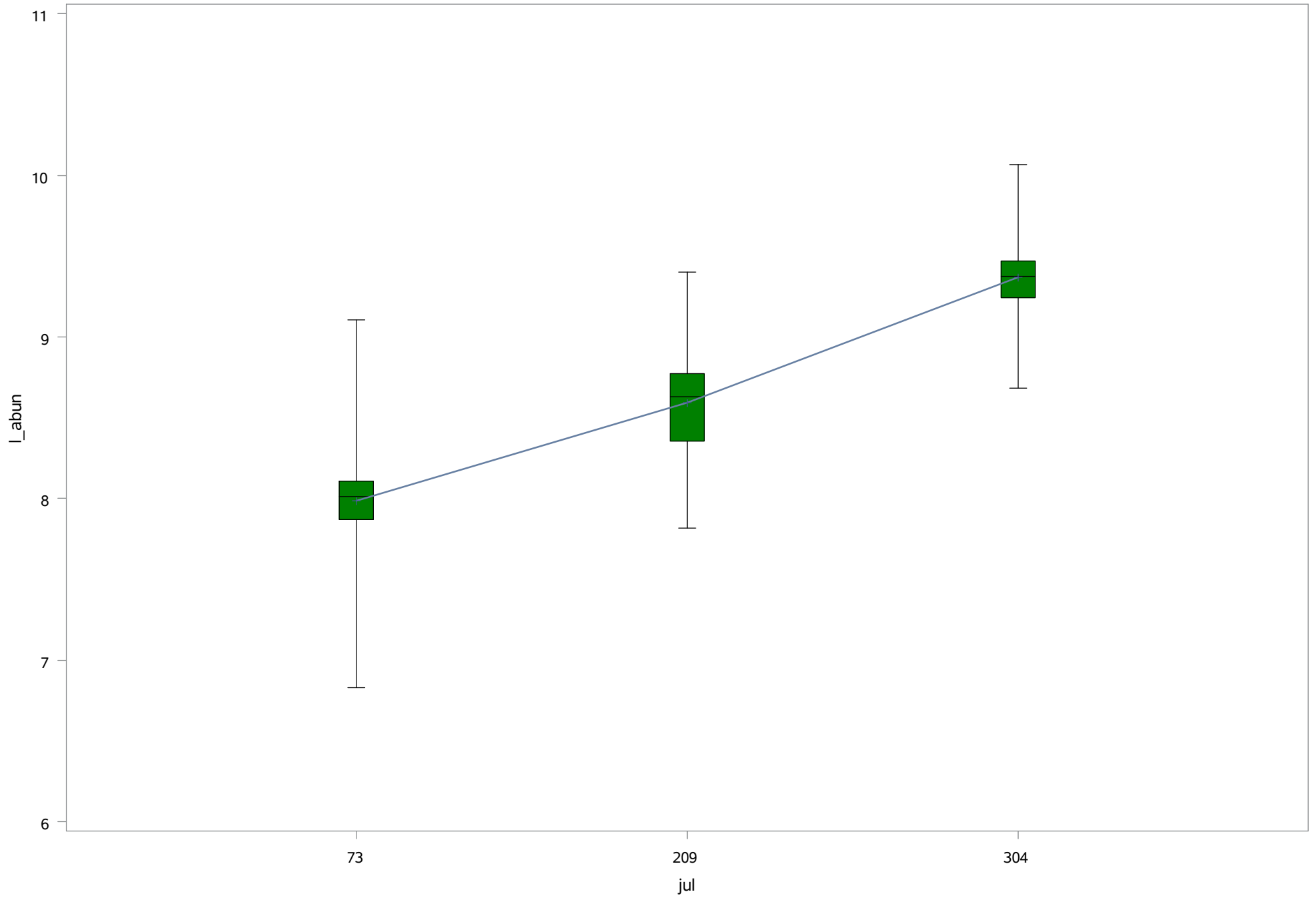
RKM=262.2 Site=KR9



2017 Macroinvertebrate Data Log Trends over Sampling Date RKM=262.2 Site=KR9



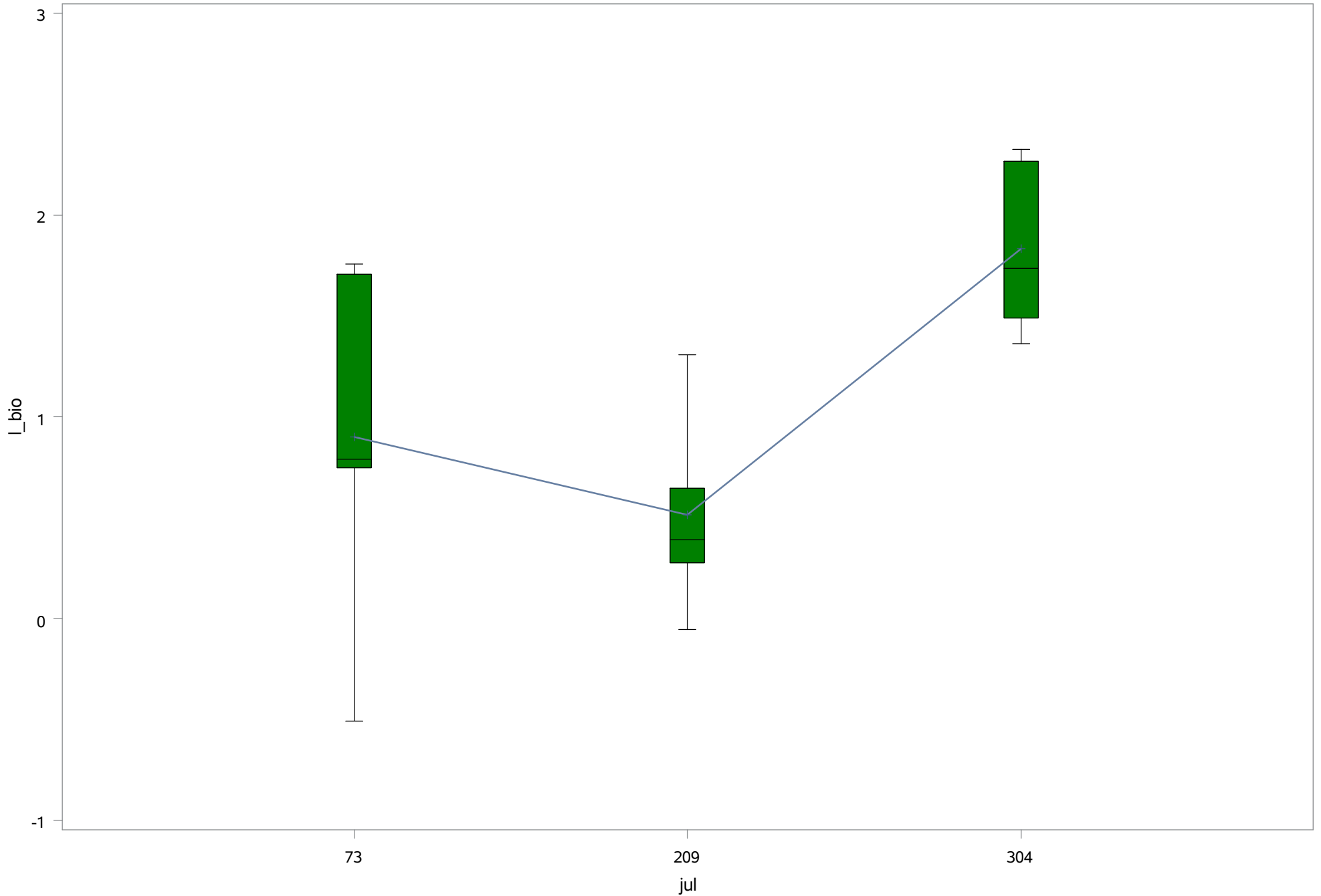
2017 Macroinvertebrate Data Log Trends over Sampling Date RKM=276.1 Site=KR9.1



2017 Macroinvertebrate Data

Log Trends over Sampling Date

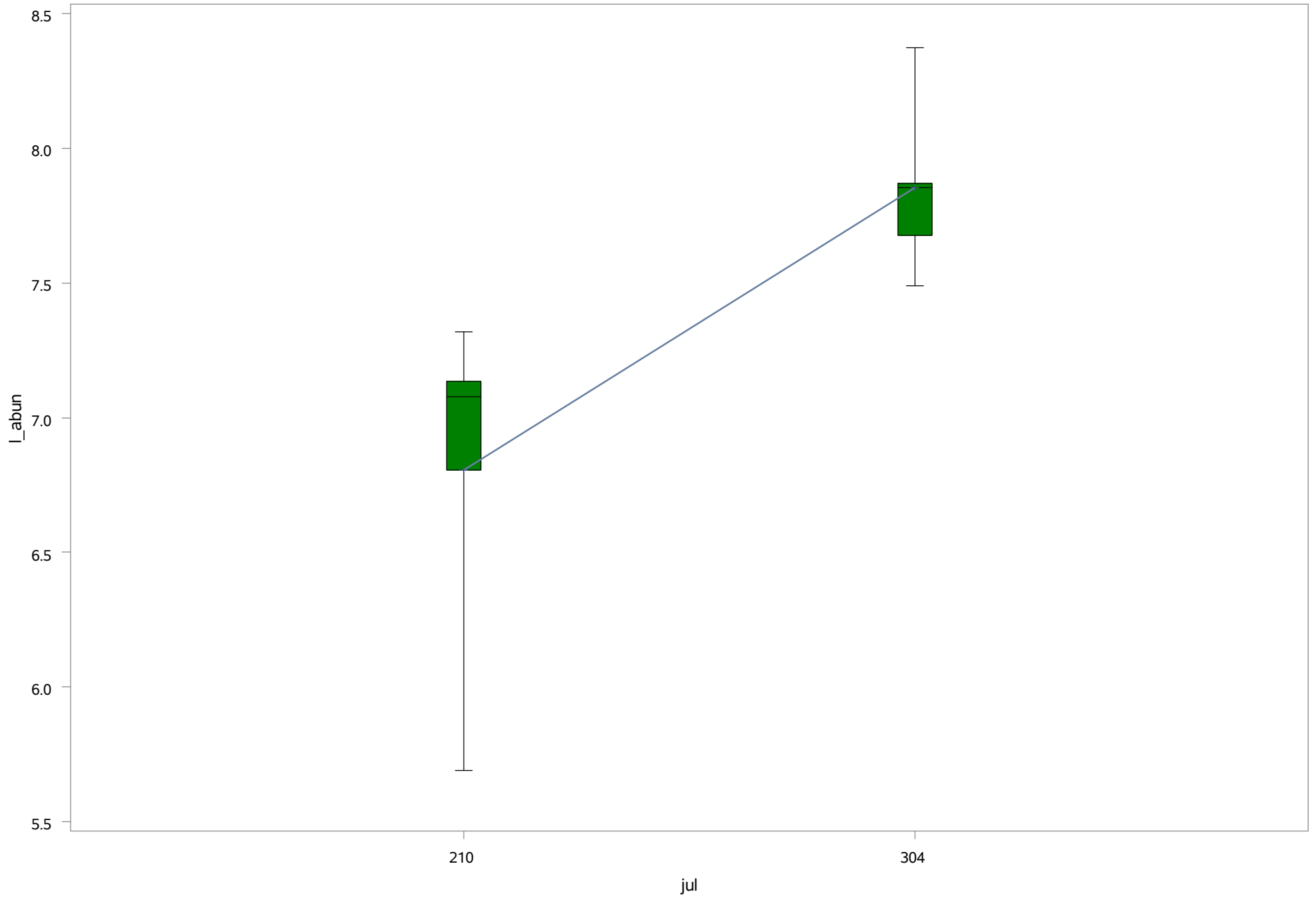
RKM=276.1 Site=KR9.1



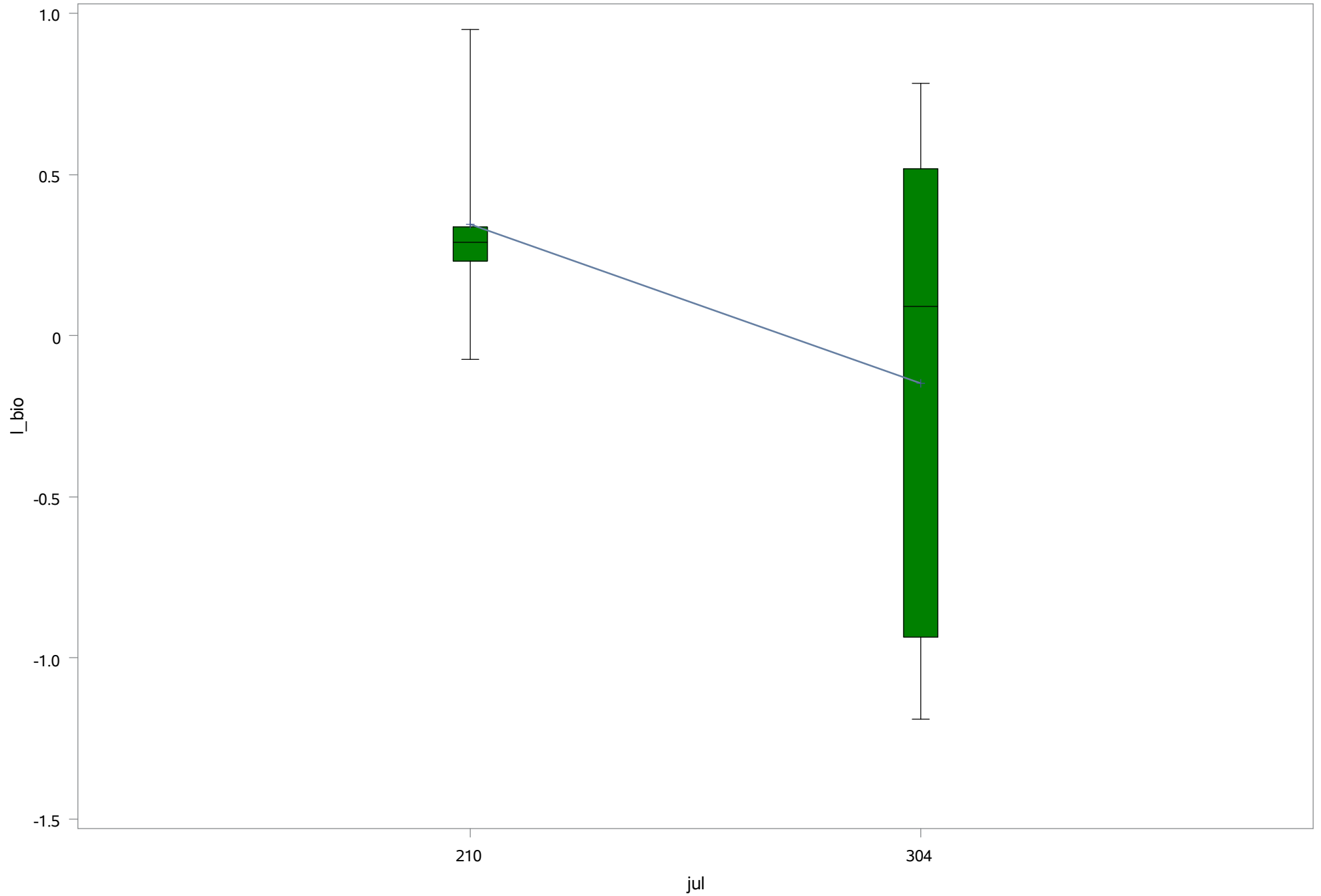
2017 Macroinvertebrate Data

Log Trends over Sampling Date

RKM=285.6 Site=KR10



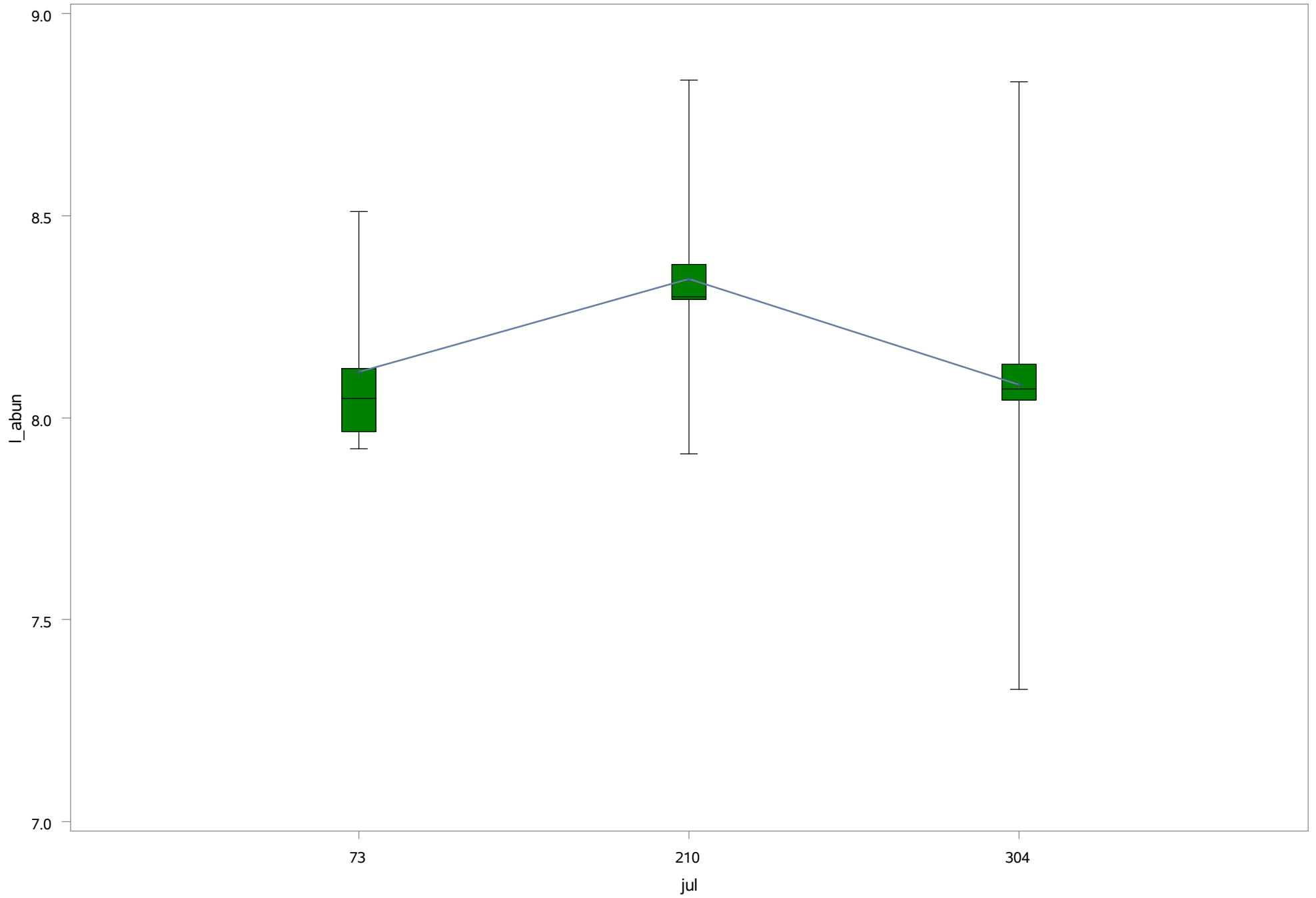
2017 Macroinvertebrate Data Log Trends over Sampling Date RKM=285.6 Site=KR10



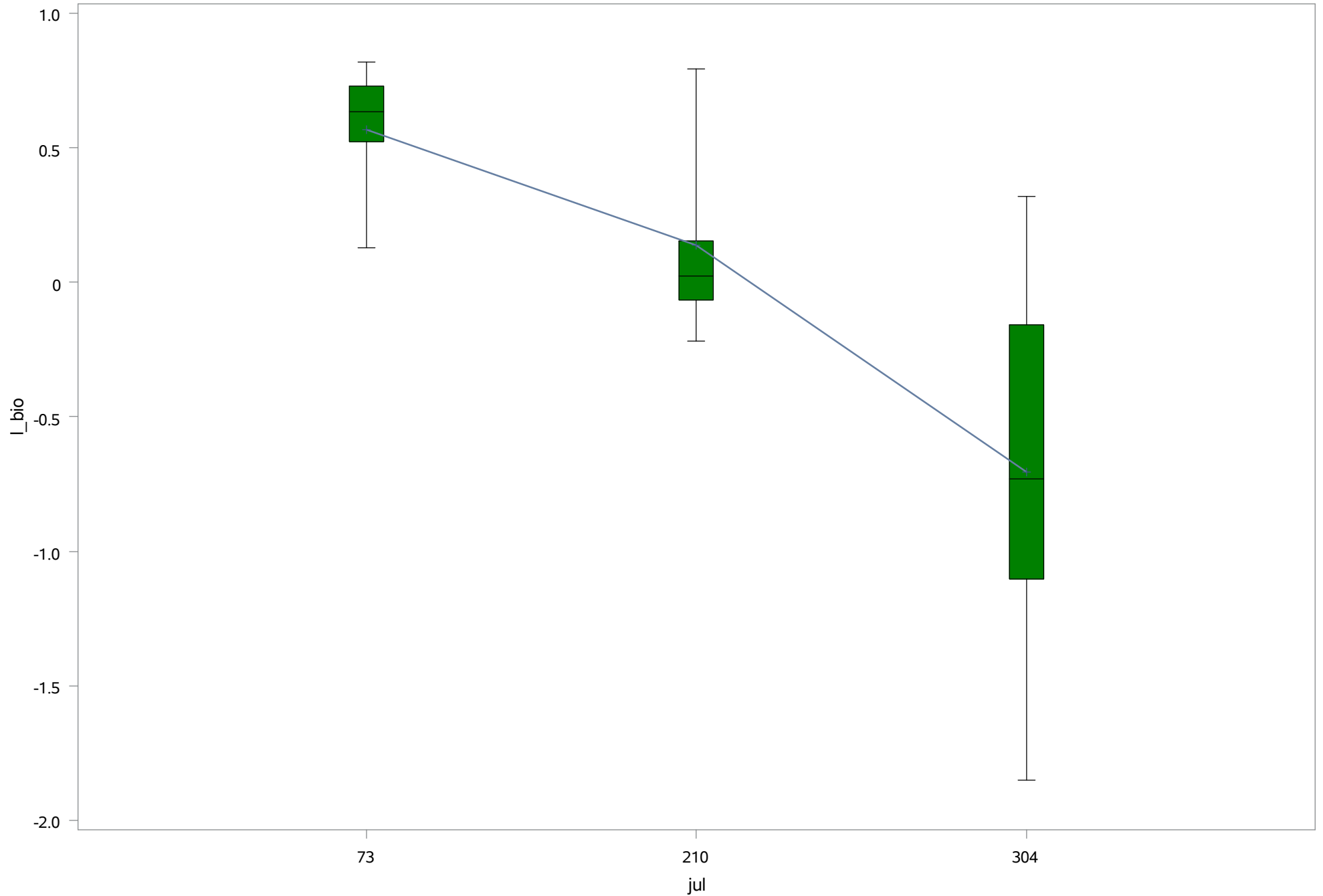
2017 Macroinvertebrate Data

Log Trends over Sampling Date

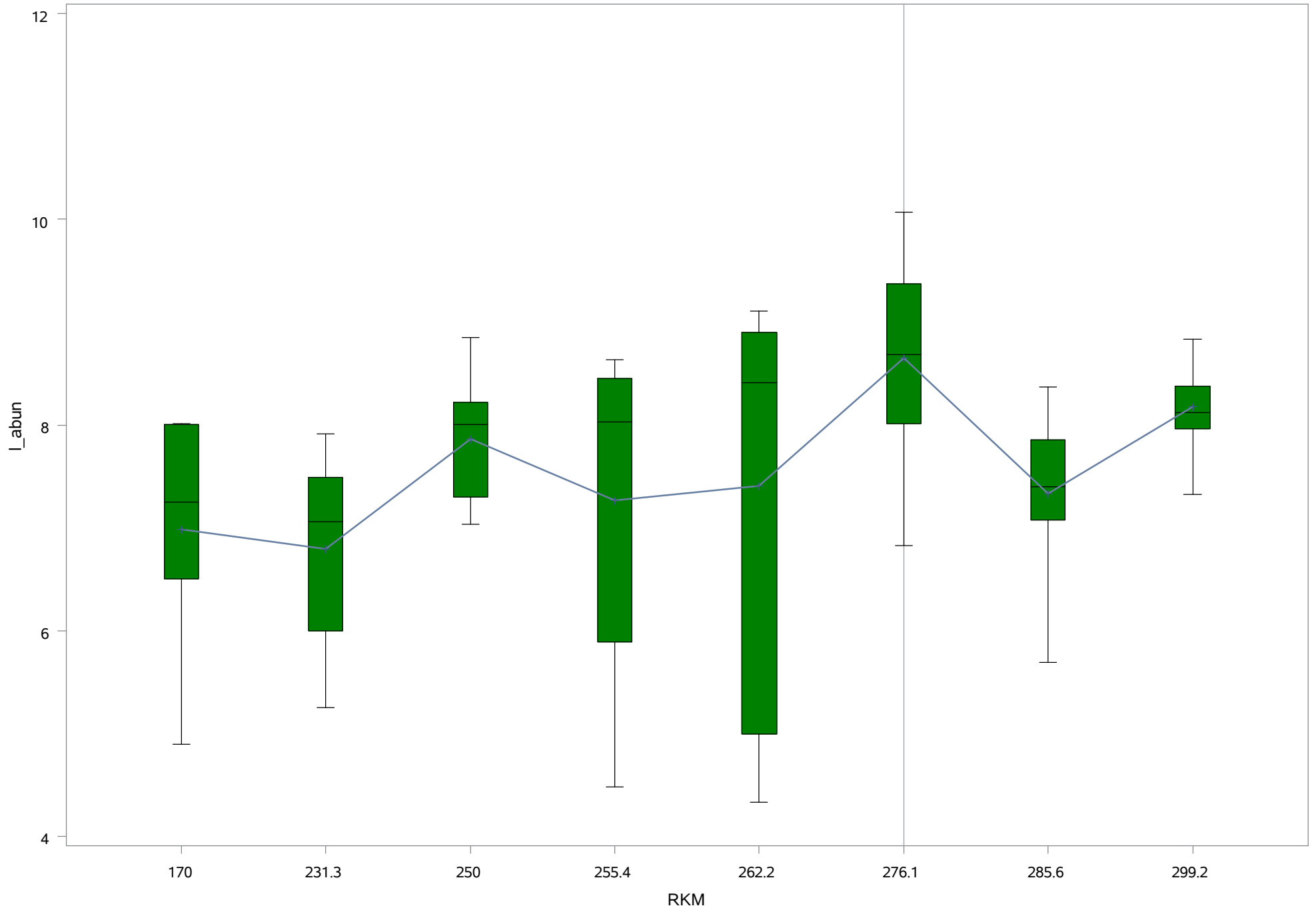
RKM=299.2 Site=KR10.5



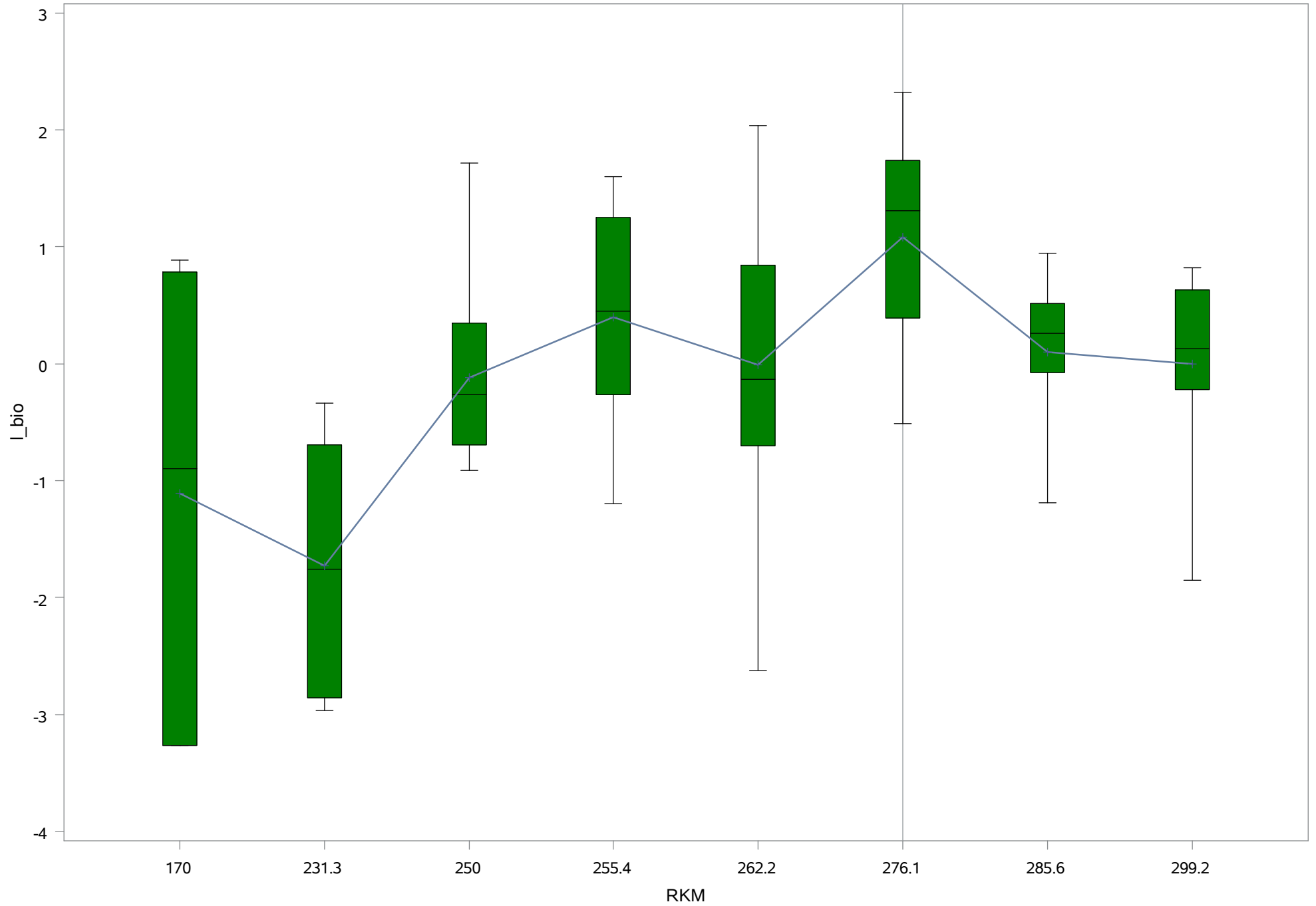
2017 Macroinvertebrate Data Log Trends over Sampling Date RKM=299.2 Site=KR10.5



2017 Macroinvertebrate Data Log Trends over RKM



2017 Macroinvertebrate Data Log Trends over RKM



2017 Macroinvertebrate Data Estimated Sample Sizes

confidence=0.9

Site	samplesize_abun	samplesize_bio
KR2	1	5
KR4	1	1
KR6	1	29
KR7	1	2
KR9	1	11232
KR9.1	1	1
KR10	1	51
KR10.5	1	4339304

confidence=0.95

Site	samplesize_abun	samplesize_bio
KR2	1	7
KR4	1	1
KR6	1	42
KR7	1	3
KR9	1	15947
KR9.1	1	1
KR10	1	72
KR10.5	1	6161149

confidence=0.99

Site	samplesize_abun	samplesize_bio
KR2	3	12
KR4	2	1
KR6	1	72
KR7	1	6
KR9	2	27544
KR9.1	1	1
KR10	1	125
KR10.5	1	10641423

Biomass Sample Sizes for 2003-2017

Obs	site	bio_03	bio_04	bio_05	bio_06	bio_07	bio_08	bio_09	bio_10	bio_11	bio_12	bio_13	bio_14	bio_15	bio_16	bio_17
1	KR1	1	1	-	19	1	1	1	1	3	3	1	1	-	-	-
2	KR2	1	1	-	2	2	1	1	4	5	1	1	1	3	5	7
3	KR3	1	1	1	2	3	4	1	-	-	-	-	-	-	-	-
4	KR4	1	1	1	3	1	1	1	1	1	>100	1	1	1	1	1
5	KR6	7	2	1	11	1	16	46	6	1	>100	>100	8	100	86	42
6	KR7	6	19	1	1	1	1	1	-	1	1	-	-	1	1	3
7	KR9	1	1	1	9	1	1	1	8	1	3	2	1	1	1	>100
8	KR9.1	-	7	>100	1	1	7	1	1	1	1	1	1	1	1	1
9	KR9.2	-	-	-	-	5	8	1	1	4	15	-	-	-	-	-
10	KR10	3	4	1	>100	32	1	2	11	1	1	7	>100	>100	19	72
11	KR10.5	-	-	-	-	-	-	-	-	-	-	-	-	22	30	>100
12	KR11	7	1	1	2	>100	3	1	-	-	-	-	-	-	-	-
13	KR12	1	1	2	3	>100	1	1	-	-	-	-	-	-	-	-
14	KR13	13	1	1	1	2	8	1	2	1	1	86	13	-	-	-
15	KR14	3	9	7	2	13	45	1	1	2	3	1	-	-	-	-

Abundance Sample Sizes for 2003-2017

Obs	site	abun_03	abun_04	abun_05	abun_06	abun_07	abun_08	abun_09	abun_10	abun_11	abun_12	abun_13	abun_14	abun_15	abun_16	abun_17
1	KR1	1	1	-	1	1	1	3	2	2	1	1	1	-	-	-
2	KR2	1	1	-	1	2	1	1	2	6	1	1	1	1	1	1
3	KR3	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-
4	KR4	1	1	3	2	2	3	1	1	4	1	1	1	1	1	1
5	KR6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	KR7	1	1	1	1	1	1	1	-	1	1	-	-	1	1	1
7	KR9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	KR9.1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	KR9.2	-	-	-	-	14	1	1	1	1	1	-	-	-	-	-
10	KR10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	KR10.5	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
12	KR11	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-
13	KR12	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-
14	KR13	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-
15	KR14	1	1	1	1	1	1	1	2	1	1	1	-	-	-	-

