Sculpin Metals Data

Appendix I

Slimy Sculpin Metals Data for Red Devil Creek Used In Baseline Risk Assessment

This appendix includes a summary of the slimy sculpin metals data for Red Devil Creek. The fish were collected by BLM in 2010 and 2011. Data tables, box-plots, and Q-Q plots are included herein.

Table I-1 Sculpin Metals Data from Red Devil Creek Used in Baseline Ecological Risk Assessment.

Sample			Sb (mg/kg wet)		As (mg/kg wet)		Ba (mg/kg wet)		Be (mg/kg wet)				Cr (mg/kg wet)		Mn (mg/kg wet)		Hg (mg/kg wet)		Se (mg/kg wet)		V (mg/kg wet)		Zn (mg/kg wet)	
Month-Year	LabID	Client Samp ID	Result	Q	Result	Q	Result	Q	LabID	Cl	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
June 2010	253	RD 4/Slimey Sculpin	1.513		2.352		3.341		253	D	0.025	U	0.039		9.423		0.09		1.127		0.132		20.657	J-
June 2010	255	RD 7/Slimey Sculpin	2.173		3.029		2.688		255	D	0.025	U	0.046		11.292		0.09		0.986		0.095		19.812	J-
June 2010	256	RD 8/Slimey Sculpin	0.399		1.132	J	2.405		256	D	0.025	U	0.028		8.955		0.05		1.291		0.122		18.718	J-
June 2010	257	RD 9/Slimey Sculpin	0.615		1.439		2.82		257	D	0.025	U	0.035		13.854		0.06		0.834		0.206		26.846	J-
June 2010	258	RD 10/Slimey Sculpin	0.479		1.098	J	2.008		258	D	0.025	U	0.057		9.76		0.07		0.851		0.102		17.129	J-
June 2010	259	RD 11/Slimey Sculpin	1.374		2.554		2.602		259	D	0.025	U	0.062		9.502		0.13		1.43		0.123		21.938	J-
June 2010	260	RD 12/Slimey Sculpin	4.044		3.387		3.066		260	D	0.025	U	0.069		8.562		0.63		1.199		0.161		23.009	J-
June 2010	261	RD 13/Slimey Sculpin	1.496		4.493		4.347		261	D	0.025	U	2.431		15.994		0.23		1.052		0.359		30.716	J-
June 2010	262	RD 15/Slimey Sculpin	1.151		2.63		3.067		262	D	0.025	U	0.053		8.442		0.09		0.912		0.136		22.158	J-
Aug 2010	530	2-RD-1-SC	18.692		9.645		3.794		530	R	0.025	U	0.074		11.099		2.2593		2.975		0.16		24.836	
Aug 2010	531	2-RD-2-SC	12.303		13.222		5.402		531	R	0.025	U	0.062		21.275		1.8515		1.836		0.214		29.581	
Aug 2010	532	2-RD-3-SC	14.224		8.231		3.609		532	R	0.025	U	0.053		9.044		1.5268		1.596		0.152		20.634	
Aug 2010	533	2-RD-4-SC	22.281		11.785		3.103		533	R	0.025	U	0.104		6.653		3.7009		2.025		0.195		22.897	
Aug 2010	534	2-RD-5-SC	23.668		20.099		4.097		534	R	0.025	U	0.13		10.345		3.1578		2.414		0.243		22.666	
Aug 2010	535	2-RD-6-SC	10.482		14.878		2.829		535	R	0.025	U	0.105		9.831		1.35536		2.223		0.22		28.516	
Aug 2010	536	2-RD-7-SC	17.199		18.099		3.884		536	R	0.025	U	0.097		9.836		1.74736		2.252		0.266		27.254	
Aug 2010	537	2-RD-8-SC	38.1		24.06		5.15		537	R	0.025	U	0.188		11.712		3.6834		2.234		0.317		26.68	
Aug 2010	538	2-RD-9-SC	10.145		9.314		3.156		538	R	0.025	U	0.155		10.888		0.68364		2.423		0.182		27.235	
Aug 2010	539	2-RD-10-SC	18.29		14.624		4.471		539	R	0.025	U	0.106		17.558		1.9511		1.825		0.276		35.373	
Aug 2010	540	2-RD-11-SC	6.512		6.864		3.308		540	2-R	0.025	U	0.038	J	11.192		0.8909		1.852		0.21		29.254	
Aug 2010	541	2-RD-12-SC	17.486		12.339		3.514		541	2-R	0.025	U	0.071		10.351		2.80423		1.533		0.211		26.177	
June 2011	1110258-01	RDSS1-1	na		5.81		4.56		1110258-01	RD	0.057	U	0.05	U	22.40		0.273		0.68		0.038	U	32	
June 2011	1110258-02	RDSS1-2	na		4.51		1.93		1110258-02	RD	0.057	U	0.05	U	7.46		0.269		0.92		0.038	U	26.1	
June 2011	1110258-03	RDSS1-3	na		1.62		4.83		1110258-03	RD	0.066	U	0.06	U	19.20		0.161		0.98		0.044	U	33.5	
June 2011	1110258-04	RDSS1-4	na		6.07		1.60		1110258-04	RD	0.066	U	0.06	U	9.17		0.123		0.78		0.044	U	26.3	
June 2011	1110258-05	RDSS1-5	na		9.11		3.21		1110258-05	RD	0.063	U	0.05	U	22.70		0.142		0.64		0.041	U	20.3	
June 2011	1110258-06	RDSS1-6	na		7.78		2.29		1110258-06	RD	0.058	U	0.05	U	16.40		0.159		0.9		0.038	U	26.1	
June 2011	1110258-07	RDSS1-7	na		2.49		3.94		1110258-07	RD	0.059	U	0.05	U	14.20		0.102		0.92		0.039	U	24.4	
June 2011	1110258-08	RDSS1-8	na		1.98		1.79		1110258-08	RD	0.06	U	0.05	U	14.00		0.0858		0.96		0.040	U	21.3	
June 2011	1110258-09	RDSS1-9	na		4.95		3.49		1110258-09	RD	0.065	U	0.06	U	8.27		0.279		0.76		0.043	U	24.5	
June 2011	1110258-10	RDSS1-10	na		2.9		5.14		1110258-10	RD	0.06	U	0.05	U	40.70		0.135		1.05		0.040	U	30.3	
June 2011	1110258-11	RDSS1-11	na		3.13		3.90		1110258-11	RD	0.066	U	0.06	U	14.00		0.131		0.59		0.043	U	26.7	
June 2011	1110258-12	RDSS1-12	na		7.89		3.49		1110258-12	RD	0.064	U	0.05	U	17.10		0.158		0.61		0.042	U	24.1	
Sept 2011	1110264-01	RDSS2-1	na		12.2		4.63		1110264-01	RD	0.065	U	0.06	U	12.50		0.219		1.18		0.043	U	21.9	
Sept 2011	1110264-02	RDSS2-2	na		6.94		3.74		1110264-02	RD	0.059	U	0.05	U	10.20		0.0998		0.58		0.039	U	22	
Sept 2011	1110264-03	RDSS2-3	na		3.66		0.99		1110264-03	RD	0.061	U	0.05	U	3.49		0.114		0.94		0.040	U	20.6	
Sept 2011	1110264-04	RDSS2-4	na		45.9		6.96		1110264-04	RD	0.061	U	0.05	U	23.00		0.504		1.19		0.33		26.3	
Sept 2011	1110264-05	RDSS2-5	na		11.1		1.36		1110264-05	RD	0.059	U	0.05	U	14.20		0.336		1.34		0.039	U	26.1	
Sept 2011	1110264-06	RDSS2-6	na		15.2		4.84		1110264-06	RD	0.061	U	0.05	U	8.81		0.239		1.28		0.040	U	15.9	
Sept 2011	1110264-07	RDSS2-7	na		17.7		1.66		1110264-07	RD	0.067	U	0.06	U	9.67		0.153		0.61		0.044	U	16.4	
Sept 2011	1110264-08	RDSS2-8	na		40.5		2.59		1110264-08	RD	0.065	U	0.06	U	23.50		0.427		1.01		0.043	U	21.1	
Sept 2011	1110264-09	RDSS2-9	na		25		2.97		1110264-09	RD	0.065	U	0.05	U	30.30		0.181		1.34		0.43		26.9	
Sept 2011	1110264-10	RDSS2-10	na		22.3		1.63		1110264-10	RD	0.058	U	0.05	U	19.40		0.341		1.35		0.31		23.6	
Sept 2011	1110264-11	RDSS2-11	na		12.3		1.95		1110264-11	RD	0.063	U	0.05	U	11.60		0.223		1.48		0.042	U	24.9	
Sept 2011	1110264-12	RDSS2-12	na		9.27		2.11		1110264-12	RD	0.063	U	0.05	U	9.11		0.999		0.67		0.042	U	19.7	

Key:
J = estimated value
na = not analayzed
Q = qualifier
U = not detected

Table I-2 Sculpin Methylmercury Data from Red Devil Creek Used in the Red Devil Mine Site Baseline Ecological Risk Assessment.

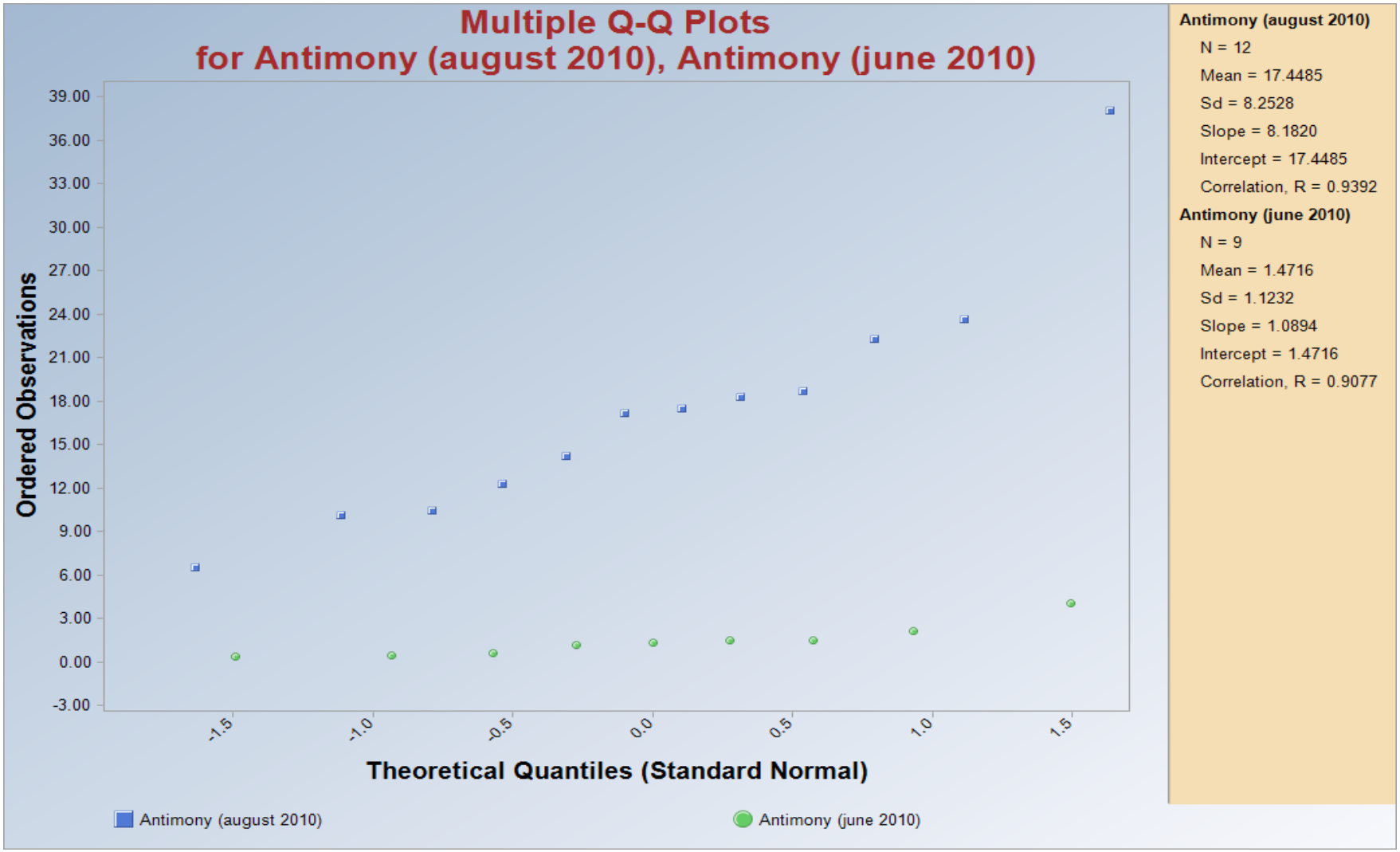
Sample			Methyl Hg		Total Hg		Fraction
			(mg/kg wet)		(mg/kg wet)		
Month-Year	LabID	Client Samp ID	Result	Q	Result	Q	Methyl Hg
June 2010*	1007189-40	RD 5, 6, 14	0.312		na		na
Aug 2010	1009071-04	2-RD-9-SC	0.16		0.684		0.23
June 2011	1110258-01	RDSS1-1	0.114		0.273		0.42
June 2011	1110258-02	RDSS1-2	0.164		0.269		0.61
June 2011	1110258-03	RDSS1-3	0.0501		0.161		0.31
Sept 2011	1110264-01	RDSS2-1	0.135		0.219		0.62
Sept 2011	1110264-02	RDSS2-2	0.0827		0.0998		0.83
							0.50 Average

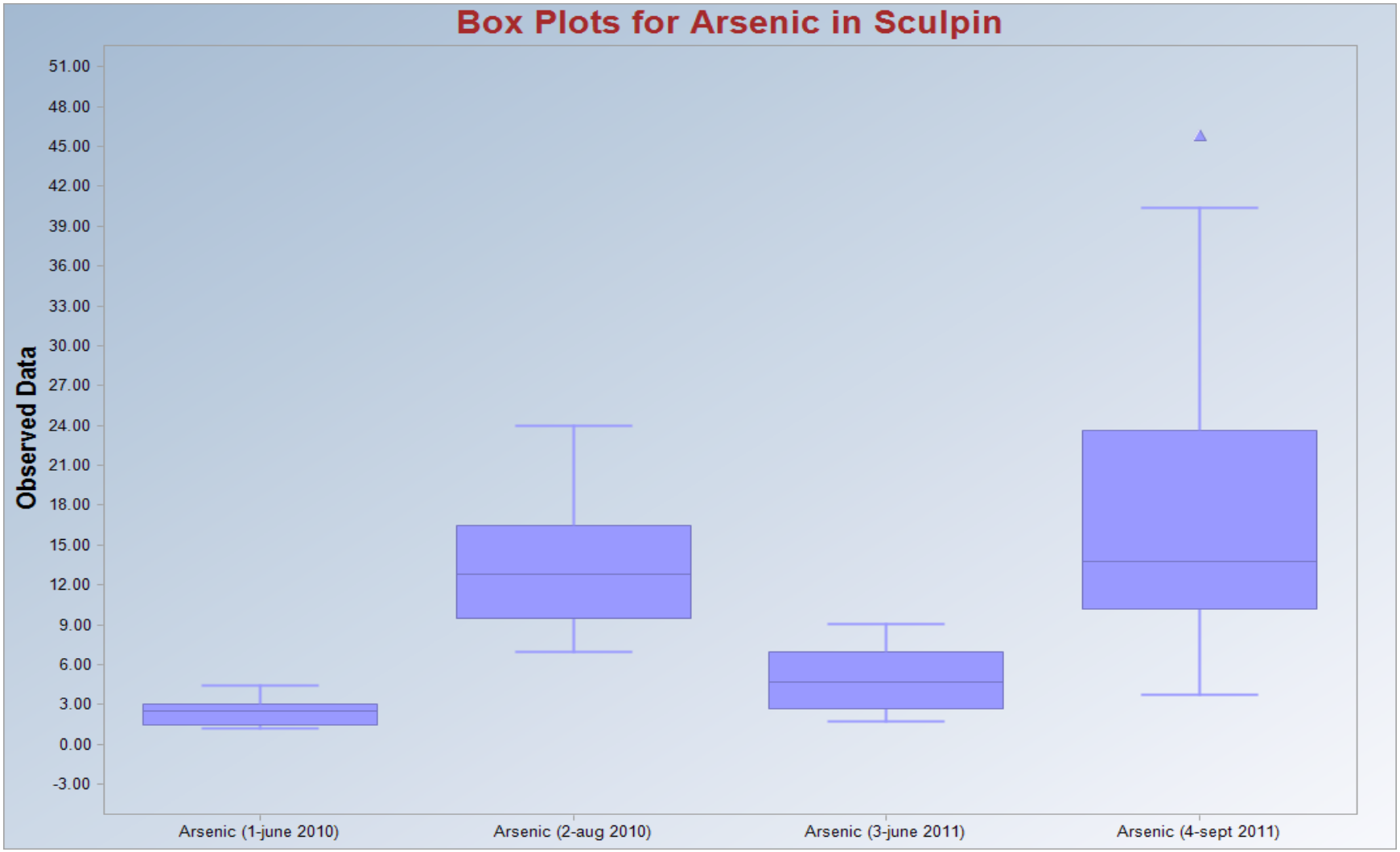
* Composite sample of 3 sculpin

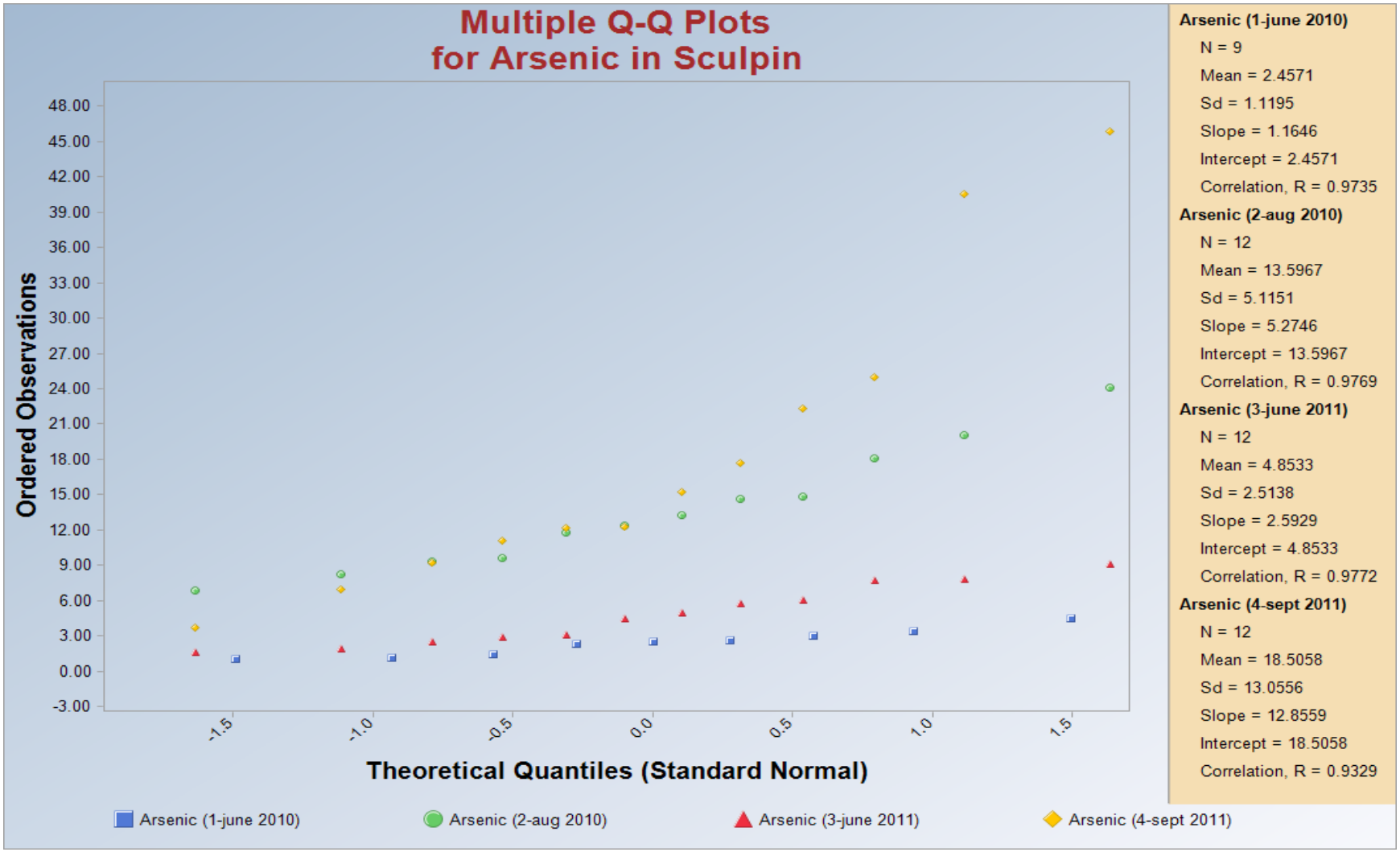
Key:
Hg = mercury
mg/kg wet = milligrams per kilogram wet material
na = not available

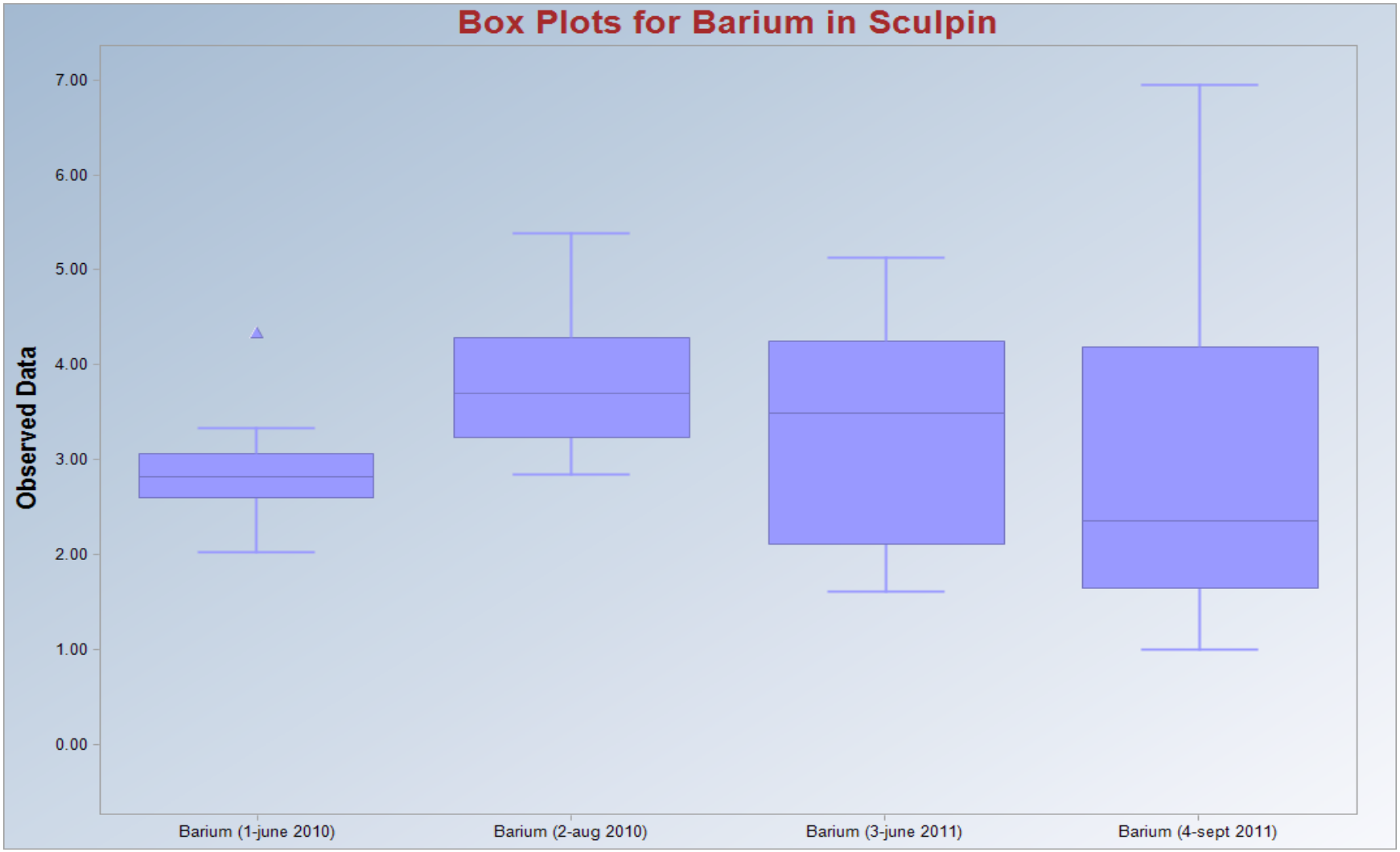
Table I-3 Percentage of Inorganic Arsenic in Scuplin from Red Devil Creek

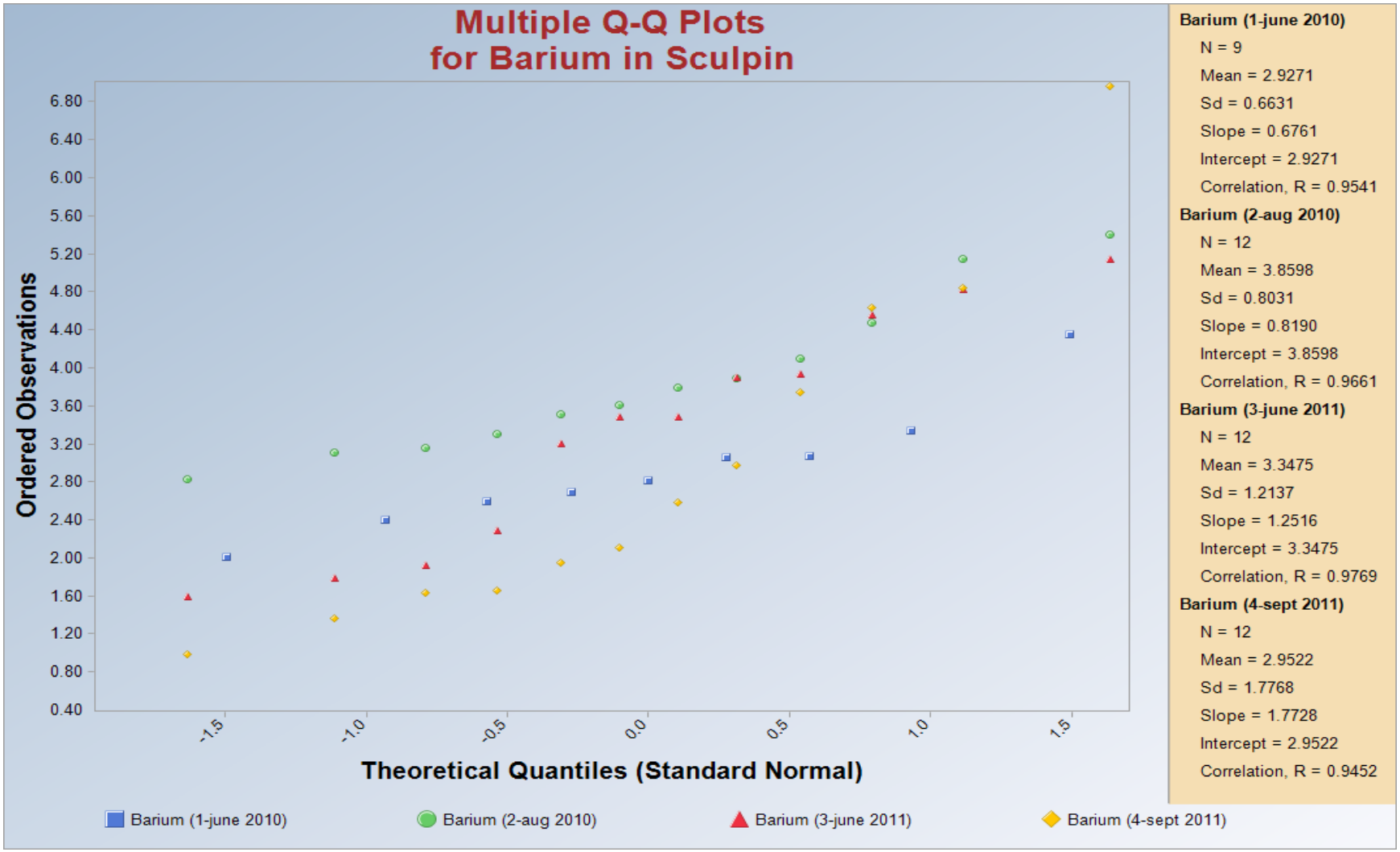
Sample	Total Arsenic	Inorganic Arsenic	% Inorganic Arsenic
RDSS2-1	12.2	14	115%
RDSS2-2	6.94	7.48	108%
RDSS2-3	3.66	2.07	57%
RDSS2-4	45.9	37.9	83%
RDSS2-5	11.1	2.66	24%
RDSS2-6	15.2	13.9	91%
RDSS2-7	17.7	16.3	92%
RDSS2-8	40.5	29.7	73%
RDSS2-9	25	10.7	43%
RDSS2-10	22.3	17.4	78%
RDSS2-11	12.3	7.47	61%
RDSS2-12	9.27	3.18	34%
		Avg:	76%

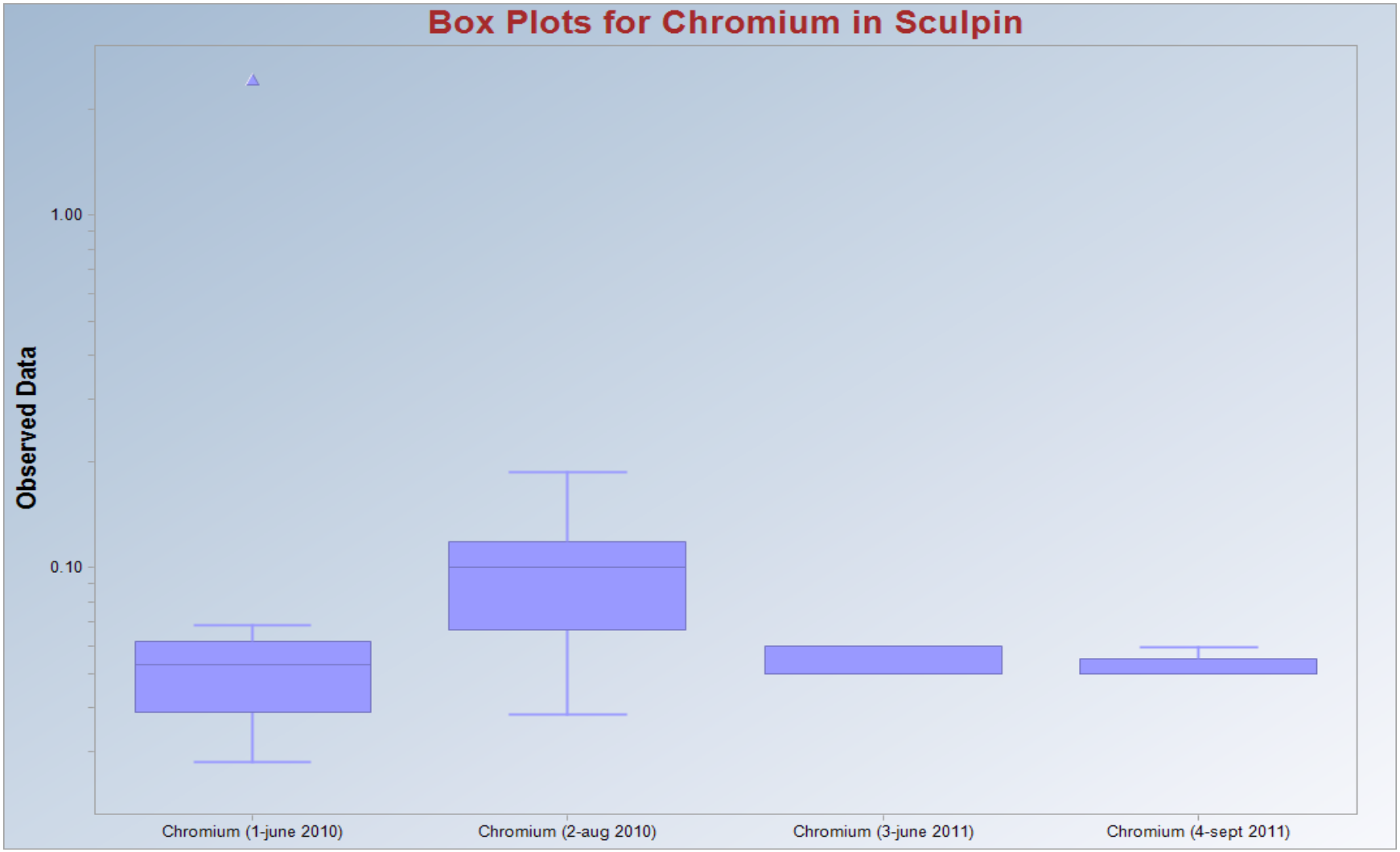

Multiple Q-Q Plots
for Antimony (august 2010), Antimony (june 2010)
Ordered Observations
39.00
36.00
33.00
30.00
27.00
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
-3.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Antimony (august 2010)
Antimony (june 2010)
Antimony (august 2010)
N = 12
Mean = 17.4485
Sd = 8.2528
Slope = 8.1820
Intercept = 17.4485
Correlation, R = 0.9392
Antimony (june 2010)
N = 9
Mean = 1.4716
Sd = 1.1232
Slope = 1.0894
Intercept = 1.4716
Correlation, R = 0.9077

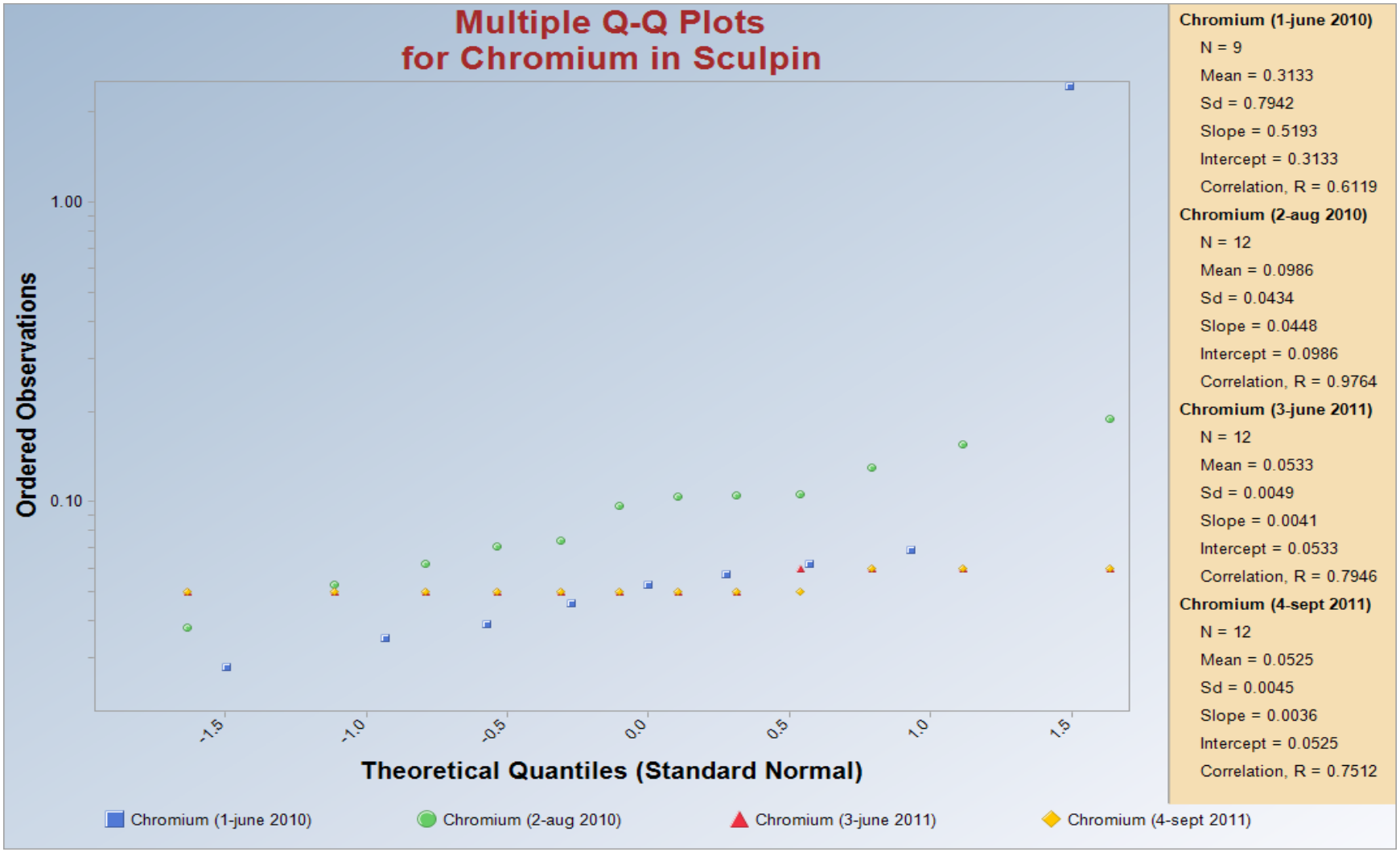

Box Plots for Arsenic in Sculpin
Observed Data
51.00
48.00
45.00
42.00
39.00
36.00
33.00
30.00
27.00
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
-3.00
Arsenic (1-june 2010)
Arsenic (2-aug 2010)
Arsenic (3-june 2011)
Arsenic (4-sept 2011)

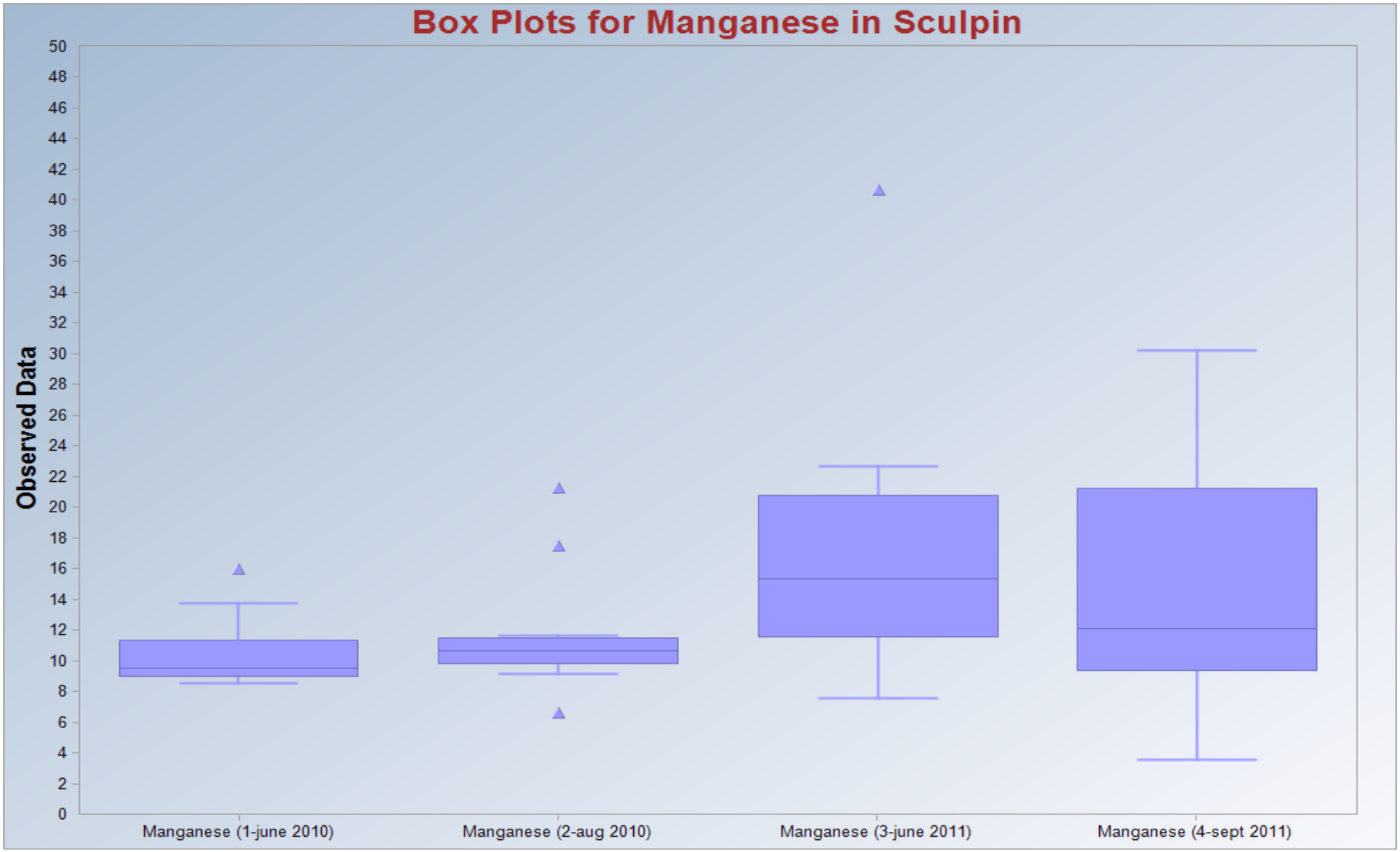

Multiple Q-Q Plots
for Arsenic in Sculpin
Ordered Observations
48.00
45.00
42.00
39.00
36.00
33.00
30.00
27.00
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
-3.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Arsenic (1-june 2010)
Arsenic (2-aug 2010)
Arsenic (3-june 2011)
Arsenic (4-sept 2011)
Arsenic (1-june 2010)
N = 9
Mean = 2.4571
Sd = 1.1195
Slope = 1.1646
Intercept = 2.4571
Correlation, R = 0.9735
Arsenic (2-aug 2010)
N = 12
Mean = 13.5967
Sd = 5.1151
Slope = 5.2746
Intercept = 13.5967
Correlation, R = 0.9769
Arsenic (3-june 2011)
N = 12
Mean = 4.8533
Sd = 2.5138
Slope = 2.5929
Intercept = 4.8533
Correlation, R = 0.9772
Arsenic (4-sept 2011)
N = 12
Mean = 18.5058
Sd = 13.0556
Slope = 12.8559
Intercept = 18.5058
Correlation, R = 0.9329

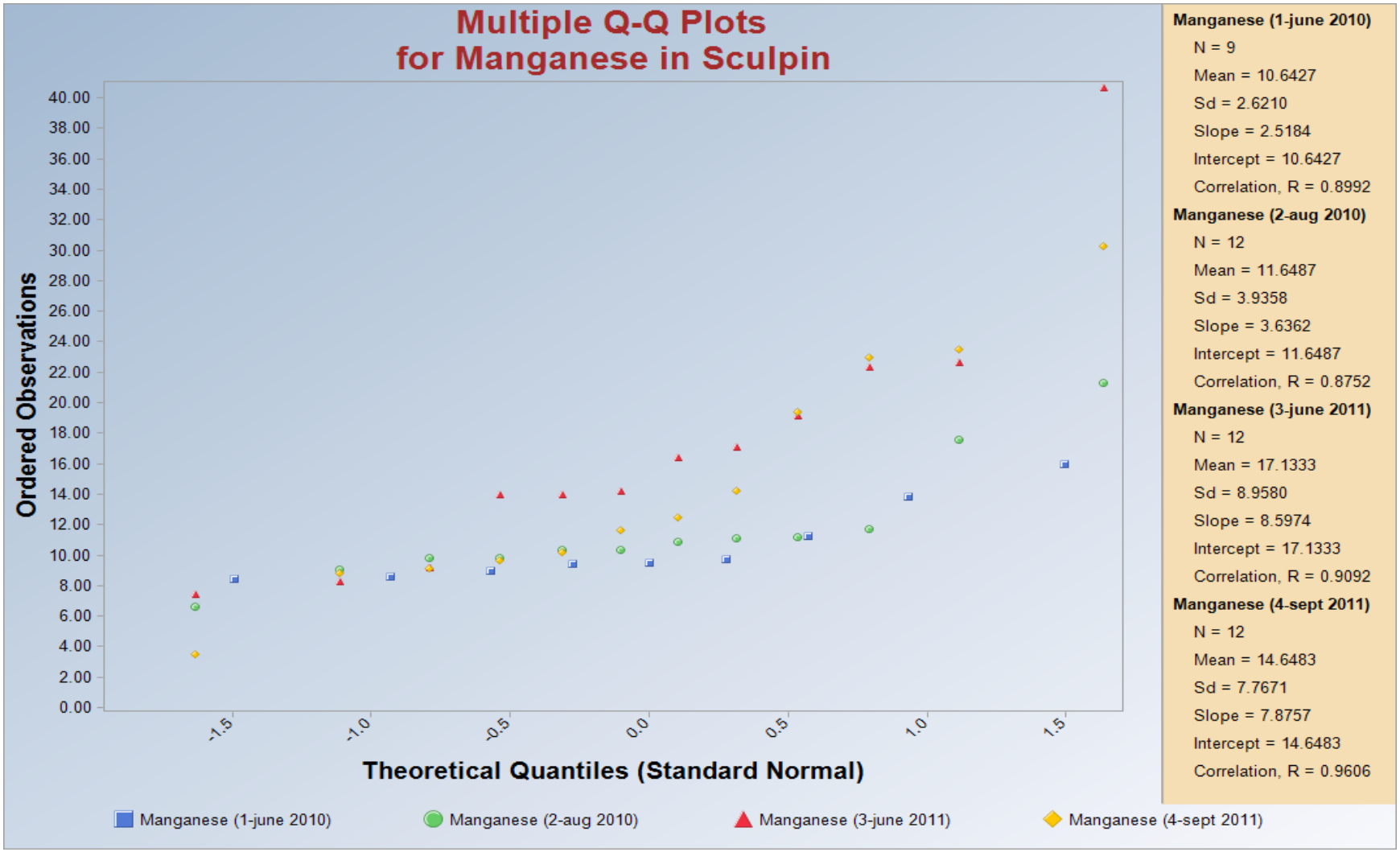

Box Plots for Barium in Sculpin
Observed Data
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Barium (1-june 2010)
Barium (2-aug 2010)
Barium (3-june 2011)
Barium (4-sept 2011)

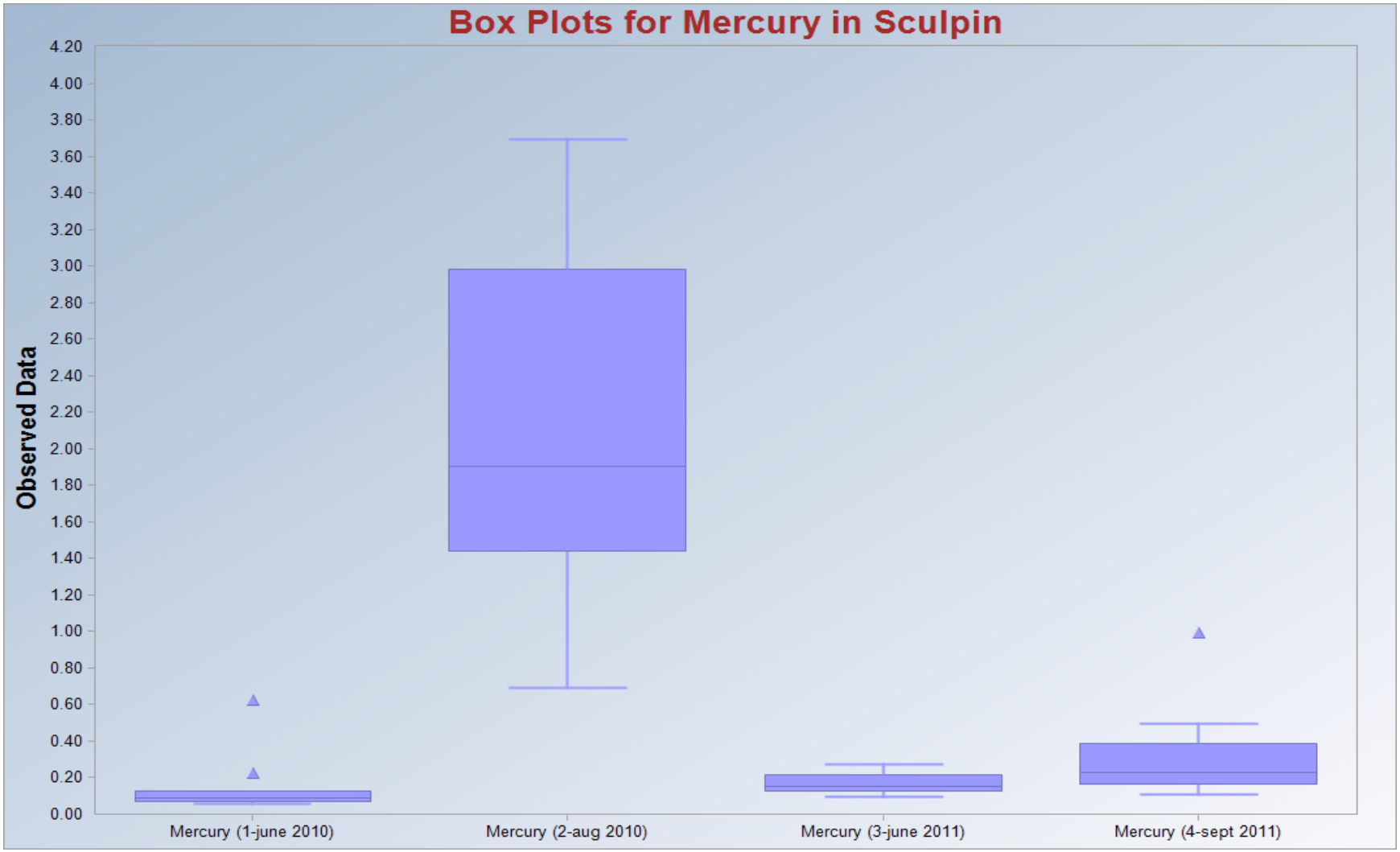

Multiple Q-Q Plots
for Barium in Sculpin
Ordered Observations
6.80
6.40
6.00
5.60
5.20
4.80
4.40
4.00
3.60
3.20
2.80
2.40
2.00
1.60
1.20
0.80
0.40
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Barium (1-june 2010)
Barium (2-aug 2010)
Barium (3-june 2011)
Barium (4-sept 2011)
Barium (1-june 2010)
N = 9
Mean = 2.9271
Sd = 0.6631
Slope = 0.6761
Intercept = 2.9271
Correlation, R = 0.9541
Barium (2-aug 2010)
N = 12
Mean = 3.8598
Sd = 0.8031
Slope = 0.8190
Intercept = 3.8598
Correlation, R = 0.9661
Barium (3-june 2011)
N = 12
Mean = 3.3475
Sd = 1.2137
Slope = 1.2516
Intercept = 3.3475
Correlation, R = 0.9769
Barium (4-sept 2011)
N = 12
Mean = 2.9522
Sd = 1.7768
Slope = 1.7728
Intercept = 2.9522
Correlation, R = 0.9452

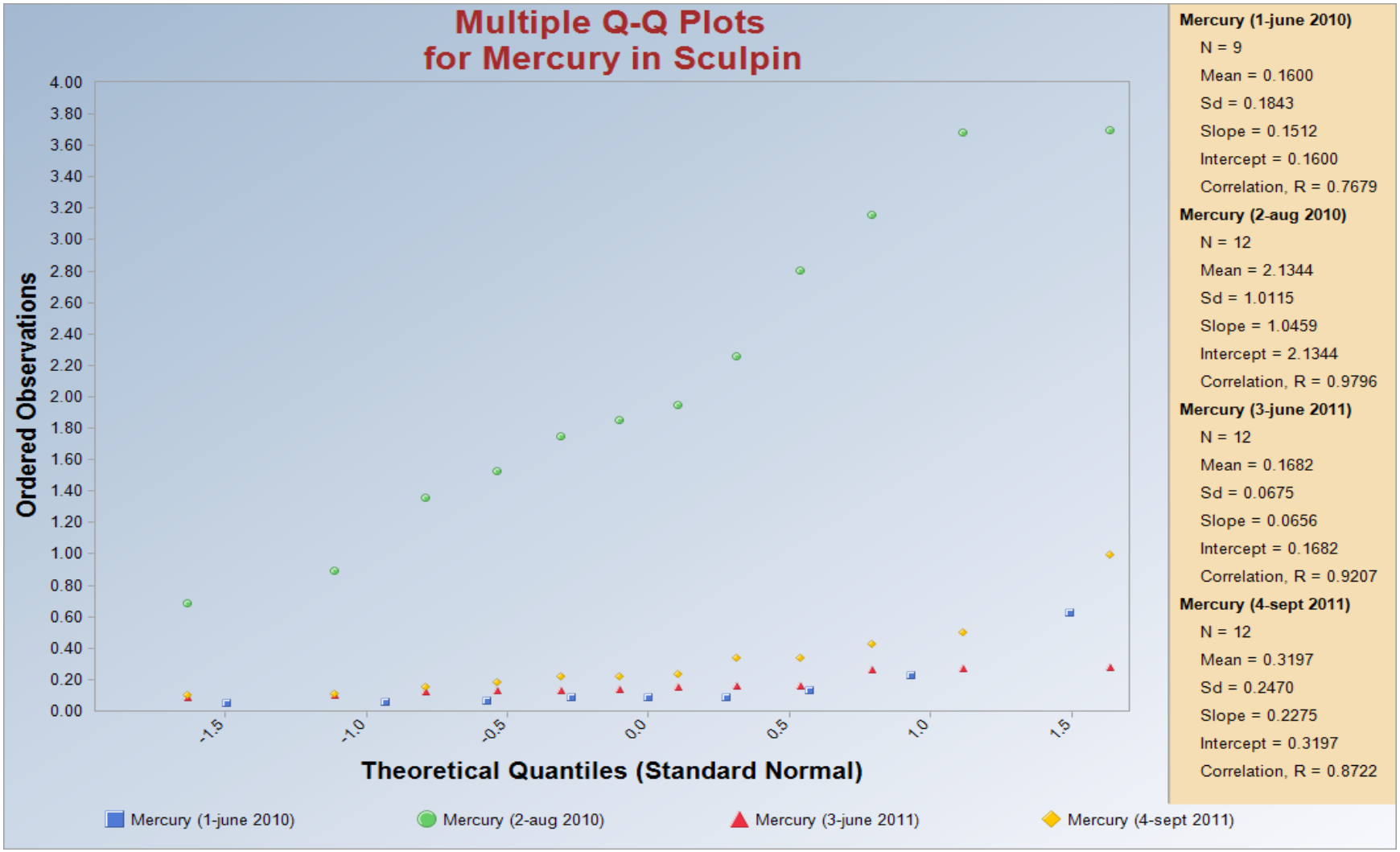

Box Plots for Chromium in Sculpin
Observed Data
1.00
0.10
Chromium (1-june 2010)
Chromium (2-aug 2010)
Chromium (3-june 2011)
Chromium (4-sept 2011)

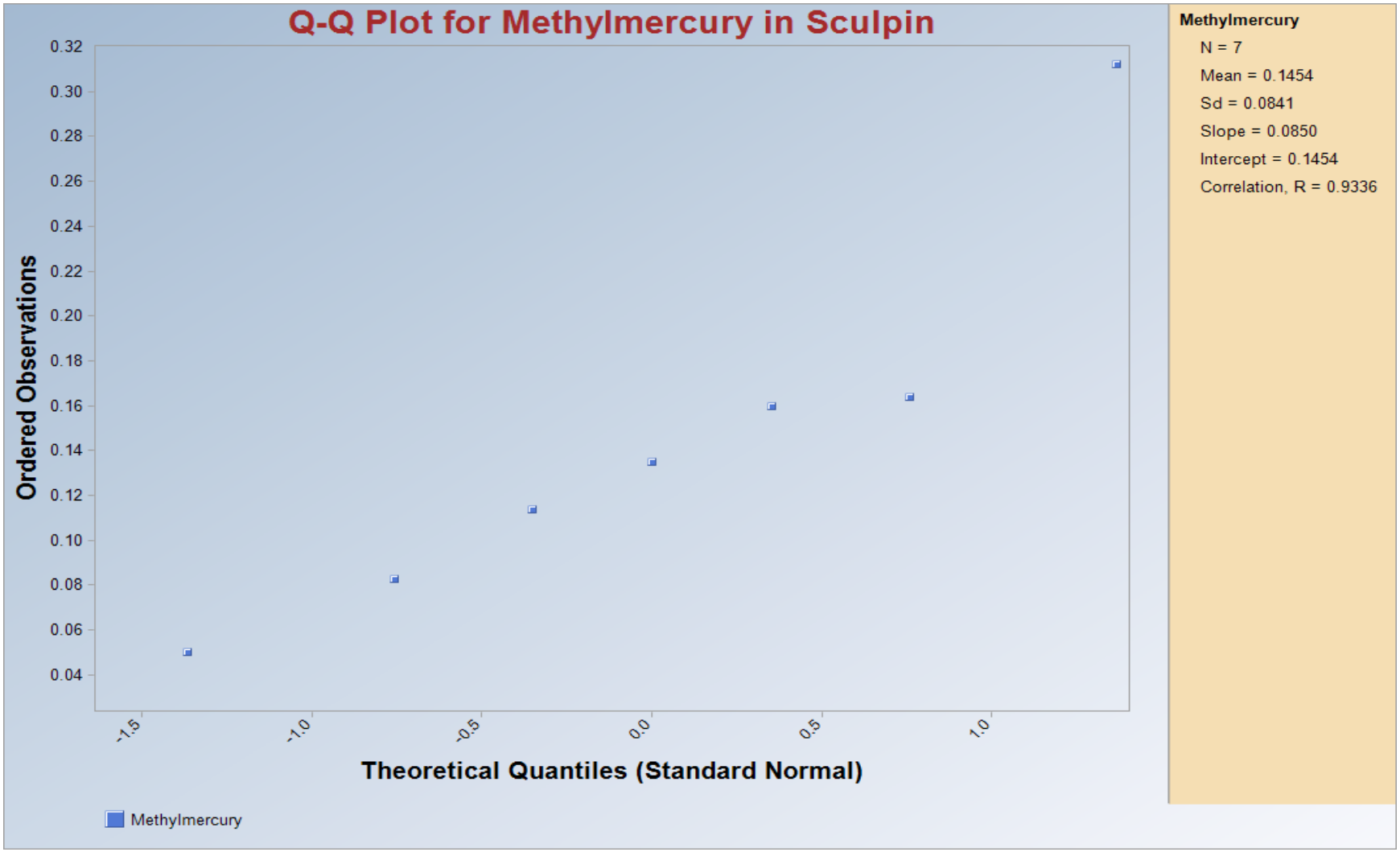

Multiple Q-Q Plots
for Chromium in Sculpin
Ordered Observations
1.00
0.10
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Chromium (1-june 2010)
Chromium (2-aug 2010)
Chromium (3-june 2011)
Chromium (4-sept 2011)
Chromium (1-june 2010)
N = 9
Mean = 0.3133
Sd = 0.7942
Slope = 0.5193
Intercept = 0.3133
Correlation, R = 0.6119
Chromium (2-aug 2010)
N = 12
Mean = 0.0986
Sd = 0.0434
Slope = 0.0448
Intercept = 0.0986
Correlation, R = 0.9764
Chromium (3-june 2011)
N = 12
Mean = 0.0533
Sd = 0.0049
Slope = 0.0041
Intercept = 0.0533
Correlation, R = 0.7946
Chromium (4-sept 2011)
N = 12
Mean = 0.0525
Sd = 0.0045
Slope = 0.0036
Intercept = 0.0525
Correlation, R = 0.7512

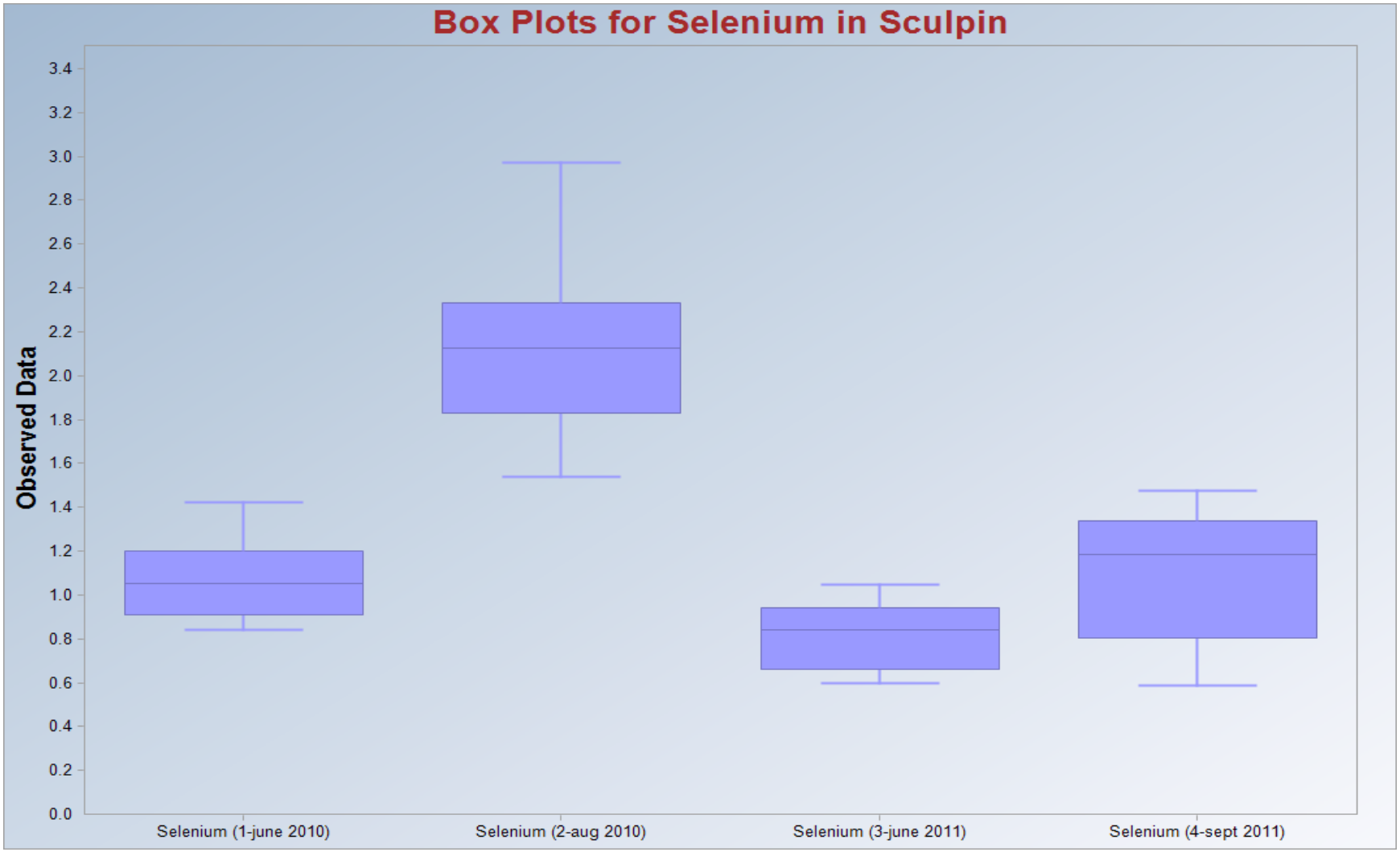

Box Plots for Manganese in Sculpin
Observed Data
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Manganese (1-june 2010)
Manganese (2-aug 2010)
Manganese (3-june 2011)
Manganese (4-sept 2011)

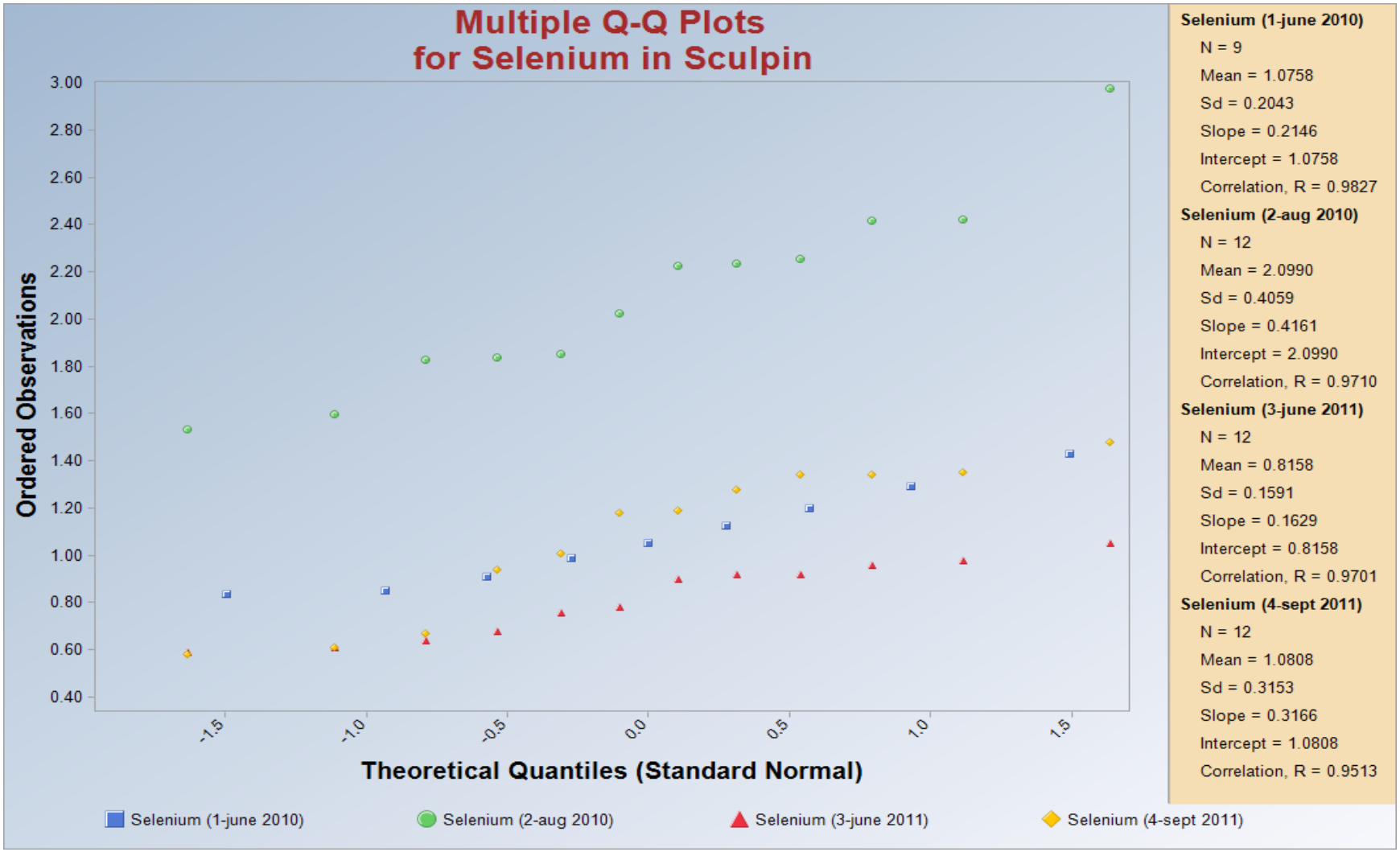

Multiple Q-Q Plots
for Manganese in Sculpin
Ordered Observations
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Manganese (1-june 2010)
Manganese (2-aug 2010)
Manganese (3-june 2011)
Manganese (4-sept 2011)
Manganese (1-june 2010)
N = 9
Mean = 10.6427
Sd = 2.6210
Slope = 2.5184
Intercept = 10.6427
Correlation, R = 0.8992
Manganese (2-aug 2010)
N = 12
Mean = 11.6487
Sd = 3.9358
Slope = 3.6362
Intercept = 11.6487
Correlation, R = 0.8752
Manganese (3-june 2011)
N = 12
Mean = 17.1333
Sd = 8.9580
Slope = 8.5974
Intercept = 17.1333
Correlation, R = 0.9092
Manganese (4-sept 2011)
N = 12
Mean = 14.6483
Sd = 7.7671
Slope = 7.8757
Intercept = 14.6483
Correlation, R = 0.9606

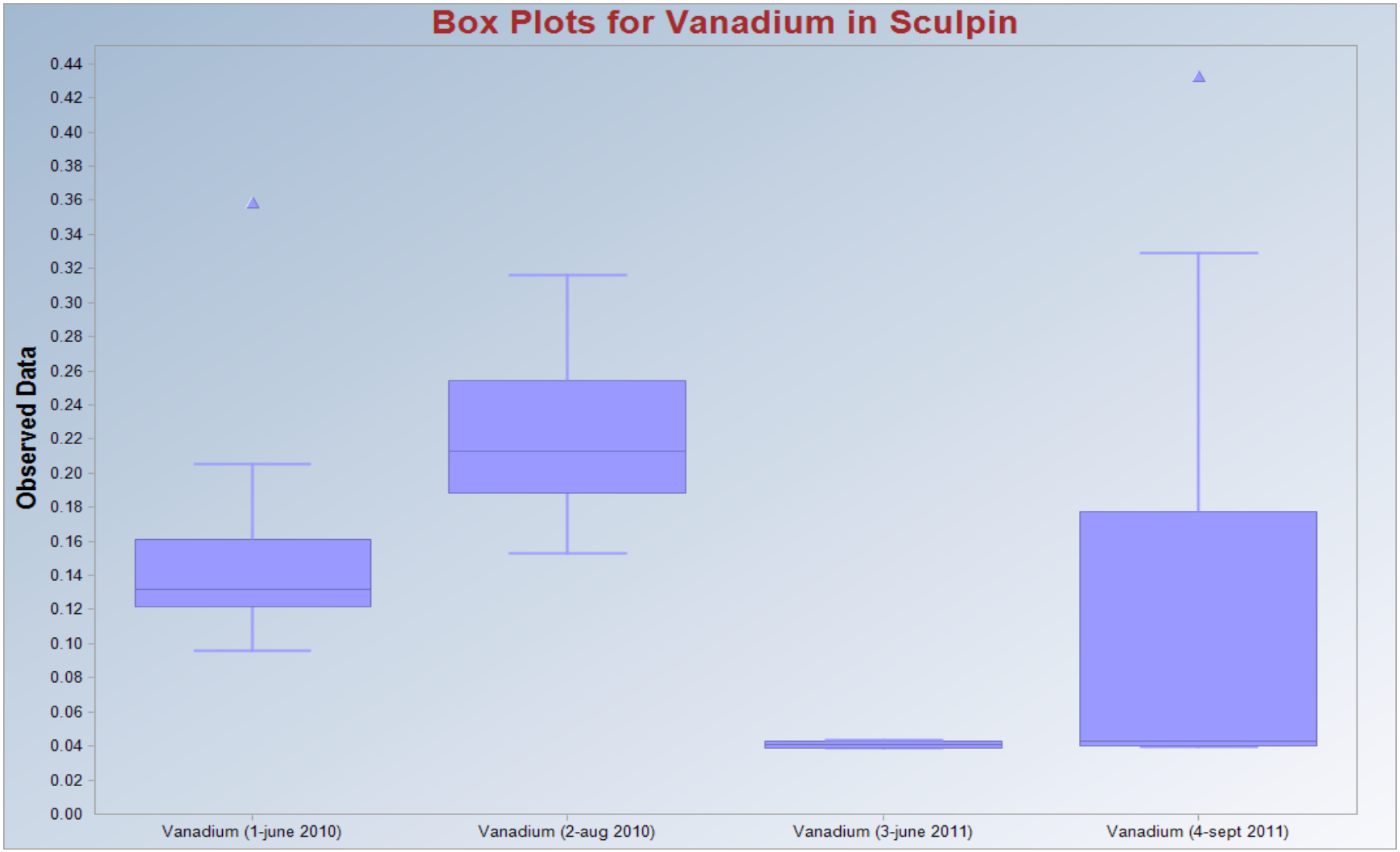

Box Plots for Mercury in Sculpin
Observed Data
4.20
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Mercury (1-june 2010)
Mercury (2-aug 2010)
Mercury (3-june 2011)
Mercury (4-sept 2011)

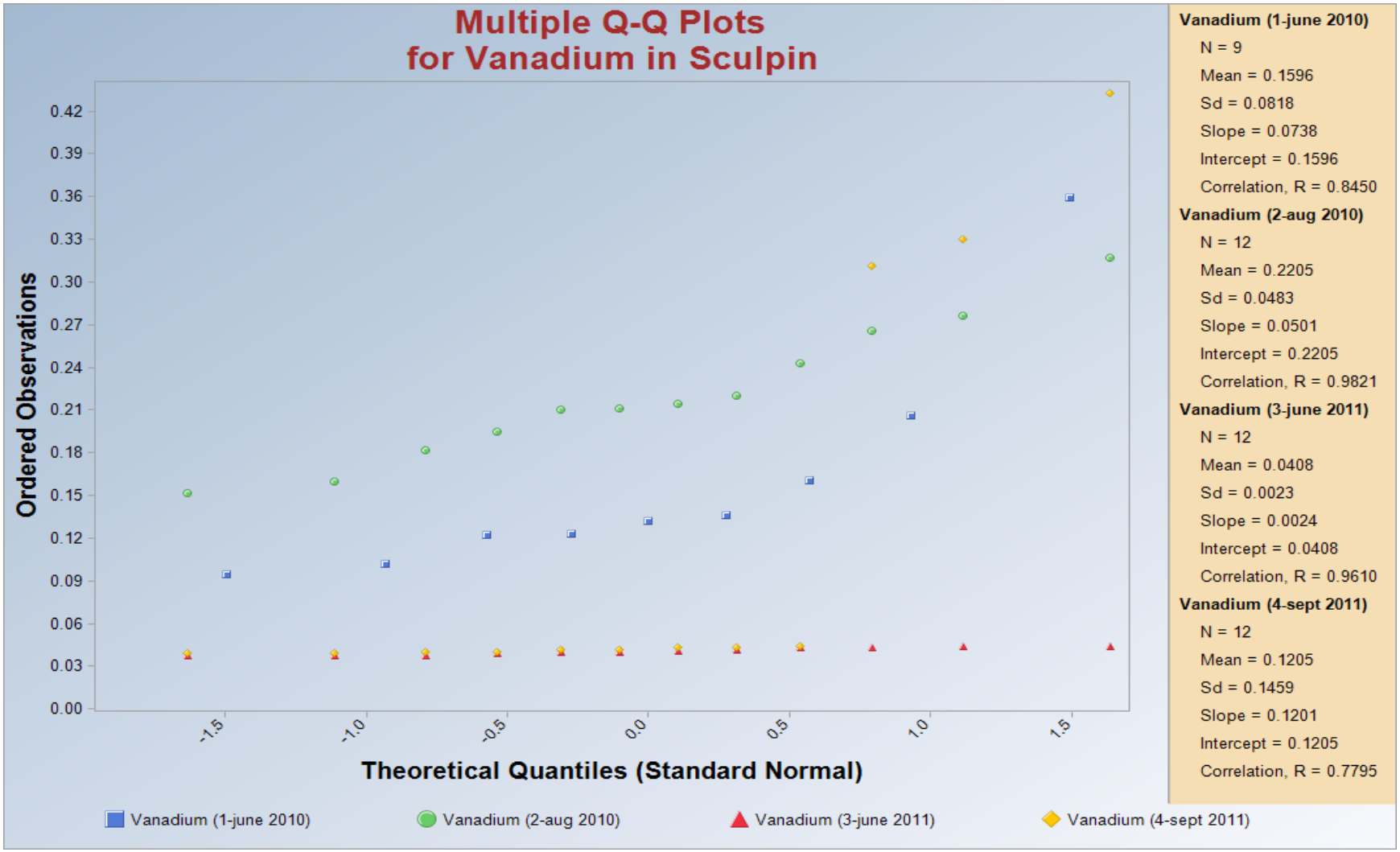

Multiple Q-Q Plots
for Mercury in Sculpin
Ordered Observations
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Mercury (1-june 2010)
Mercury (2-aug 2010)
Mercury (3-june 2011)
Mercury (4-sept 2011)
Mercury (1-june 2010)
N = 9
Mean = 0.1600
Sd = 0.1843
Slope = 0.1512
Intercept = 0.1600
Correlation, R = 0.7679
Mercury (2-aug 2010)
N = 12
Mean = 2.1344
Sd = 1.0115
Slope = 1.0459
Intercept = 2.1344
Correlation, R = 0.9796
Mercury (3-june 2011)
N = 12
Mean = 0.1682
Sd = 0.0675
Slope = 0.0656
Intercept = 0.1682
Correlation, R = 0.9207
Mercury (4-sept 2011)
N = 12
Mean = 0.3197
Sd = 0.2470
Slope = 0.2275
Intercept = 0.3197
Correlation, R = 0.8722

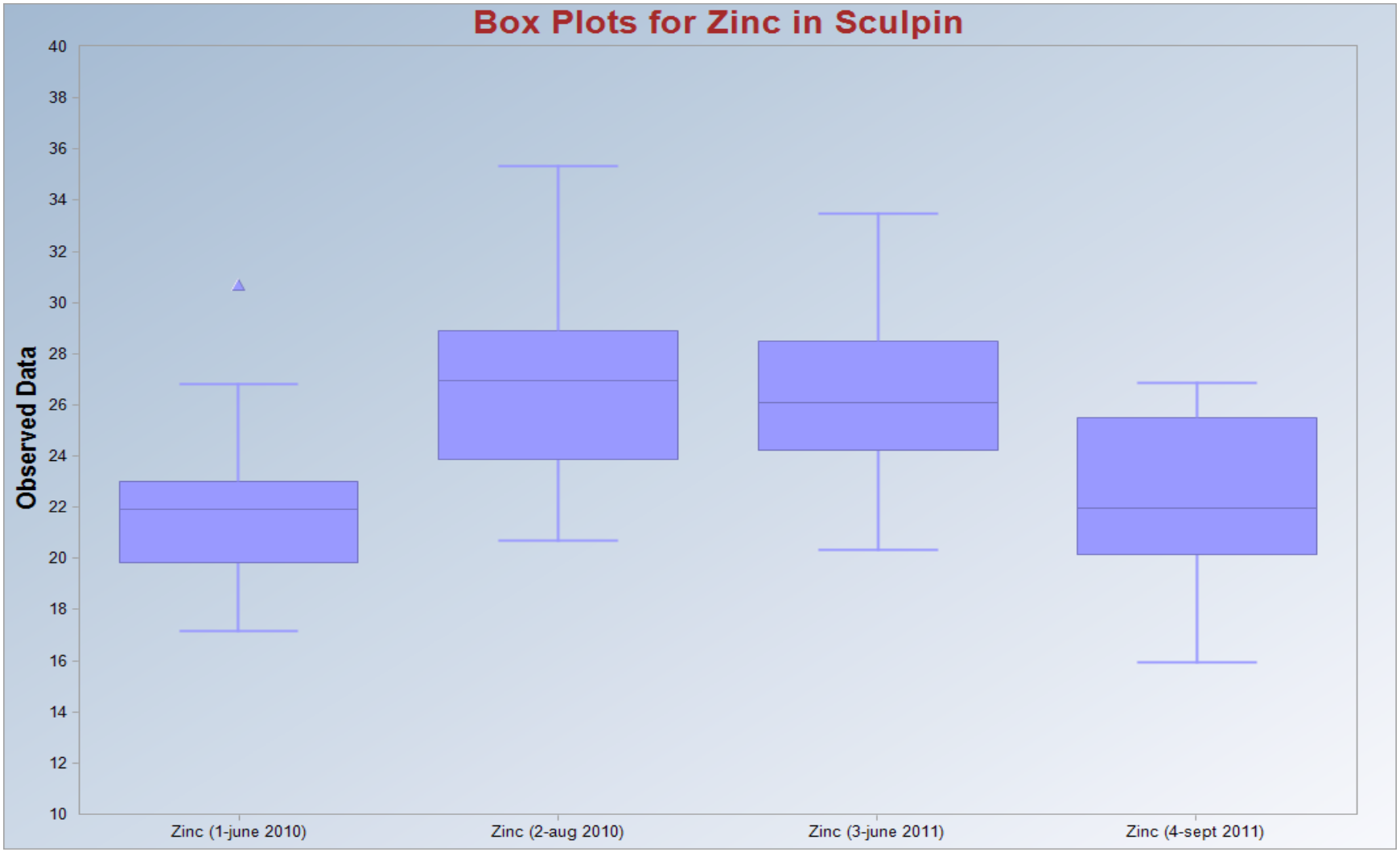

Q-Q Plot for Methylmercury in Sculpin
Ordered Observations
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
-1.5
-1.0
-0.5
0.0
0.5
1.0
Theoretical Quantiles (Standard Normal)
Methylmercury
Methylmercury
N = 7
Mean = 0.1454
Sd = 0.0841
Slope = 0.0850
Intercept = 0.1454
Correlation, R = 0.9336

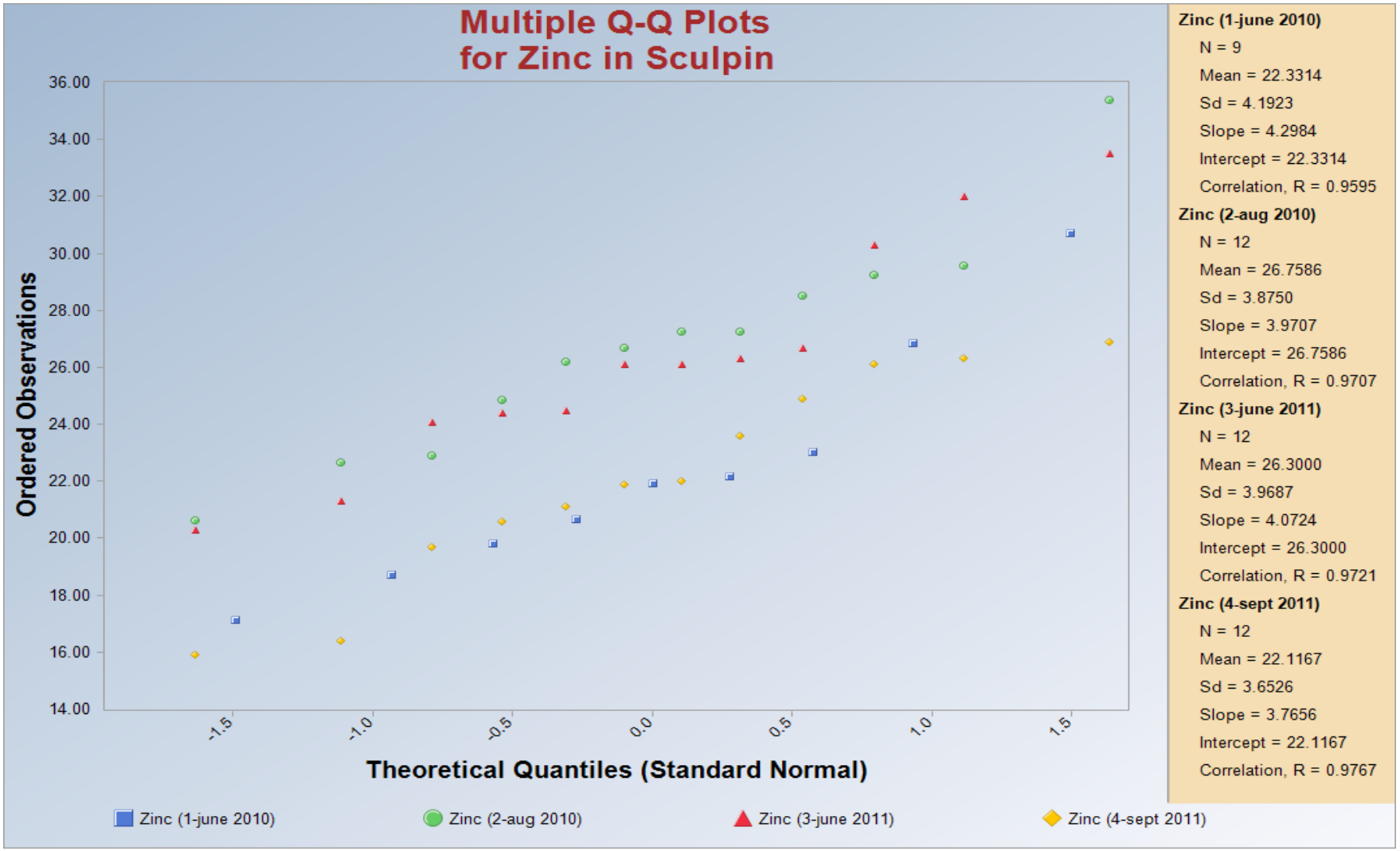

Box Plots for Selenium in Sculpin
Observed Data
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Selenium (1-june 2010)
Selenium (2-aug 2010)
Selenium (3-june 2011)
Selenium (4-sept 2011)


Multiple Q-Q Plots
for Selenium in Sculpin
Ordered Observations
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Selenium (1-june 2010)
Selenium (2-aug 2010)
Selenium (3-june 2011)
Selenium (4-sept 2011)
Selenium (1-june 2010)
N = 9
Mean = 1.0758
Sd = 0.2043
Slope = 0.2146
Intercept = 1.0758
Correlation, R = 0.9827
Selenium (2-aug 2010)
N = 12
Mean = 2.0990
Sd = 0.4059
Slope = 0.4161
Intercept = 2.0990
Correlation, R = 0.9710
Selenium (3-june 2011)
N = 12
Mean = 0.8158
Sd = 0.1591
Slope = 0.1629
Intercept = 0.8158
Correlation, R = 0.9701
Selenium (4-sept 2011)
N = 12
Mean = 1.0808
Sd = 0.3153
Slope = 0.3166
Intercept = 1.0808
Correlation, R = 0.9513


Box Plots for Vanadium in Sculpin
Observed Data
0.44
0.42
0.40
0.38
0.36
0.34
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Vanadium (1-june 2010)
Vanadium (2-aug 2010)
Vanadium (3-june 2011)
Vanadium (4-sept 2011)


Multiple Q-Q Plots
for Vanadium in Sculpin
Ordered Observations
0.00
0.03
0.06
0.09
0.12
0.15
0.18
0.21
0.24
0.27
0.30
0.33
0.36
0.39
0.42
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Vanadium (1-june 2010)
Vanadium (2-aug 2010)
Vanadium (3-june 2011)
Vanadium (4-sept 2011)
Vanadium (1-june 2010)
N = 9
Mean = 0.1596
Sd = 0.0818
Slope = 0.0738
Intercept = 0.1596
Correlation, R = 0.8450
Vanadium (2-aug 2010)
N = 12
Mean = 0.2205
Sd = 0.0483
Slope = 0.0501
Intercept = 0.2205
Correlation, R = 0.9821
Vanadium (3-june 2011)
N = 12
Mean = 0.0408
Sd = 0.0023
Slope = 0.0024
Intercept = 0.0408
Correlation, R = 0.9610
Vanadium (4-sept 2011)
N = 12
Mean = 0.1205
Sd = 0.1459
Slope = 0.1201
Intercept = 0.1205
Correlation, R = 0.7795


Box Plots for Zinc in Sculpin
Observed Data
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
Zinc (1-june 2010)
Zinc (2-aug 2010)
Zinc (3-june 2011)
Zinc (4-sept 2011)


Multiple Q-Q Plots
for Zinc in Sculpin
Ordered Observations
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Zinc (1-june 2010)
Zinc (2-aug 2010)
Zinc (3-june 2011)
Zinc (4-sept 2011)
Zinc (1-june 2010)
N = 9
Mean = 22.3314
Sd = 4.1923
Slope = 4.2984
Intercept = 22.3314
Correlation, R = 0.9595
Zinc (2-aug 2010)
N = 12
Mean = 26.7586
Sd = 3.8750
Slope = 3.9707
Intercept = 26.7586
Correlation, R = 0.9707
Zinc (3-june 2011)
N = 12
Mean = 26.3000
Sd = 3.9687
Slope = 4.0724
Intercept = 26.3000
Correlation, R = 0.9721
Zinc (4-sept 2011)
N = 12
Mean = 22.1167
Sd = 3.6526
Slope = 3.7656
Intercept = 22.1167
Correlation, R = 0.9767