

Appendix 1.1. Raw environmental base data for the Lower *varcus* Zone

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style /thickness	Substrate type	Water depth
-78.75	42.75	Ludlowville: Wanakah Sh; med grey, soft, fossilif. Shale & shaly mudstone	55	20	0	25	ls concretions, fossils in tempestite layers	Thin	Muddy	Photic zone below SWB to above SWB for ls
-78.25	42.75	Ludlowville: Wanakah Sh; dk grey sh, ls, calcareous grey sh, encrinite	50	30	0	20	Tempestite shell layers	Thin	Muddy	Below SWB to near normal WB
-77.75	42.75	Ludlowville: Wanakah, grey fissile shale	70	0	0	30	Burried bottom ls assemblage	Thin	Muddy	SWB to normal WB for ls (20–25 m), below SWB for sh (100-150 m)
-77.25	42.75	Ludlowville: Wanakah, black shale	70	15	0	15	Shell beds	Thin	Muddy	Below SWB
-76.75	42.75	Ludlowville: Wanakah, black shale, micritic ls	80	10	0	10	Shell beds	Thin	Muddy	Below SWB
-76.25	42.75	Ludlowville: Otisco Sh, Ivy Pt. Siltst.; siltstone, ls, concretions, mudst	60	20	0	20	Individual HCS, laminated mudstone	Thin to moderate	Muddy to sandy	Below SWB to lower shoreface
-75.75	42.75	Ludlowville: upper, undif, micaceous siltst, silty sh, sandy siltst	30	60	0	10	Laminated and ripple laminated	Thin to moderate	Silty	Below SWB to just above SWB
-75.25	42.75	Ludlowville to Panther Mtn sst	15	10	75	0				

Appendix 1.1. (Continued)

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style /thickness	Substrate type	Water depth
-77.75	41.75	No outcrop								
-77.25	41.75	No outcrop								
-76.75	41.75	No outcrop								
-76.25	41.75	No outcrop								
-75.75	41.75	No outcrop								
-75.25	41.75	No outcrop								
-74.75	41.75	No outcrop								
-74.25	41.75	No outcrop								
-80.25	41.25	No outcrop								
-79.75	41.25	No outcrop								
-79.25	41.25	No outcrop								
-78.75	41.25	No outcrop								
-78.25	41.25	No outcrop								
-77.75	41.25	No outcrop								
-77.25	41.25	Millsboro Shale and Mahantango; black shale to siltstone	90	10	0	0	Laminated and storm-derived ripples	Thin to moderate	Muddy to silty	Below to just at SWB
-76.75	41.25	Millsboro Shale and Mahantango; black shale to siltstone	80	20	0	0	Laminated and storm-derived ripples	Thin to moderate	Muddy to silty	Below to just at SWB
-76.25	41.25	Millsboro Shale and Mahantango; black shale to siltstone to fine sst.	63	35	2	0	Laminated beds, ripple forms, a few HCS	Thin to moderate	Muddy to silty	Below SWB to above SWB
-75.75	41.25	Mahantango; mudstone to siltstone a few fine sst	43	47	10	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to silty	Below to just above SWB

-75.25	41.25	Mahantango; mudstone to fine sst (more mudst)	52	44	4	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to sandy	Below SWB to lower shoreface
-74.75	41.25	Mahantango; siltstone to fine sst (more sst)	20	28	52	0	HCS, amalgamated or single, sto- rm facies only	Moderate to thick	Silty to sandy	At SWB to upper Shoreface
-78.25	40.75	Millsboro Shale and Mahantango; black shale to siltstone	80	20	0	0	Laminated and storm-derived ripples	Thin to moderate	Muddy to silty	Below to just at SWB
-77.75	40.75	Millsboro Shale and Mahantango; black shale to siltstone to fine sst.	57	40	3	0	Laminated beds, ripple forms, a few HCS	Thin to moderate	Muddy to silty	Below SWB to above SWB
-77.25	40.75	Mahantango; SWB mudstone to siltstone a few fine sst	62	25	13	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to silty	Below to just above
-76.75	40.75	Mahantango; mudstone to fine sst (more mudst)	27	40	33	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to sandy	Below SWB to lower shoreface
-76.25	40.75	Mahantango; mudstone to fine sst (more mudst)	21	47	32	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to sandy	Below SWB to lower shoreface
-75.75	40.75	Mahantango; mudstone to fine sst (more mudst)	14	46	40	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to sandy	Below SWB to lower shoreface
-75.25	40.75	Mahantango; mudstone to	10	53	37	0	Laminated beds, a few HCS,	Thin (mainly) to moderate	Muddy to sandy	Below SWB to lower shoreface

Appendix 1.1. (Continued)

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style /thickness	Substrate type	Water depth
		fine sst (more mudst)					storm facies			
-78.75	40.25	Mahantango & Millsboro; Blk sh, mudst, few sltst.	48	52	0	0	Laminated beds, ripple forms, storm facies	Thin (mainly) to moderate	Muddy to silty	Below to just above SWB
-78.25	40.25	Mahantango; mudstone to siltstone a few fine sst	36	50	14	0	Laminated beds, massive siltstone, a few HCS, storm facies	Thin (mainly) storm facies	Muddy to silty	Below to just above SWB
-77.75	40.25	Mahantango; mudstone to siltstone a few fine sst	28	50	22	0	Laminated beds, massive siltstone, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to fine sandy	Below SWB to lower shoreface
-77.25	40.25	Mahantango; siltstone to coarse sst	15	41	44	0	Amalgamated HCS, TXB, channel sands, mud draped ripples	Moderate to thick	Sandy	At SWB, upper shoreface to intertidal
-76.75	40.25	Mahantango; fine to coarse sst	0	6	94	0	Amalgamated HCS, TXB, channel sands, mud draped ripples	Moderate to thick	Sandy	Above SWB, upper shoreface to intertidal
-76.25	40.25	Mahantango, none					None	None	Subaerially exposed	Subaerially exposed

-75.75	40.25	Mahantango, none					None	None	Subaerially exposed	Subaerially exposed
-78.75	39.75	Mahantango; mudstone to siltstone a few fine sst	33	50	17	0	Laminated beds, massive siltstone, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to silty	Below to just above SWB
-78.25	39.75	Mahantango; mudstone to siltstone a few fine sst	25	50	25	0	Laminated beds, massive siltstone, a few HCS, storm facies	Thin (mainly) to moderate	Silty	Just above SWB
-77.75	39.75	Mahantango; mudstone, fine to coarse sst	15	43	42	0	Amalgamated HCS, TXB, channel sands, mud draped ripples	Few thin, mostly moderate to thick	Muddy to sandy (mostly)	At SWB to upper shoreface to intertidal
-79.75	39.25	Millsboro Shale; black shale	100	0	0	0	Laminated	Thin	Muddy	Well below SWB
-79.25	39.25	Millsboro Shale and Mahantango; black shale to siltstone	75	25	0	0	Laminated and storm-derived ripples	Thin to moderate	Muddy to silty	Below to just at SWB
-78.75	39.25	Mahantango; mudstone to siltstone a few fine sst	31	50	19	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to silty	Below to just above SWB
-78.25	39.25	Mahantango; mudstone to fine sst (more mudst)	25	50	25	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Silty	Just above SWB
-77.75	39.25	No outcrop								

-80.25	37.75	Millsboro Shale and Mahantango; black shale to siltstone	66	32	2	0	Laminated and storm-derived ripples	Thin to moderate	Muddy to silty	Below to just at SWB
-79.75	37.75	Mahantango; mudstone to fine sst (more mudst)	34	50	16	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to sandy	Below SWB to lower shoreface
-79.25	37.75	no outcrop								
-81.25	37.25	Millsboro Shale and Mahantango; black shale to siltstone	75	25	0	0	Laminated and storm-derived ripples	Thin to moderate	Muddy to silty	Below to just at SWB
-80.75	37.25	Mahantango; mudstone with a few siltstone to v. fine sst	38	62	0	0	Laminated beds, ripple forms	Thin	Muddy	Below SWB
-80.25	37.25	Mahantango; mudstone to siltstone a few fine sst	39	50	11	0	Laminated beds, a few HCS, storm facies	Thin (mainly) to moderate	Muddy to silty	Below to just above SWB
-79.75	37.25	No outcrop								
-81.75	36.75	No outcrop								

Appendix 1.1. Raw environmental base data for the Lower *varcus* Zone.

Longitude	Latitude	Depositional environment	Ichnofacies/bioturbation	Oxygenation	Biofacies	Reference
-78.75	42.75	Outer to middle shelf	<i>Cruziana</i> and <i>Zoophycus</i>	Normal marine	<i>Ambocoelia</i> , <i>Athyris</i> , and normal marine	Oliver and Klapper, 1981; Miller, 1986; Wygart, 1996; Batt, 1999
-78.25	42.75	outer to middle shelf		Normal marine		Batt, 1999
-77.75	42.75	Deep to distal shelf	<i>Zoophycus</i> , lots of bioturbation	Normal marine	<i>Ambocoelia</i> , <i>Palaeoneilo</i> , <i>Chonetids</i>	Oliver and Klapper, 1981; Savarese et al., 1986; Batt, 1999
-77.25	42.75	Shelf to basin	<i>Zoophycus</i>	Dysaerobic	Dysaerobic	Batt, 1999
-76.75	42.75	Basin	<i>Zoophycus</i>	Dysaerobic	Dysaerobic	Batt, 1999
-76.25	42.75	Shelf	<i>Zoophycus</i> , lots of bioturbation	Normal marine	Corals	Brett et al., 1986; Brett and Baird, 1994; Mayer, 1994
-75.75	42.75	Middle shelf		Normal marine	<i>Cypricardella</i> , <i>Ambo-coelia</i> , <i>Tropidoleptus</i>	Oliver and Klapper, 1981
-75.25	42.75					
-74.75	42.75	Tidal to estuarine		Subaerial	Nonmarine	Ver Straeten and Brett, 1999
-74.25	42.75	Alluvial fan & coastal plain		Subaerial	Nonmarine	Ver Straeten and Brett, 1999
-73.75	42.75					
-80.25	42.25					
-79.75	42.25					
-79.25	42.25					
-78.75	42.25					
-78.25	42.25					
-77.75	42.25					
-77.25	42.25					

-76.75	42.25					
-76.25	42.25					
-75.75	42.25					
-75.25	42.25	Alluvial fan & coastal plain		Subaerial	Nonmarine	Ver Straeten and Brett, 1999
-74.75	42.25					
-74.25	42.25					
-73.75	42.25					
-80.25	41.75					
-79.75	41.75					
-79.25	41.75					
-78.75	41.75					
-78.25	41.75					
-77.75	41.75					
-77.25	41.75					
-76.75	41.75					
-76.25	41.75					
-75.75	41.75					
-75.25	41.75					
-74.75	41.75					
-74.25	41.75					
-80.25	41.25					
-79.75	41.25					
-79.25	41.25					
-78.75	41.25					
-78.25	41.25					
-77.75	41.25					
-77.25	41.25	Deep to outer shelf	<i>Cruziana</i> ; slight to intense	Dysaerobic	Anoxic to open marine	Prave et al., 1996: inferred
-76.75	41.25	Deep to outer shelf	<i>Cruziana</i> ; slight to intense	Dysaerobic	Anoxic to open marine	Prave et al., 1996: inferred
-76.25	41.25	Outer shelf to middle shelf	<i>Cruziana</i> ; bioturbation common	Nn	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Prave et al., 1996: inferred

Appendix 1.1. (Continued)

Longitude	Latitude	Depositional environment	Ichnofacies/bioturbation	Oxygenation	Biofacies	Reference
-75.75	41.25	Outer shelf to middle shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Prave et al., 1996: inferred
-75.25	41.25	Outer shelf to inner shelf/shoreface	<i>Cruziana</i> and some <i>Skolithos</i>	Normal marine	Open marine to abraded brach valves	Prave et al., 1996: inferred
-74.75	41.25	Middle shelf to inner shelf/shoreface	<i>Cruziana</i> and <i>Skolithos</i>	Normal marine	Open marine to abraded brach valves	Prave et al., 1996: section
-78.25	40.75	Deep to outer shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Anoxic to open marine	Prave et al., 1996: inferred
-77.75	40.75	Outer shelf to middle shelf	<i>Cruziana</i> ; bioturbation common	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Prave et al., 1996: inferred
-77.25	40.75	Outer shelf to middle shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Prave et al., 1996: inferred
-76.75	40.75	Outer shelf to inner shelf/shoreface	<i>Cruziana</i> and some <i>Skolithos</i>	Normal marine	Open marine to abraded brach valves	Prave et al., 1996: inferred; Faill et al., 1973: section
-76.25	40.75	Outer shelf to inner shelf/shoreface	<i>Cruziana</i> and some <i>Skolithos</i>	Normal marine	Open marine to abraded brach valves	Prave et al., 1996: inferred
-75.75	40.75	Outer shelf to inner shelf/shoreface	<i>Cruziana</i> and some <i>Skolithos</i>	Normal marine	Open marine to abraded brach valves	Prave et al., 1996: section
-75.25	40.75	Outer shelf to inner shelf/shoreface	<i>Cruziana</i> and some <i>Skolithos</i>	Normal marine	Open marine to abraded brach valves	Prave et al., 1996: inferred
-78.75	40.25	Basin, outer shelf	<i>Cruziana</i>	Dysaerobic	Open marine & anoxic	Prave et al., 1996: inferred; Dennison and Hasson, 1976: section

-78.25	40.25	Outer shelf to middle shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Prave et al., 1996: inferred; Dennison and Hasson, 1976: section
-77.75	40.25	Outer shelf to inner shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Prave et al., 1996: inferred; Dennison and Hasson, 1976: section
-77.25	40.25	Middle platform to prograding tidal delta	<i>Skolithos</i>	Normal marine	Thick shelled brachs, mainly abraded	Prave et al., 1996: section
-76.75	40.25	Inner platform to prograding tidal delta	<i>Skolithos</i>	Normal marine	Thick shelled brachs, mainly abraded	Prave et al., 1996: section
-76.25	40.25	Coastal plain	subaerially exposed	Subaerial	Subaerially exposed	Prave et al., 1996: inferred
-75.75	40.25	Coastal plain	subaerially exposed	Subaerial	Subaerially exposed	Prave et al., 1996: inferred
-78.75	39.75	Outer shelf to middle shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Prave et al., 1996: inferred; Dennison and Hasson, 1976: section
-78.25	39.75	Middle shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Prave et al., 1996: section; Dennison et al., 1979: section
-77.75	39.75	Middle platform to prograding tidal delta	<i>Cruziana</i> (some) and <i>Skolithos</i>	Normal marine	Open marine to thick shelled brachs, mainly abraded	Prave et al., 1996: inferred
-79.75	39.25	Deep shelf	?	Anaerobic	Anoxic	Dennison and Hasson, 1976: inferred
-79.25	39.25	Deep to outer shelf	<i>Cruziana</i> ; slight to intense	Dysaerobic	Anoxic to open marine	Dennison and Hasson, 1976: inferred
-78.75	39.25	Outer shelf to middle shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Dennison and Hasson, 1976: inferred
-78.25	39.25	Outer shelf to middle shelf	<i>Cruziana</i> ; slight to intense		Open marine: brachs, coral, crinoids; bryo and mollusks rare	Dennison and Hasson, 1976: inferred

Appendix 1.1. (Continued)

Longitude	Latitude	Depositional environment	Ichnofacies/bioturbation	Oxygenation	Biofacies	Reference
-77.75	39.25					
-79.75	38.75	Deep shelf	?		Anoxic	Dennison and Hasson, 1976, inferred
-79.25	38.75	Deep to outer shelf	<i>Cruziana</i> ; slight to intense	Anaerobic	anoxic to open marine	Dennison and Hasson, 1976, inferred
-78.75	38.75	Middle shelf	<i>Cruziana</i> ; slight to intense	Dysaerobic	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Dennison and Hasson, 1976, inferred
-78.25	38.75	Outer shelf to middle shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Dennison and Hasson, 1976: inferred
-80.25	38.25	Deep shelf	?	Anaerobic	Anoxic	Dennison and Hasson, 1976: inferred
-79.75	38.25	Deep to outer shelf	<i>Cruziana</i> ; slight to intense	Dysaerobic	Anoxic to open marine	Dennison and Hasson, 1976: inferred; Hasson and Dennison, 1979, text
-79.25	38.25	Deep outer shelf to inner shelf/shoreface	<i>Cruziana</i> and some <i>Skolithos</i>	Normal marine	Open marine to abraded brach valves	Dennison and Hasson, 1976: inferred

-78.75	38.25					
-80.75	37.75					
-80.25	37.75	Deep to outer shelf	<i>Cruziana</i> ; slight to intense	Dysaerobic	Anoxic to open marine	Dennison and Hasson, 1976: inferred
-79.75	37.75	Outer shelf to inner shelf/shoreface	<i>Cruziana</i> and some <i>Skolithos</i>	Normal marine	Open marine to abraded brach valves	Dennison and Hasson, 1976: inferred
-79.25	37.75					
-81.25	37.25	Deep to outer shelf	<i>Cruziana</i> ; slight to intense	Dysaerobic	Anoxic to open marine	Dennison and Hasson, 1976: inferred
-80.75	37.25	Outer shelf	<i>Cruziana</i> ; bioturbation common	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Dennison and Hasson, 1976: inferred
-80.25	37.25	Outer shelf to middle shelf	<i>Cruziana</i> ; slight to intense	Normal marine	Open marine: brachs, coral, crinoids; bryo and mollusks rare	Dennison and Hasson, 1976: inferred
-79.75	37.25					
-81.75	36.75					

Appendix 1.2. Raw environmental base data for the *punctata* Zone.

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style / thickness	Substrate type	Water depth
-78.75	42.75	Cashaqua Sh: light to dark gray shale w/concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below wave base
-78.25	42.75	Cashaqua Sh: olive gray mudst 80% w/concretions 20%	80	0	0	20	Concretions horizons	Thin	Muddy	Below wave base
-77.75	42.75	Cashaqua Sh: gray-green sh, mdst, concretions	70	5	5	20	Concretions	Thin	Muddy	Below wave base to shallow basin
-77.25	42.75	Cashaqua (1/2) Rock Stream Fm (1/2); blue-gray calc siltstone and shale	50	33	10	7	Rare shallow current ripples; isolated turbidite flows; bioturbated	Thin to moderate	Muddy to silty	Above or near SWB
-76.75	42.75	Cashaqua/ Rock Stream Fm. Olive grey shale, 40% silt/sand, 60% mud	50	29	26	5	Rare shallow current ripples	Thin to moderate	Silty	Above or near SWB
-76.25	42.75	Glen Aubrey	69	8	22	0	Rare shallow current ripples, HCS, scours	Thin to moderate	Muddy and sandy	Above or near FWWB
-75.75	42.75	Glen Aubrey	69	8	22	0	Rare shallow current ripples, HCS, scours	Thin to moderate	Muddy and sandy	Above or near FWWB
-75.25	42.75	Glen Aubrey/Walton	35	15	50	0	rare shallow current ripples	Thin to moderate	Muddy and sandy	Above or near FWWB

-74.75	42.75	Walton	15	10	75	0	Bar complexes, fluvial sedimentation	Thick	Sandy	Above FWWB to subaerial
-74.25	42.75	Walton	10	10	80	0	Bar complexes, fluvial sedimentation	Thick	Sandy	Above FWWB to subaerial
-73.75	42.75	Eroded								
-80.25	42.25	Cashaqua Sh. Gray shale with 1st concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below SWB
-79.75	42.25	Cashaqua Sh. Gray shale with 1st concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below SWB
-79.25	42.25	Cashaqua Sh. Gray shale with 1st concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below SWB
-78.75	42.25	Cashaqua Sh: light to dark gray shale w/concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below SWB
-78.25	42.25	Cashaqua Sh: olive gray mudst 80% w/concretions 20%	80	0	0	20	Concretions horizons	Thin	Muddy	Below SWB
-77.75	42.25	Cashaqua Sh: gray-green sh, mdst, concretions	70	5	5	20	Concretions	Thin	Muddy	Below wave to near SWB basin
-77.25	42.25	Cashaqua (1/2) Rock Stream Fm (1/2); blue-gray calc siltst and shale	40	45	12	3	x-beds, isolated turbidites, bioturbated	Thin to moderate	Silty	Above or near SWB
-76.75	42.25	Cashaqua/Rock Stream olive gray sh, 40% silt/s and, 60% mud	40	45	20	5	Rare shallow current ripples, x-beds, concretions	Thin to moderate	Silty to sandy	Above SWB to near FWWB

Appendix 1.2. (Continued)

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style / thickness	Substrate type	Water depth
-76.25	42.25	Glen Aubrey mudst interbed w/silst thinner sh or sst	85	0	15	0	Groove casts, cross lamination, cuscate ripples	Thin to moderate	Muddy to silty	At or below FWWB, 30 to 120' of water
-75.75	42.25	Glen Aubrey, green shale, silst, sst	75	20	10	0	HCS, scours, wave ripples	moderate	Muddy to silty	At FWWB to intertidal
-75.25	42.25	Glen Aubrey/Walton	35	15	50	0	Rare shallow current ripples, HCS, scours	Thin to moderate	Muddy and sandy	Above or near FWWB
-74.75	42.25	Walton Fm. red shale and coarse sst	20	10	70	0	Tidal indicators, x-beds, shallow channels	Thick	Sandy	Intertidal to subaerial
-74.25	42.25	Walton Fm. red shale and sst; red and gray (Onteora sst)	10	10	80	0	Fluvial system, x-beds, slickensides	Thick	Sandy	Subaerial
-73.75	42.25	Walton Fm. red shale and sst	5	5	90	0	Fluvial system	Thick	Sandy	Subaerial
-80.25	41.75	Cashaqua Sh. Gray shale with lst concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below SWB
-79.75	41.75	Cashaqua Sh. Gray shale with lst concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below SWB
-79.25	41.75	Cashaqua Sh. Gray shale with lst concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below SWB
-78.75	41.75	Cashaqua Sh: light to dark gray shale w/concretions	90	0	0	10	Concretions horizons	Thin	Muddy	Below SWB

-78.25	41.75	Cashaqua Sh: olive gray mudst 80% w/concretions 20%	80	0	0	20	Concretions horizons	Thin	Muddy	Below SWB
-77.75	41.75	Cashaqua Sh: gray-green sh, mdst, concretions	70	5	5	20	Concretions	Thin	Muddy	Below wave to near SWB basin
-77.25	41.75	Rock Stream; sst, mudst	70	4	26	0	Current and wave ripples; moderate ripples	Moderate	Muddy and sandy	above SWB but below FWWB
-76.75	41.75	Rock Stream; sst, mudst	70	4	26	0	Current and wave ripples; moderate ripples	Moderate	Muddy and sandy	Above SWB but below FWWB
-76.25	41.75	Glen Aubrey mudst interbed w/silst thinner sh or sst	69	8	22	0	Rare shallow current ripples, HCS, scours	Thin to moderate	Muddy to sandy	At or below FWWB, 30 to 120' of water
-75.75	41.75	Glen Aubrey mudst interbed w/silst thinner sh or sst	69	8	22	0	Rare shallow current ripples, HCS, scours	Thin to moderate	Muddy to sandy	At or below FWWB, 30 to 120' of water
-75.25	41.75	Walton Fm. red shale and sst	20	10	70	0	Tidal indicators	Thick	Sandy	Intertidal to subaerial
-74.75	41.75	Walton Fm. red shale and sst	10	10	80	0	Fluvial system	Thick	Sandy	Subaerial
-74.25	41.75	Walton Fm. red shale and sst	5	5	90	0	Fluvial system	Thick	Sandy	Subaerial
-80.25	41.25	No outcrop								
-79.75	41.25	No outcrop								
-79.25	41.25	No outcrop								
-78.75	41.25	No outcrop								
-78.25	41.25	No outcrop								
-77.75	41.25	No outcrop								
-77.25	41.25	No outcrop								
-76.75	41.25	No outcrop								

Appendix 1.2. (Continued)

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style / thickness	Substrate type	Water depth
-76.25	41.25	Subaerial redbeds								
-75.75	41.25	Subaerial redbeds								
-75.25	41.25	Subaerial redbeds								
-74.75	41.25	Eroded								
-78.25	40.75	Marine sh, siltst, sst								
-77.75	40.75	Marine sh, siltst, sst								
-77.25	40.75	Subaerial redbeds								
-76.75	40.75	Subaerial redbeds								
-76.25	40.75	Subaerial redbeds								
-75.75	40.75	Subaerial redbeds								
-75.25	40.75	Subaerial redbeds								
-78.75	40.25	Marine sh, siltst, sst								
-78.25	40.25	Marine sh, siltst, sst								
-77.75	40.25	Subaerial redbeds								
-77.25	40.25	Trimmers Rock Fm., siltstone to silty shale within sst beds and Redbeds	50	35	15	0	Graded beds, flute casts, ball and pillow	Thin to moderate	Muddy	Moderate
-76.75	40.25	Subaerial redbeds								
-76.25	40.25	Eroded								
-75.75	40.25	Eroded								
-78.75	39.75	Bralier Fm., gray silst and silty shale	20	75	5	0	Flute casts	Thin	Silty	Below FWWB and near SWB

-78.25	39.75	Trimmers Rock Fm. equivalent, siltstone to silty shale within sst beds	50	35	15	0				
-77.75	39.75	Catskill, non-marine red beds								
-79.75	39.25	Chatanooga, black shale	85	10	0	5				
-79.25	39.25	“Portage” or Brallier, grey silty shale and siltst	65	30	5	0	Thickly laminated shales w/siltstone interbeds	Thin	Muddy to silty	Below SWB
-78.75	39.25	Brallier Fm., gray silt and silty shale	57	38	5	0				
-78.25	39.25	“Chemung” or Trimmers Rock equivalent, siltstone with shale and sst	50	35	15	0				
-77.75	39.25	Catskill, non-marine red beds								
-79.75	38.75	“Portage” or Brallier, grey silty shale and siltst	65	30	5	0				
-79.25	38.75	Brallier Fm., gray silt and silty shale	57	38	5	0				
-78.75	38.75	“Chemung” or Trimmers Rock equivalent, siltstone with shale and sst	50	35	15	0	Poorly sorted siltstone, thickly laminated	Thin (90%) to moderate (10%)	Muddy to silty	Below SWB
-78.25	38.75	Catskill, non-marine red beds								

Appendix 1.2. (Continued)

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style / thickness	Substrate type	Water depth
-80.25	38.25	“Portage” or Brallier, grey silty shale and siltst	65	30	5	0				
-79.75	38.25	Brallier Fm., gray siltst and silty shale	57	38	5	0		Siltstone		
-79.25	38.25	“Chemung” or Trimmers Rock equivalent, silstone with shale and sst	50	35	15	0				
-78.75	38.25	Catskill, non-marine red beds								
-80.75	37.75	Chatanooga, black shale	85	10	0	5				
-80.25	37.75	Dark shale basinal of Brallier	75	22	0	3				
-79.75	37.75	Brallier Fm., gray siltst and silty shale	57	38	5	0		Moderate		
-79.25	37.75	“Chemung” or Trimmers Rock	50	35	15	0				

		equivalent, silstone with shale and sst								
-81.25	37.25	Dark shale basinal of Brallier	75	22	0	3				
-80.75	37.25	Brallier Fm., gray silst and silty shale	57	38	5	0		Moderate		
-80.25	37.25	Brallier Fm., gray silst and silty shale	20	40	40	0	x-beds, lenticular- irregular beds, coursening upward, TXB, Bouma seq	Mod to thick	Sandy and silty	Below FWWB
-79.75	37.25	Brallier Fm., gray silst and silty shale	20	40	40	0				
-81.75	36.75	Brallier Fm., gray silst and silty shale	57	38	5	0				

Appendix 1.2. Raw environmental base data for the *punctata* Zone.

Longitude	Latitude	Depositional environment	Ichnofacies/ bioturbation	Oxygenation	Biofacies	Reference
-78.75	42.75	Distal slope	?		Ammonites, conodonts	Over et al., 1999; Oliver and Klapper, 1981; Sutton et al., 1970; Sutton, 1963; Sutton and McGhee, 1985
-78.25	42.75	Distal slope	Some		Naples fauna	Kirchgasser, 1983; Sutton et al., 1970; Sutton, 1960
-77.75	42.75	Distal slope	High in middle, lower on top and bottom		Middle-bivalves & plants, other bivalves and gastropods	Kirchgasser et al., 1994; Sutton et al., 1970; Sutton, 1960
-77.25	42.75	Outer shelf, distal platform	?	Good	<i>Rhipidomella</i> ; bivalves, gast, ceph, brachs, arths, fish	Sutton and McGhee, 1985
-76.75	42.75	Outer shelf, distal platform	?	Good	<i>Rhipidomella</i> ; bivalves, gast, ceph, brachs, arths, fish	Adams et al., 1956; Sutton et al., 1970; Sutton and McGhee, 1985; Sutton, 1960
-76.25	42.75	Inner shelf	?		<i>Cypricardella</i>	Sutton and McGhee, 1985; Sutton et al., 1970; Sutton, 1960
-75.75	42.75	Inner shelf	?		<i>Cypricardella</i>	Sutton and McGhee, 1985; Sutton et al., 1970; Sutton, 1960
-75.25	42.75	Inner shelf	?		<i>Cypricardella</i>	Sutton and McGhee, 1985; Sutton et al., 1970
-74.75	42.75	Alluvial plain	?	Subaerial		Sutton et al., 1970; Woodrow, 1985
-74.25	42.75	Alluvial plain	?	Subaerial		Sutton et al., 1970; Woodrow, 1985
-73.75	42.75					Sutton et al., 1970

-80.25	42.25	Distal slope		Mod	Ammonites, conodonts	Sutton et al., 1970
-79.75	42.25	Distal slope		Mod	Molluscan	Tesmer, 1966; Sutton et al., 1970
-79.25	42.25	Distal slope		Mod	Molluscan	Tesmer, 1966; Sutton et al., 1970
-78.75	42.25	Distal slope	?		Ammonites, conodonts	Tesmer, 1966; Sutton et al., 1970
-78.25	42.25	Distal slope	Some		Naples fauna	Sutton et al., 1970
-77.75	42.25	Distal slope	High in middle, lower on top and bottom		Middle-bivalves & plants, other bivalves and gastropods	Sutton et al., 1970
-77.25	42.25	Outer shelf, distal platform		Good	<i>Rhipidomella</i> ; bivalves, ceph, gast; rare brachs, arths, fish	Sutton et al., 1970; Sutton, 1960
-76.75	42.25	Outer shelf	?	Good	<i>Rhipidomella</i> ; bivalves, ceph, gast; rare brachs, arths, fish	Sutton and McGhee, 1985; Sutton et al., 1970; Sutton, 1960
-76.25	42.25	Prodelta, distal platform, and open shelf	Tracks, trails, burrows	Good	<i>Cypricardella</i> ; Productella, <i>Ambocoelia</i> , <i>Chonetes</i> , <i>Leptodesma</i> , <i>Cypricardella</i>	Bowen et al., 1970; Sutton et al., 1970; Sutton and McGhee, 1985; Bishuk et al., 1991
-75.75	42.25	Tidal flat/marsh, prodelta, delta platform				Krajewski and Williams, 1971; Sutton et al., 1970; Sutton and McGhee, 1985
-75.25	42.25	Inner shelf to subaerial	?		<i>Cypricardella</i>	Krajewski and Williams, 1971; Sutton et al., 1970; Sutton and McGhee, 1985
-74.75	42.25	Tidal flat to alluvial plain		Subaerial	Plant roots and stems	Fletcher, 1962; Woodrow, 1985; Krajewski and Williams, 1971; Sutton et al., 1970; Bridge and Dingman, 1981

Appendix 1.2. (Continued)

Longitude	Latitude	Depositional environment	Ichnofacies/ bioturbation	Oxygenation	Biofacies	Reference
-74.25	42.25	Alluvial plain		Subaerial		Fletcher, 1962; Woodrow, 1985; Krajewski and Williams, 1971; Sutton et al., 1970
-73.75	42.25	Alluvial plain		Subaerial		Inferred
-80.25	41.75	Distal slope		Mod	Ammonites, conodonts	Inferred
-79.75	41.75	Distal slope		Mod	Molluscan	Inferred
-79.25	41.75	Distal slope		Mod	Molluscan	Inferred
-78.75	41.75	Distal slope	?		Ammonites, conodonts	Inferred
-78.25	41.75	Distal slope	Some		Naples fauna	Inferred
-77.75	41.75	Distal slope	High in middle, lower on top and bottom		Middle-bivalves & plants, other bivalves and gastropods	Inferred
-77.25	41.75	Outer shelf			<i>Rhipidomella</i>	Krajewski and Williams, 1971; Sutton et al., 1970; Sutton and McGhee, 1985
-76.75	41.75	Outer shelf			<i>Rhipidomella</i>	Krajewski and Williams, 1971; Sutton et al., 1970; Sutton and McGhee, 1985
-76.25	41.75	Inner shelf	Tracks, trails, burrows		<i>Cypricardella</i>	Krajewski and Williams, 1971; Sutton et al., 1970; Sutton and McGhee, 1985
-75.75	41.75	Inner shelf	Tracks, trails, burrows		<i>Cypricardella</i>	Krajewski and Williams, 1971; Sutton et al., 1970; Sutton and McGhee, 1985

-75.25	41.75	Tidal flat	Krajewski and Williams, 1971; Sutton et al., 1970; Woodrow, 1985
-74.75	41.75	Alluvial plain	Krajewski and Williams, 1971; Sutton et al., 1970; Woodrow, 1985
-74.25	41.75	Alluvial plain	Krajewski and Williams, 1971; Sutton et al., 1970; Woodrow, 1985
-80.25	41.25		
-79.75	41.25		
-79.25	41.25		
-78.75	41.25		
-78.25	41.25		
-77.75	41.25		
-77.25	41.25		
-76.75	41.25		
-76.25	41.25		
-75.75	41.25		
-75.25	41.25		
-74.75	41.25		
-78.25	40.75		
-77.75	40.75		
-77.25	40.75		
-76.75	40.75		
-76.25	40.75		
-75.75	40.75		
-75.25	40.75		
-78.75	40.25		

Appendix 1.2. (Continued)

Longitude	Latitude	Depositional environment	Ichnofacies/ bioturbation	Oxygenation	Biofacies	Reference
-78.25	40.25					
-77.75	40.25					
-77.25	40.25	Shelf, turbidite flows	Low overall, higher in intervals		Crinoids, brachs, bivalves, gast in siltst.	
-76.75	40.25					
-76.25	40.25					
-75.75	40.25					
-78.75	39.75	Turbidite basin		Good		Dennison et al., 1979
-78.25	39.75					Dennison, 1985
-77.75	39.75					Dennison, 1985
-79.75	39.25					Dennison, 1985; Dennison et al., 1979
-79.25	39.25	Turbidite basin				Dennison, 1985
-78.75	39.25					Dennison, 1985
-78.25	39.25					Dennison, 1985
-77.75	39.25					Dennison, 1985
-79.75	38.75	Turbidite basin				Dennison, 1985; Dennison et al., 1979
-79.25	38.75	Turbidite basin				Dennison, 1985; Dennison et al., 1979

-78.75	38.75	Turbidite basin			Dennison, 1985
-78.25	38.75				Dennison, 1985
-80.25	38.25				Dennison, 1985
-79.75	38.25	Turbidite basin			Dennison, 1985; Dennison et al., 1979
-79.25	38.25				Dennison, 1985; Dennison et al., 1979
-78.75	38.25				Dennison, 1985; Dennison et al., 1979
-80.75	37.75				Dennison, 1985
-80.25	37.75				Dennison, 1985
-79.75	37.75				Dennison, 1985; Lundegard et al., 1985
-79.25	37.75				Dennison, 1985
-81.25	37.25				
-80.75	37.25				Lundegard et al., 1985
-80.25	37.25	Delta front, turbidite slopes	Low, vertical burrows	Good	Lundegard et al., 1985
-79.75	37.25				
-81.75	36.75				Lundegard et al., 1985

Appendix 1.3. Raw environmental base data for the *linguiformis* Zone.

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style/ thickness	Substrate type	Water depth
-78.75	42.75	Hanover Fm; 10% calc., grey sh 75%, siltst 15%, few sst	73	13	4	10	Distal turbidites, concretions	Thin 90% to moderate 10%	Muddy to silty	Below SWB
-78.25	42.75	Wiscony Fm & Hanover; grey sh 30%, silt 60%, sst 5%, lst 5%	30	60	5	5	Turbidites (more proximal), calc. concretions	Thin 50% to moderate 50%	Mainly silty	Near to above SWB
-77.75	42.75	Wiscony Fm; calc silt 20%, fine sst 60%, gray shale 20%, thin lst 5%	25	60	20	5	No HCS	Silt = massive; moderate 80% to thick 20%	Silty to sandy	Above SWB to near or above FWWB
-77.25	42.75	Wiscony; grey to green, sst 52%; mudst 24%, sh 14%, siltst 4%	24	28	52	0	x-beds, current ripples	Moderate	Muddy and sandy	Above SWB to below FWWB
-76.75	42.75	Wiscony; sst 43%; mudst 18%, sh 51%, siltst 3%	69	3	43	0	Current ripples	Moderate	Muddy and sandy	Above SWB to below FWWB
-76.25	42.75	Manfield Sh and sst; 40% sh, 60% sst	40	0	60	0	x-bedding, parting lineation, oscillation ripples, load casts	Thin to thick	Muddy and sandy	Above FWWB to subtidal
-75.75	42.75	Slide Mountain; Catskill Facies, sst, redbeds	15	10	75	0	Thick x-beds, shallow channels	Thick	Sandy	Subaerial to fluvial

-75.25	42.75	Slide Mountain; Catskill Facies, sst, redbeds	10	10	80	0	Thick x-beds, shallow channels	Thick	Sandy	Subaerial to fluvial
-74.75	42.75	Slide Mountain; Catskill Facies, sst, redbeds	5	5	90	0	Thick x-beds, shallow channels	Thick	Sandy	Subaerial to fluvial
-74.25	42.75	Slide Mountain; Catskill Facies, sst, redbeds	3	2	95	0	Thick x-beds, shallow channels	Thick	Sandy	Subaerial to fluvial
-73.75	42.75	eroded								
-80.25	42.25	Hanover Sh; grey sh w/ dk grey sh and silst and lst	85	7	0	8	Calcareous nodules	Thin	Muddy	Below SWB
-79.75	42.25	Hanover Sh; grey sh w/ dk grey sh and silst and lst	85	7	0	8	Calcareous nodules	Thin	Muddy	Below SWB
-79.25	42.25	Hanover Sh; grey sh w/ dk grey sh and silst and lst	85	7	0	8	Calcareous nodules	Thin	Muddy	Below SWB
-78.75	42.25	Hanover Sh; grey sh w/ dk grey sh and silst and lst	73	13	4	10	Distal turbidities, concretions	Thin (90%), moderate (10%)	Muddy	Below SWB
-78.25	42.25	Hanover (type section); med gray to med green-gr calc sh and mudrock	70	10	5	15	lst concretions	Thin 95% to moderate 5%	Muddy	Below SWB to above SWB
-77.75	42.25	Wisconoy and Hanover, shale, silst, sandst	40	35	25	0	Flute casts, cuspidate ripples, turbidite deposits	Thin to moderate	Muddy to silty	Below SWB to near FWWB

Appendix 1.3. (Continued)

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style/ thickness	Substrate type	Water depth
-77.25	42.25	Wiscoy; med-dk gray and dk green-gray silst and fine sst	20	40	40	0	HCS, bed rolls	Moderate	Silty to sandy	Above SWB to below FWWB
-76.75	42.25	Wiscoy	40	5	55	0	Groove and flute casts	Moderate	Muddy to sandy	Above SWB to below FWWB
-76.25	42.25	Manfield Sh and sst; 40% sh, 60% sst	40	0	60	0	x-bedding, parting lineation, oscillation ripples, load casts	Thin to thick	Muddy and sandy	Above FWWB to subtidal
-75.75	42.25	Slide Mountain; Catskill Facies, sst, redbeds	15	10	75	0	Thick x-beds, shallow channels	Thick	Sandy	Subaerial to fluvial
-75.25	42.25	eroded								
-74.75	42.25	eroded								
-74.25	42.25	eroded								
-73.75	42.25	eroded								
-80.25	41.75	Hanover Sh; grey sh w/ dk grey sh and silst and lst	85	7	0	8	Calcareous nodules	Thin	Muddy	Below SWB
-79.75	41.75	Hanover Sh; grey sh w/ dk grey sh and silst and lst	85	7	0	8	Calcareous nodules	Thin	Muddy	Below SWB
-79.25	41.75	Hanover Sh; grey sh w/ dk grey sh and silst and lst	85	7	0	8	Calcareous nodules	Thin	Muddy	Below SWB

-78.75	41.75	Hanover Sh; grey sh w/ dk grey sh and siltst and lst	73	13	4	10	Distal turbidites, concretions	Thin (90%), moderate (10%)	Muddy	Below SWB
-78.25	41.75	Hanover-Wiscoy; sst 15%; mudst 18%; sh 59%, siltst 8%	77	8	15	0		Thin to moderate	Muddy	Above SWB and below FWWB
-77.75	41.75	Hanover-Wiscoy; sst 15%; mudst 18%; sh 59%, siltst 8%	77	8	15	0		Thin to moderate	Muddy	Above SWB and below FWWB
-77.25	41.75	Wiscoy; sst 52%; mudst 24%, sh 14%, siltst 4%	38	4	52	0	Current ripples	Moderate	Muddy and sandy	Above SWB to below FWWB
-76.75	41.75	Wiscoy; sst 43%; mudst 18%, sh 51%, siltst 3%	69	3	43	0	Current ripples	Moderate	Muddy and sandy	Above SWB to below FWWB
-76.25	41.75	Manfield Sh and sst; 40% sh, 60% sst	40	0	60	0	x-bedding, parting lineation, oscillation ripples, load casts	Thin to thick	Muddy and sandy	Above FWWB to subaerial
-75.75	41.75	Slide Mountain, red siltstone 40, sst 60%	5	20	75	0	Trough cross beds, ripples	Thick	Sandy	Above FWWB to subaerial
-75.25	41.75	Eroded								
-74.75	41.75	Eroded								
-74.25	41.75	Eroded								
-80.25	41.25	Eroded								
-79.75	41.25	Eroded								
-79.25	41.25	Eroded								
-78.75	41.25	Eroded								
-78.25	41.25	Eroded								
-77.75	41.25	Eroded								
-77.25	41.25									
-76.75	41.25									

Appendix 1.3. (Continued)

Longitude	Latitude	Grain size/rock type	% Mud	% Silt	% Sand	% ls	Sedimentary structures	Bedding style/ thickness	Substrate type	Water depth
-76.25	41.25	Trimmers Rock Fm, silty sh, sst, siltst, gray, olive-green, brown	45	40	13	2	x-beds, laminated, load structures	Thin	Silty	Below SWB
-75.75	41.25									
-75.25	41.25	Trimmers Rock, type I, coarse sst to fine; lt to dk gray	15	82	3	0	Load casts, eroded bases	Thin to moderate	Silty	Below SWB
-74.75	41.25	Trimmers Rock, type I, coarse sst to fine; mod to light gray	8	90	2	0	Load casts, few x-beds, planar, graded beds to massive	Thin to moderate	Silty	Below SWB
-78.25	40.75	Trimmers Rock, Type I, dk. Brown, red, lt. Grey silty shale facies	30	45	25	2	x-beds, load casts, pillows, HCS	Thin	Silty to sandy	Within SWB
-77.75	40.75	Trimmers Rock, silty sh and sst	35	50	15	0	x-beds, flaser bedding, wavy beds, HCS	Thin to thick	Silty	Within SWB
-77.25	40.75	Trimmers Rock Fm, Type I (80%), type II (20%), grey, olive, red, sst and mudst	39	51	10	0	Cross beds, load casts, some is	Thin to moderate	Muddy and sandy	Below SWB

-76.75	40.75	Trimmers Rock, Type I and II, green-olive	36	50	14	0	x-beds, load casts, scour bases	Thin	Muddy to silty	Below SWB
-76.25	40.75	Trimmers Rk/Catskill, Type I sst and sh, lt. Gray, olive, & lt. Brown	15	79	5	1	Load structures, laminated	Thin	Muddy to silty	Below SWB
-75.75	40.75	Trimmers Rock, silty sh and sst	10	82	8	0	Fining upward	Thin	Silty	Below SWB
-75.25	40.75	Trimmer Rock, silty and silty sh, few sst	8	82	10	0	Bouma sequences, load structures, etc.	Thin to moderate	Silty	Below SWB
-78.75	40.25	Trimmers Rock, siltst to shale and sst	25	20	55	0		Thin	Silty to sandy	Below SWB
-78.25	40.25	Trimmers Rock, Type I, green/red/ lt. gray shale and sst	25	20	55	0	x-beds, loads	Thin	Sandy and muddy	Below SWB
-77.75	40.25									
-77.25	40.25	Trimmers Rock Fm., dk to lt olive, brn, red, siltst to silty sh, top= green shale	60	30	10	0	Load casts, graded beds, flute casts	Thin to moderate	Muddy	Between SWB and FWB
-76.75	40.25	Trimmer Rock Fm, sst to shale, red, olive, lt brown, gray	70	20	1	0	Load casts, snowballs	Thin to moderate	Muddy	Below SWB
-76.25	40.25	Trimmers Rock Fm, shales to type I sst	39	56	5	0	x-beds, load casts, eroded base, laminated beds	Thin to moderate	Muddy to silty	Below SWB

-79.25	38.75	Foreknobs Fm: Pound sst.; fine to med yellow-gray sst	Cross beds	Thick	Sandy	Above SWB to intertidal zone
-78.75	38.75	exposed				
-78.25	38.75	exposed				
-80.25	38.25	Brallier				
-79.75	38.25	Foreknobs Fm: Pound sst.; yellow-gray sst	Cross beds	Thick	Sandy	Above SWB to intertidal zone
-79.25	38.25	Foreknobs Fm: Pound sst.; yellow-gray sst	Cross beds	Thick	Sandy	Above SWB to intertidal zone
-78.75	38.25	exposed				
-80.75	37.75	"Portage" gray shale				
-80.25	37.75	Brallier silt				
-79.75	37.75	Chemung				
-79.25	37.75	Catstill				
-81.25	37.25	"Portage" gray shale				
-80.75	37.25	"Portage" gray shale				
-80.25	37.25	Brallier				
-79.75	37.25	Chemung				

Appendix 1.3. Raw environmental base data for the *linguiformis* Zone.

Longitude	Latitude	Depositional environment	Ichnofacies/ bioturbation	Oxygenation	Biofacies	Reference
-78.75	42.75	Proximal basin	Gutter casts, escape burrows		Gast, carb. plants, crinoids, pteriods, ammonites, cephalopods	Jacobi and Smith, 1999; Over, 1997; Sutton and McGhee, 1985; deWitt, 1960; Smith and Jacobi, 2000; Pepper and deWitt, 1950
-78.25	42.75	Shelf to lower shoreface	<i>Skolithos</i> to offshore		<i>Ambocoelia</i> , <i>Cariniferella</i>	Jacobi and Smith, 1999; Over, 1997 Sutton and McGhee, 1985
-77.75	42.75	Lower shoreface to lagoon	<i>Skolithos</i> ; <i>Arenicolites</i> / <i>Teichichnus</i>		Fossils scarce, <i>Ambocoelia</i> , <i>Cariniferella</i>	Jacobi and Smith, 1999; Over, 1997; Sutton and McGhee, 1985
-77.25	42.75	Middle shelf			<i>Tylothyris-Schizophoria</i>	McGhee and Sutton, 1981
-76.75	42.75	Inner shelf			<i>Cyrtospirifer-Douvillina</i>	McGhee and Sutton, 1981
-76.25	42.75	Nearshore marine, estuary, lagoon, distributary mouth bar	Tracks and trails		<i>Cyrtospirifer-Douvillina</i>	inferred
-75.75	42.75	Alluvial fans	Root traces	Subaerial		Woodrow, 1985
-75.25	42.75	Alluvial fans	Root traces	Subaerial		Woodrow, 1985
-74.75	42.75	Alluvial fans	Root traces	Subaerial		Woodrow, 1985
-74.25	42.75	Alluvial fans	Root traces	Subaerial		Woodrow, 1985
-73.75	42.75					
-80.25	42.25	Proximal basin	Low	Low	Conodonts and ammonites	inferred
-79.75	42.25	Proximal basin	Low	Low	Conodonts and ammonites	inferred
-79.25	42.25	Proximal basin	Low	Low	Conodonts and ammonites	Jacobi and Smith, 1999; Metzger et al., 1974; Tesmer, 1974; Leighton, 2000; McGhee and Sutton, 1981

-78.75	42.25	Shelf to lower shelf	<i>Skolithos</i> to offshore		<i>Ambocoelia</i> , <i>Cariniferella</i>	Jacobi and Smith, 1999; Metzger et al., 1974; Tesmer, 1974; Leighton, 2000; McGhee and Sutton, 1981
-78.25	42.25	Shelf, slope, and basin	<i>Cruziana</i>		Ammonites, <i>Ambocoelia</i> , <i>Cariniferella</i>	Smith and Jacobi, 2000; Jacobi and Smith, 1999; Tesmer, 1974; Leighton, 2000; McGhee and Sutton, 1981
-77.75	42.25	Distal slope, open shelf, inner platform to lower shoreface	<i>Cruziana/Skolithos</i>		Brachs, gast, bivalves, <i>Ambocoelia</i> , <i>Cariniferella</i>	deWitt, 1960; McGhee and Sutton, 1981; Leighton, 2000; Jacobi and Smith, 1999; Metzger et al., 1974
-77.25	42.25	Nearshore to inner platform; open shelf, prodelta, inner & outer platform	<i>Zoophycus/Skolithos</i>		Rugose corals, <i>Tylothyris-Schizophoria</i>	deWitt, 1960; McGhee and Sutton, 1981; Leighton, 2000; Jacobi and Smith, 1999; Metzger et al., 1974
-76.75	42.25	Middle shelf			<i>Cyrtospirifer-Douvillina</i> , <i>Tylothyris-Schizophoria</i>	Woodrow, 1985
-76.25	42.25	Nearshore marine, estuary, lagoon, distributary mouth bar	Tracks and trails		<i>Cyrtospirifer-Douvillina</i>	
-75.75	42.25	Alluvial fans	Root traces	Subaerial		Krajecski and Williams, 1971; Woodrow, 1985

Appendix 1.3. (Continued)

Longitude	Latitude	Depositional environment	Ichnofacies/ bioturbation	Oxygenation	Biofacies	Reference
-75.25	42.25					Krajewski and Williams, 1971
-74.75	42.25					Krajewski and Williams, 1971
-74.25	42.25					Krajewski and Williams, 1971
-73.75	42.25					Krajewski and Williams, 1971
-80.25	41.75	Proximal basin	Low	Low	Conodonts and ammonites	inferred
-79.75	41.75	Proximal basin	Low	Low	Conodonts and ammonites	inferred
-79.25	41.75	Proximal basin	Low	Low	Conodonts and ammonites	inferred
-78.75	41.75	Shelf to lower shelf	<i>Skolithosto</i> offshore		<i>Ambocoelia, Cariniferella</i>	inferred
-78.25	41.75	Outer shelf	<i>Cruziana</i>		<i>Ambocoelia-Cariniferella</i>	McGhee and Sutton, 1981
-77.75	41.75	Outer shelf	<i>Cruziana</i>		<i>Ambocoelia-Cariniferella</i>	McGhee and Sutton, 1981
-77.25	41.75	Middle shelf			<i>Tylothyris-Schizophoria</i>	McGhee and Sutton, 1981
-76.75	41.75	Inner shelf			<i>Cyrtospirifer-Douvillina</i>	McGhee and Sutton, 1981
-76.25	41.75	Inner shelf, nearshore marine, estuary, lagoon, distributary mouth bar	Tracks and trails		<i>Cyrtospirifer-Douvillina</i>	McGhee and Sutton, 1981
-75.75	41.75	Beach, tidal flat	Some burrows in red siltst		None	Krajewski and Williams, 1971; Woodrow, 1985
-75.25	41.75					Krajewski and Williams, 1971
-74.75	41.75					Krajewski and Williams, 1971
-74.25	41.75					Krajewski and Williams, 1971
-80.25	41.25					Krajewski and Williams, 1971

-79.75	41.25					Krajewski and Williams, 1971
-79.25	41.25					
-78.75	41.25					
-78.25	41.25					
-77.75	41.25					
-77.25	41.25					
-76.75	41.25					
-76.25	41.25	Distal slope to proximal basin floor	Some		Isolated	Frakes, 1964
-75.75	41.25					Schultz, 1974
-75.25	41.25	Shelf slope	Common	Good	Isolated fossils	Frakes, 1964; Schultz, 1974
-74.75	41.25	Turbidites stacked, shelf slope	Common	Good	Isolated fossils	Frakes, 1964; Schultz, 1974
-78.25	40.75	Shallow marine, prodelta, subtidal		Good		Frakes, 1964; Rahmanian, 1979; Williams and Slingerland, 1985
-77.75	40.75	Shallow marine, subtidal, shelf	Common			Rahmanian, 1979; Williams and Slingerland, 1985
-77.25	40.75	Shelf slope to basin floor	Common		Sparse fossils	Frakes, 1964
-76.75	40.75	Shelf slope to basin floor	Common		Sparse fossils	Frakes, 1964
-76.25	40.75	Basinal or distal slope	Common		Sparse fossils	Frakes, 1964; Schultz, 1974
-75.75	40.75	Slope	Common		In lenses	Frakes, 1964; Schultz, 1974
-75.25	40.75	Slope				Frakes, 1964; Schultz, 1974
-78.75	40.25	Slope to basin				Rahmanian, 1979
-78.25	40.25	Distal slope and basinal floor				Frakes, 1964; Rahmanian, 1979

Appendix 1.3. (Continued)

Longitude	Latitude	Depositional environment	Ichnofacies/ bioturbation	Oxygenation	Biofacies	Reference
-77.75	40.25					
-77.25	40.25	Shelf, turbidite flows	Overall low, higher in intervals	High	Crinoid columnals, brachs & bivalves, gastropods	Frakes, 1964
-76.75	40.25	Platform slope	Common		Sparse fossils	Frakes, 1964
-76.25	40.25	Platform slope	Common		Sparse fossils	Frakes, 1964
-75.75	40.25					
-78.75	39.75	Shallow marine to beach, prodelta, slope				Rahmanian, 1979, Dennison, 1979
-78.25	39.75	Shallow marine to distal platform				Frakes, 1964; Rahmanian, 1979
-77.75	39.75					
-79.75	39.25					
-79.25	39.25	Nearshore bar sands	<i>Skolithos</i>	High	<i>Cyrtospirifer-Camarotoechia</i> ; crinoids, brach, plant stems	McGhee, 1976; McGhee and Sutton, 1981; Dennison et al., 1979
-78.75	39.25	Nearshore bar sands	<i>Skolithos</i>	High	<i>Cyrtospirifer-Camarotoechia</i>	McGhee, 1976; McGhee and Sutton, 1981; Dennison, et al., 1979
-78.25	39.25	Nearshore bar sands	<i>Skolithos</i>	High	<i>Cyrtospirifer-Camarotoechia</i>	McGhee, 1976; McGhee and Sutton, 1981
-77.75	39.25					
-79.75	38.75					Dennison, 1985

-79.25	38.75	Nearshore bar sands	<i>Skolithos</i>	High	<i>Cyrtospirifer-Camarotoechia</i> , <i>Schizophoria</i> , <i>Atrypa</i>	McGhee, 1976; McGhee and Sutton, 1981; Dennison, et al., 1979; Dennison, 1985
-78.75	38.75					Dennison, 1985
-78.25	38.75					Dennison, 1985
-80.25	38.25					Dennison, 1985
-79.75	38.25	Nearshore bar sands	<i>Skolithos</i>	High	<i>Cyrtospirifer-Camarotoechia</i>	McGhee, 1976; McGhee and Sutton, 1981; Dennison, et al., 1979; Dennison, 1985
-79.25	38.25	Nearshore bar sands	<i>Skolithos</i>	High	<i>Cyrtospirifer-Camarotoechia</i>	McGhee, 1976; McGhee and Sutton, 1981; Dennison, 1985
-78.75	38.25					Dennison, 1985
-80.75	37.75					Dennison, 1985
-80.25	37.75					Dennison, 1985
-79.75	37.75					Dennison, 1985
-79.25	37.75					Dennison, 1985
-81.25	37.25					Dennison, 1985
-80.75	37.25					Dennison, 1985
-80.25	37.25					Dennison, 1985
-79.75	37.25					Dennison, 1985

Appendix 2. Species occurrence data used in the GARP modeling analysis.

Appendix 2.1 Occurrence data points of species extant during the Lower *varcus* Zone.

Species	Longitude	Latitude
<i>Athyris cora</i>	-76.42	42.71
<i>Athyris cora</i>	-76.11	42.80
<i>Athyris cora</i>	-75.92	42.82
<i>Athyris cora</i>	-75.53	42.82
<i>Athyris cora</i>	-78.78	42.65
<i>Athyris cora</i>	-75.91	42.88
<i>Athyris spiriferiodes</i>	-77.30	42.88
<i>Athyris spiriferiodes</i>	-77.90	42.77
<i>Athyris spiriferiodes</i>	-76.53	42.55
<i>Athyris spiriferiodes</i>	-77.90	42.77
<i>Athyris spiriferiodes</i>	-77.44	42.23
<i>Athyris spiriferiodes</i>	-78.88	42.75
<i>Athyris spiriferiodes</i>	-78.67	42.77
<i>Athyris spiriferiodes</i>	-78.37	42.88
<i>Athyris spiriferiodes</i>	-78.52	42.85
<i>Athyris spiriferiodes</i>	-78.23	42.90
<i>Athyris spiriferiodes</i>	-76.58	42.97
<i>Athyris spiriferiodes</i>	-78.20	42.15
<i>Athyris spiriferiodes</i>	-74.77	42.60
<i>Athyris spiriferiodes</i>	-75.53	42.82
<i>Athyris spiriferiodes</i>	-77.30	42.88
<i>Athyris spiriferiodes</i>	-76.90	40.34
<i>Cariniferella carinata</i>	-77.30	42.88
<i>Cariniferella carinata</i>	-78.37	42.88
<i>Cariniferella carinata</i>	-74.86	42.38
<i>Cariniferella carinata</i>	-75.88	42.77
<i>Cariniferella carinata</i>	-76.53	42.55
<i>Cariniferella carinata</i>	-77.90	42.77
<i>Cariniferella carinata</i>	-77.28	42.83
<i>Cariniferella carinata</i>	-76.27	42.17
<i>Cariniferella carinata</i>	-75.74	42.71
<i>Cariniferella carinata</i>	-78.88	42.75
<i>Cariniferella carinata</i>	-83.73	42.77
<i>Cariniferella carinata</i>	-78.77	42.88
<i>Cariniferella carinata</i>	-78.35	42.90
<i>Cariniferella carinata</i>	-78.23	42.90
<i>Cariniferella carinata</i>	-78.10	42.92
<i>Cariniferella carinata</i>	-78.28	42.92
<i>Cariniferella carinata</i>	-76.55	42.53
<i>Cariniferella carinata</i>	-75.18	42.62
<i>Cariniferella carinata</i>	-78.83	42.70
<i>Cariniferella carinata</i>	-75.53	42.72
<i>Cariniferella carinata</i>	-77.30	42.88

Appendix 2.1 (Continued)

Species	Longitude	Latitude
<i>Cypricardella bellistriata</i>	-75.18	42.62
<i>Cypricardella bellistriata</i>	-78.67	42.77
<i>Cypricardella bellistriata</i>	-76.74	42.95
<i>Cypricardella bellistriata</i>	-76.95	40.47
<i>Leptodesma (Leiopteria) spinerigum</i>	-75.25	42.81
<i>Leptodesma (Leiopteria) spinerigum</i>	-78.73	39.67
<i>Leptodesma (Leiopteria) spinerigum</i>	-75.92	42.82
<i>Leptodesma (Leiopteria) spinerigum</i>	-75.52	42.53
<i>Leptodesma (Leiopteria) spinerigum</i>	-75.62	42.82
<i>Mucrospirifer mucronatus</i>	-78.10	42.92
<i>Mucrospirifer mucronatus</i>	-74.86	42.38
<i>Mucrospirifer mucronatus</i>	-77.90	42.77
<i>Mucrospirifer mucronatus</i>	-77.28	42.83
<i>Mucrospirifer mucronatus</i>	-78.77	42.88
<i>Mucrospirifer mucronatus</i>	-78.23	42.90
<i>Mucrospirifer mucronatus</i>	-78.10	42.92
<i>Mucrospirifer mucronatus</i>	-78.10	42.92
<i>Mucrospirifer mucronatus</i>	-78.97	42.72
<i>Palaeoneilo constricta</i>	-78.76	39.61
<i>Palaeoneilo constricta</i>	-78.54	39.52
<i>Palaeoneilo constricta</i>	-78.73	39.67
<i>Palaeoneilo constricta</i>	-75.50	42.64
<i>Palaeoneilo constricta</i>	-75.57	42.69
<i>Palaeoneilo constricta</i>	-77.02	42.76
<i>Palaeoneilo constricta</i>	-78.78	42.65
<i>Palaeoneilo constricta</i>	-74.31	42.67
<i>Palaeoneilo constricta</i>	-76.42	42.71
<i>Palaeoneilo constricta</i>	-75.62	42.82
<i>Palaeoneilo constricta</i>	-76.74	42.95
<i>Palaeoneilo constricta</i>	-78.44	40.39
<i>Palaeoneilo constricta</i>	-76.95	40.47
<i>Paracyclas lirata</i>	-74.77	42.60
<i>Paracyclas lirata</i>	-78.09	39.68
<i>Paracyclas lirata</i>	-74.86	42.38
<i>Paracyclas lirata</i>	-75.18	42.48
<i>Paracyclas lirata</i>	-75.09	42.53
<i>Paracyclas lirata</i>	-74.86	42.38
<i>Paracyclas lirata</i>	-75.53	42.82
<i>Paracyclas lirata</i>	-78.04	39.86
<i>Paracyclas lirata</i>	-76.95	40.47
<i>Spinatrypa spinosa</i>	-74.77	42.60
<i>Spinatrypa spinosa</i>	-77.77	42.73
<i>Spinatrypa spinosa</i>	-78.67	42.77
<i>Spinatrypa spinosa</i>	-76.53	42.01
<i>Spinatrypa spinosa</i>	-75.09	42.53

Appendix 2.1 (Continued)

Species	Longitude	Latitude
<i>Spinatrypa spinosa</i>	-76.42	42.71
<i>Spinatrypa spinosa</i>	-76.11	42.80
<i>Spinatrypa spinosa</i>	-76.05	42.83
<i>Spinatrypa spinosa</i>	-76.53	42.55
<i>Spinatrypa spinosa</i>	-76.42	42.71
<i>Spinatrypa spinosa</i>	-78.97	42.72
<i>Spinatrypa spinosa</i>	-77.90	42.77
<i>Spinatrypa spinosa</i>	-77.90	42.77
<i>Spinatrypa spinosa</i>	-78.81	42.77
<i>Spinatrypa spinosa</i>	-75.43	42.80
<i>Spinatrypa spinosa</i>	-78.18	43.00
<i>Spinocyrtia granulosa</i>	-78.78	42.65
<i>Spinocyrtia granulosa</i>	-78.97	42.72
<i>Spinocyrtia granulosa</i>	-77.03	42.75
<i>Spinocyrtia granulosa</i>	-78.67	42.77
<i>Spinocyrtia granulosa</i>	-78.98	42.81
<i>Spinocyrtia granulosa</i>	-78.37	42.88
<i>Spinocyrtia granulosa</i>	-78.78	42.65

Appendix 2.2 Occurrence data points of species extant during the *punctata* Zone.

Species	Longitude	Latitude
<i>Cupularostrum exima</i>	-76.72	42.03
<i>Cupularostrum exima</i>	-76.72	42.03
<i>Cupularostrum exima</i>	-76.42	42.22
<i>Cupularostrum exima</i>	-76.42	42.22
<i>Cupularostrum exima</i>	-75.87	42.33
<i>Cupularostrum exima</i>	-76.30	42.38
<i>Eoschizodus chemungensis</i>	-76.57	42.02
<i>Eoschizodus chemungensis</i>	-77.98	42.17
<i>Eoschizodus chemungensis</i>	-75.54	42.31
<i>Eoschizodus chemungensis</i>	-75.54	42.31
<i>Eoschizodus chemungensis</i>	-75.31	42.33
<i>Goniophora chemungensis</i>	-76.73	42.02
<i>Goniophora chemungensis</i>	-76.57	42.02
<i>Goniophora chemungensis</i>	-76.72	42.03
<i>Goniophora chemungensis</i>	-76.72	42.03
<i>Goniophora chemungensis</i>	-76.72	42.03
<i>Goniophora chemungensis</i>	-76.72	42.03
<i>Goniophora chemungensis</i>	-76.72	42.03
<i>Goniophora chemungensis</i>	-76.72	42.03
<i>Goniophora chemungensis</i>	-76.72	42.03
<i>Goniophora chemungensis</i>	-76.72	42.03
<i>Goniophora chemungensis</i>	-75.87	42.33
<i>Goniophora chemungensis</i>	-76.05	42.79
<i>Grammysia elliptica</i>	-76.73	42.03
<i>Grammysia elliptica</i>	-76.72	42.03
<i>Grammysia elliptica</i>	-76.72	42.03
<i>Grammysia elliptica</i>	-76.72	42.03
<i>Grammysia elliptica</i>	-76.72	42.03
<i>Grammysia elliptica</i>	-76.72	42.03
<i>Grammysia elliptica</i>	-78.05	42.27
<i>Grammysia elliptica</i>	-75.57	42.30
<i>Grammysia elliptica</i>	-75.54	42.31
<i>Grammysia elliptica</i>	-75.87	42.33
<i>Grammysia elliptica</i>	-75.50	42.36
<i>Leptodesma (Leioptera) nitida</i>	-76.57	42.02
<i>Leptodesma (Leioptera) nitida</i>	-76.57	42.02
<i>Leptodesma (Leioptera) nitida</i>	-76.72	42.03
<i>Leptodesma (Leioptera) nitida</i>	-76.72	42.03
<i>Leptodesma (Leioptera) nitida</i>	-76.72	42.03
<i>Leptodesma (Leioptera) nitida</i>	-76.72	42.03
<i>Leptodesma (Leioptera) nitida</i>	-76.72	42.03
<i>Leptodesma (Leioptera) nitida</i>	-77.98	42.17
<i>Leptodesma (Leioptera) nitida</i>	-76.42	42.22
<i>Palaeoneilo constricta</i>	-76.57	42.02

Appendix 2.2 (Continued)

Species	Longitude	Latitude
<i>Palaeoneilo constricta</i>	-75.87	42.33
<i>Palaeoneilo constricta</i>	-76.40	42.37
<i>Palaeoneilo constricta</i>	-76.03	42.44
<i>Palaeoneilo constricta</i>	-76.37	42.59
<i>Praewaagenoconcha speciosa</i>	-76.57	42.02
<i>Praewaagenoconcha speciosa</i>	-76.72	42.03
<i>Praewaagenoconcha speciosa</i>	-76.72	42.03
<i>Praewaagenoconcha speciosa</i>	-78.03	42.22
<i>Praewaagenoconcha speciosa</i>	-75.57	42.30
<i>Praewaagenoconcha speciosa</i>	-75.87	42.33
<i>Praewaagenoconcha speciosa</i>	-75.87	42.33
<i>Praewaagenoconcha speciosa</i>	-75.87	42.33
<i>Ptychopteria chemungensis</i>	-76.57	42.02
<i>Ptychopteria chemungensis</i>	-76.57	42.02
<i>Ptychopteria chemungensis</i>	-76.57	42.02
<i>Ptychopteria chemungensis</i>	-76.64	42.03
<i>Ptychopteria chemungensis</i>	-76.72	42.03
<i>Ptychopteria chemungensis</i>	-75.87	42.33
<i>Tylothyris mesacostalis</i>	-76.73	42.03
<i>Tylothyris mesacostalis</i>	-76.72	42.03
<i>Tylothyris mesacostalis</i>	-75.54	42.31
<i>Tylothyris mesacostalis</i>	-75.87	42.33
<i>Tylothyris mesacostalis</i>	-75.87	42.33
<i>Tylothyris mesacostalis</i>	-76.36	42.35
<i>Tylothyris mesacostalis</i>	-76.18	42.60

Appendix 2.3 Occurrence data points of species extant during the *linguiformis* Zone.

Species	Longitude	Latitude
<i>Ambocoelia gregaria</i>	-77.50	41.88
<i>Ambocoelia gregaria</i>	-78.19	41.95
<i>Ambocoelia gregaria</i>	-76.92	42.07
<i>Ambocoelia gregaria</i>	-75.82	42.08
<i>Ambocoelia gregaria</i>	-75.93	42.17
<i>Ambocoelia gregaria</i>	-79.11	42.22
<i>Ambocoelia gregaria</i>	-76.61	42.22
<i>Ambocoelia gregaria</i>	-77.79	42.25
<i>Ambocoelia gregaria</i>	-79.10	42.29
<i>Ambocoelia umbonata</i>	-79.16	41.85
<i>Ambocoelia umbonata</i>	-76.27	42.17
<i>Ambocoelia umbonata</i>	-77.67	42.33
<i>Ambocoelia umbonata</i>	-77.55	42.27
<i>Athyris angelica</i>	-80.35	41.73
<i>Athyris angelica</i>	-77.08	41.81
<i>Athyris angelica</i>	-79.16	41.85
<i>Athyris angelica</i>	-78.07	42.22
<i>Athyris angelica</i>	-78.28	42.22
<i>Athyris angelica</i>	-77.77	42.27
<i>Athyris angelica</i>	-77.55	42.27
<i>Athyris angelica</i>	-78.18	42.30
<i>Athyris angelica</i>	-78.13	42.33
<i>Athyris angelica</i>	-77.67	42.33
<i>Athyris angelica</i>	-78.11	42.34
<i>Cariniferella carinata</i>	-77.13	41.91
<i>Cariniferella carinata</i>	-76.62	42.01
<i>Cariniferella carinata</i>	-76.73	42.02
<i>Cariniferella carinata</i>	-76.82	42.05
<i>Cariniferella carinata</i>	-76.81	42.09
<i>Cariniferella carinata</i>	-77.09	42.16
<i>Cariniferella carinata</i>	-76.50	42.25
<i>Cariniferella carinata</i>	-76.36	42.35
<i>Cariniferella tioga</i>	-76.71	41.72
<i>Cariniferella tioga</i>	-76.53	42.01
<i>Cariniferella tioga</i>	-76.53	42.01
<i>Cariniferella tioga</i>	-76.73	42.02
<i>Cariniferella tioga</i>	-77.04	42.15
<i>Cariniferella tioga</i>	-76.92	42.22
<i>Cariniferella tioga</i>	-76.61	42.22
<i>Cariniferella tioga</i>	-76.67	42.23
<i>Cariniferella tioga</i>	-76.50	42.25
<i>Cariniferella tioga</i>	-76.48	42.35
<i>Cupularostrum contracta</i>	-77.08	41.81
<i>Cupularostrum contracta</i>	-77.08	41.81

Appendix 2.3 (Continued)

Species	Longitude	Latitude
<i>Cupularostrum contracta</i>	-77.50	41.88
<i>Cupularostrum contracta</i>	-76.82	42.05
<i>Cupularostrum contracta</i>	-79.48	42.08
<i>Cupularostrum contracta</i>	-79.48	42.08
<i>Cupularostrum contracta</i>	-76.81	42.09
<i>Cupularostrum contracta</i>	-78.40	42.23
<i>Cupularostrum contracta</i>	-77.79	42.25
<i>Cupularostrum contracta</i>	-79.57	42.31
<i>Cupularostrum contracta</i>	-77.67	42.33
<i>Cupularostrum exima</i>	-76.71	41.68
<i>Cupularostrum exima</i>	-80.06	41.80
<i>Cupularostrum exima</i>	-79.20	42.02
<i>Cupularostrum exima</i>	-79.10	42.29
<i>Cupularostrum exima</i>	-75.97	42.33
<i>Cyrtospirifer chemungensis</i>	-76.52	41.92
<i>Cyrtospirifer chemungensis</i>	-77.12	42.02
<i>Cyrtospirifer chemungensis</i>	-77.12	42.02
<i>Cyrtospirifer chemungensis</i>	-77.13	42.03
<i>Cyrtospirifer chemungensis</i>	-76.42	42.07
<i>Cyrtospirifer chemungensis</i>	-76.25	42.10
<i>Douvillina cayuta</i>	-76.71	41.68
<i>Douvillina cayuta</i>	-77.08	41.81
<i>Douvillina cayuta</i>	-77.13	41.91
<i>Douvillina cayuta</i>	-77.11	41.96
<i>Douvillina cayuta</i>	-77.13	42.00
<i>Douvillina cayuta</i>	-76.62	42.01
<i>Douvillina cayuta</i>	-76.46	42.01
<i>Douvillina cayuta</i>	-76.37	42.02
<i>Douvillina cayuta</i>	-77.14	42.03
<i>Douvillina cayuta</i>	-76.72	42.03
<i>Douvillina cayuta</i>	-76.87	42.08
<i>Douvillina cayuta</i>	-76.81	42.09
<i>Douvillina cayuta</i>	-76.82	42.17
<i>Douvillina cayuta</i>	-76.61	42.22
<i>Douvillina cayuta</i>	-76.50	42.25
<i>Floweria chemungensis</i>	-79.19	41.83
<i>Floweria chemungensis</i>	-77.12	42.02
<i>Floweria chemungensis</i>	-77.13	42.03
<i>Floweria chemungensis</i>	-76.05	42.17
<i>Floweria chemungensis</i>	-75.93	42.17
<i>Floweria chemungensis</i>	-78.40	42.23
<i>Floweria chemungensis</i>	-77.79	42.25
<i>Floweria parva</i>	-80.33	42.05
<i>Floweria parva</i>	-78.07	42.22
<i>Floweria parva</i>	-78.07	42.22

Appendix 2.3 (Continued)

Species	Longitude	Latitude
<i>Floweria parva</i>	-77.55	42.27
<i>Floweria parva</i>	-78.18	42.30
<i>Leptodesma (Leptodesma) spinerigum</i>	-79.41	39.41
<i>Leptodesma (Leptodesma) spinerigum</i>	-78.84	39.63
<i>Leptodesma (Leptodesma) spinerigum</i>	-78.93	39.66
<i>Leptodesma (Leptodesma) spinerigum</i>	-76.71	41.67
<i>Leptodesma (Leptodesma) spinerigum</i>	-77.08	41.81
<i>Leptodesma (Leptodesma) spinerigum</i>	-77.08	41.81
<i>Leptodesma (Leptodesma) spinerigum</i>	-77.13	42.00
<i>Leptodesma (Leptodesma) spinerigum</i>	-76.37	42.02
<i>Leptodesma (Leptodesma) spinerigum</i>	-79.20	42.02
<i>Leptodesma (Leptodesma) spinerigum</i>	-77.14	42.03
<i>Leptodesma (Leptodesma) spinerigum</i>	-76.72	42.03
<i>Leptodesma (Leptodesma) spinerigum</i>	-80.33	42.05
<i>Leptodesma (Leptodesma) spinerigum</i>	-75.82	42.08
<i>Leptodesma (Leptodesma) spinerigum</i>	-77.09	42.16
<i>Nervostrophia nervosa</i>	-76.71	41.67
<i>Nervostrophia nervosa</i>	-76.46	42.01
<i>Nervostrophia nervosa</i>	-76.73	42.02
<i>Nervostrophia nervosa</i>	-76.57	42.02
<i>Nervostrophia nervosa</i>	-76.78	42.03
<i>Nervostrophia nervosa</i>	-76.45	42.04
<i>Nervostrophia nervosa</i>	-76.87	42.08
<i>Nervostrophia nervosa</i>	-76.55	42.20
<i>Nervostrophia nervosa</i>	-76.53	42.32
<i>Praewaagenoconcha speciosa</i>	-80.15	41.64
<i>Praewaagenoconcha speciosa</i>	-77.08	41.81
<i>Praewaagenoconcha speciosa</i>	-77.08	41.81
<i>Praewaagenoconcha speciosa</i>	-77.50	41.88
<i>Praewaagenoconcha speciosa</i>	-77.50	41.88
<i>Praewaagenoconcha speciosa</i>	-77.13	41.91
<i>Praewaagenoconcha speciosa</i>	-79.48	42.07
<i>Praewaagenoconcha speciosa</i>	-76.05	42.17
<i>Praewaagenoconcha speciosa</i>	-78.40	42.23
<i>Praewaagenoconcha speciosa</i>	-77.98	42.25
<i>Praewaagenoconcha speciosa</i>	-77.67	42.33
<i>Praewaagenoconcha speciosa</i>	-76.48	42.35
<i>Productella rectispina</i>	-80.35	41.73
<i>Productella rectispina</i>	-80.06	41.80
<i>Productella rectispina</i>	-77.08	41.81
<i>Productella rectispina</i>	-77.08	41.81
<i>Productella rectispina</i>	-79.16	41.85
<i>Productella rectispina</i>	-76.58	42.02
<i>Productella rectispina</i>	-78.18	42.30
<i>Productella rectispina</i>	-78.18	42.30

Appendix 2.3 (Continued)

Species	Longitude	Latitude
<i>Pseudatrypa devoniana</i>	-76.71	41.72
<i>Pseudatrypa devoniana</i>	-80.35	41.73
<i>Pseudatrypa devoniana</i>	-80.06	41.80
<i>Pseudatrypa devoniana</i>	-77.08	41.81
<i>Pseudatrypa devoniana</i>	-77.08	41.81
<i>Pseudatrypa devoniana</i>	-76.57	42.03
<i>Pseudatrypa devoniana</i>	-80.33	42.05
<i>Pseudatrypa devoniana</i>	-78.07	42.22
<i>Pseudatrypa devoniana</i>	-77.77	42.27
<i>Ptychopteria chemungensis</i>	-76.52	41.96
<i>Ptychopteria chemungensis</i>	-76.46	42.01
<i>Ptychopteria chemungensis</i>	-76.53	42.01
<i>Ptychopteria chemungensis</i>	-76.37	42.02
<i>Ptychopteria chemungensis</i>	-76.37	42.02
<i>Ptychopteria chemungensis</i>	-76.40	42.07
<i>Ptychopteria chemungensis</i>	-76.31	42.16
<i>Ptychopteria chemungensis</i>	-76.31	42.16
<i>Ptychopteria chemungensis</i>	-75.53	42.23
<i>Ptychopteria chemungensis</i>	-76.50	42.25
<i>Ptychopteria chemungensis</i>	-76.50	42.25
<i>Schizophoria impressa</i>	-80.35	41.73
<i>Schizophoria impressa</i>	-77.08	41.81
<i>Schizophoria impressa</i>	-77.08	41.81
<i>Schizophoria impressa</i>	-77.14	42.03
<i>Schizophoria impressa</i>	-77.13	42.03
<i>Schizophoria impressa</i>	-76.42	42.07
<i>Schizophoria impressa</i>	-76.49	42.21
<i>Schizophoria impressa</i>	-78.40	42.23
<i>Schizophoria impressa</i>	-77.55	42.27
<i>Schizophoria impressa</i>	-79.72	42.28
<i>Schizophoria impressa</i>	-78.18	42.30
<i>Schizophoria impressa</i>	-75.77	42.33
<i>Schizophoria impressa</i>	-78.11	42.34
<i>Schizophoria impressa</i>	-76.50	42.43
<i>Schizophoria impressa</i>	-76.50	42.44
<i>Spinatrypa spinosa</i>	-77.08	41.81
<i>Spinatrypa spinosa</i>	-77.50	41.88
<i>Spinatrypa spinosa</i>	-76.57	42.02
<i>Spinatrypa spinosa</i>	-77.13	42.05
<i>Spinatrypa spinosa</i>	-76.10	42.17
<i>Spinatrypa spinosa</i>	-78.07	42.22
<i>Spinatrypa spinosa</i>	-76.50	42.25
<i>Spinatrypa spinosa</i>	-77.67	42.33
<i>Strophonella hybrida</i>	-77.08	41.81
<i>Strophonella hybrida</i>	-78.07	42.22

Appendix 2.3 (Continued)

Species	Longitude	Latitude
<i>Strophonella hybrida</i>	-77.55	42.27
<i>Strophonella hybrida</i>	-78.02	42.28
<i>Strophonella hybrida</i>	-78.18	42.30
<i>Strophonella hybrida</i>	-79.16	41.85
<i>Tylothyris mesacostalis</i>	-76.71	41.72
<i>Tylothyris mesacostalis</i>	-77.30	41.75
<i>Tylothyris mesacostalis</i>	-77.08	41.81
<i>Tylothyris mesacostalis</i>	-77.10	41.84
<i>Tylothyris mesacostalis</i>	-77.50	41.88
<i>Tylothyris mesacostalis</i>	-77.50	41.88
<i>Tylothyris mesacostalis</i>	-77.13	41.91
<i>Tylothyris mesacostalis</i>	-78.19	41.95
<i>Tylothyris mesacostalis</i>	-76.62	42.01
<i>Tylothyris mesacostalis</i>	-76.46	42.01
<i>Tylothyris mesacostalis</i>	-76.53	42.01
<i>Tylothyris mesacostalis</i>	-76.33	42.02
<i>Tylothyris mesacostalis</i>	-76.64	42.03
<i>Tylothyris mesacostalis</i>	-76.61	42.22
<i>Tylothyris mesacostalis</i>	-75.53	42.23
<i>Tylothyris mesacostalis</i>	-78.40	42.23
<i>Tylothyris mesacostalis</i>	-76.50	42.25
<i>Tylothyris mesacostalis</i>	-77.79	42.25
<i>Tylothyris mesacostalis</i>	-78.16	42.31
<i>Tylothyris mesacostalis</i>	-76.48	42.35
<i>Tylothyris mesacostalis</i>	-76.10	42.17