GSA Data Repository Item # 9113

Title of article Stable-isotope stratigraphy of brachiopods from Pennsylvanian shales in Texas

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see Bulletin v. 103, p. 953 - 965

Contents

Appendix - 6 pg.

APPENDIX I. Isotopic composition (in ‰ vs. PDB) and luminscent character (LC) of area sampled on brachiopod shell. SP = specimen. When only two shells were analyzed, the difference between replicates is shown (in parenthesis) rather than ±1σ. Additional data is presented in Appendix I of Adlis et al. (1988).

INT. (cm)	GENUS	SP	$\delta^{13}C$	$\delta^{18}O$	LC	avg. $\delta^{13}C$ ±1σ	avg. $\delta^{18}O$ ±1σ
UPPER WINCHELL CYCLE							
125	*Crurithyris*	a	3.61	-2.64	NL	3.38 ±0.20	-2.86 ±0.20
		b	3.52	-2.83	NL		
		c	3.19	-3.03	NL		
		d	3.21	-2.95	NL		
	Composita	b	4.81	-2.13	NL	4.61 ±0.19	-1.97 ±0.15
		c	4.44	-1.92	NL		
		d	4.57	-1.85	NL		
105	*Crurithyris*	b	2.64	-2.20	NL	3.37 ±0.67	-2.60 ±0.48
		a'	3.54	-3.14	FLST		
		d	*3.45*	*-2.99*	F		
		e	3.94	-2.48	FLST		
	Composita	a	4.19	-1.73	NL	4.49 (0.60)	-1.82 (0.18)
		b	4.79	-1.91	NL		
	Eridmatus	c	2.99	-2.11	NL	3.07 (0.17)	-1.86 (0.50)
		d	3.16	-1.61	NL		
85	*Crurithyris*	b	3.28	-2.00	vFLSP	3.26 (0.05)	-2.10 (0.20)
		c	3.23	-2.20	vFLSP		
	Composita	b	4.96	-2.62	NL	4.49 ±0.40	-2.60 ±0.10
		c	4.34	-2.50	NL		
		a	4.19	-2.69	NL		
	Eridmatus	a	4.04	-2.59	NL	3.60 ±0.73	-2.02 ±0.40
		b	4.11	-1.97	NL		
		c	2.66	-2.24	vF BD		
		d	4.22	-1.64	NL		
		e	2.96	-1.68	NL		
75	*Crurithyris*	a	2.80	-2.29	NL	2.91 (0.21)	-2.29 (0.01)
		b	*3.34*	*-2.63*	F		
		c	3.01	-2.28	NL		
	Composita	a	4.43	-2.55	NL	4.79 ±0.40	-2.10 ±0.30
		c	5.23	-1.75	NL		
		b'	4.56	-2.09	NL		
		d	4.94	-2.00	NL		
	Eridmatus	a	2.82	-2.22	NL	2.82	-2.22
65	*Composita*	a	4.30	-2.05	vF	4.59 ±0.40	-2.09 ±0.10
		b	4.88	-2.14	NL		
	Eridmatus	a	3.64	-2.16	vF-NL	3.64	-2.16
55	*Composita*	a	4.54	-2.46	NL	4.77 ±0.50	-2.20 ±0.50
		b	5.10	-1.81	NL		
		d	4.21	-1.80	NL		
		e	5.25	-2.73	NL		
	Eridmatus	a	4.07	-2.27	NL	4.33 (0.52)	-2.29 (0.04)
		b	4.59	-2.31	NL		
45	*Crurithyris*	a	4.03	-2.13	NL	4.02 (0.03)	-2.26 (0.26)
		e	4.00	-2.39	NL		
	Composita	e	4.48	-2.69	NL	4.89 ±0.50	-2.42 ±0.30
		a	4.71	-2.44	vF BD		
		c	5.49	-2.14	NL		

35	*Crurithyris*	b	4.04	-2.59	NL	4.13 (0.18)	-2.61 (0.04)
		c	4.22	-2.63	NL		
	Composita	a	5.74	-2.11	NL	5.57 ±0.20	-2.27 ±0.20
		b	5.41	-2.51	NL		
		d	5.57	-2.18	NL		
	Eridmatus	a	3.38	-1.96	NL	3.62 ±0.20	-2.17 ±0.40
		c	3.65	-1.90	NL		
		b	3.83	-2.64	NL		
25	*Crurithyris*	a	4.37	-2.39	vF	4.01 ±0.30	-2.41 ±0.10
		b	3.93	-2.53	vF		
		c	3.74	-2.31	vFLSP		
	Composita	a	5.37	-2.01	NL	5.38 ±0.10	-2.13 ±0.20
		b	5.45	-1.97	vF		
		c	5.31	-2.40	NL		
	Eridmatus	a	3.68	-1.93	NL	3.35 ±0.31	-2.10 ±0.39
		b	3.07	-1.84	NL		
		c	*3.59*	*2.60*	F		
		d	3.31	-2.55	NL		
19	*Crurithyris*	a	2.49	-2.47	NL	2.88 (0.78)	-2.14 (0.67)
		c	*4.21*	*-2.62*	F		
		d	3.27	-1.80	NL		
	Composita	b	4.13	-2.45	NL	4.73 ±0.60	-2.07 ±0.30
		d	5.36	-1.89	NL		
		a'	4.72	-1.85	NL		
13	*Crurithyris*	a	3.42	-1.86	vF	3.64 ±0.20	-2.12 ±0.20
		c'	3.83	-2.27	NL		
		d	3.68	-2.24	vF		
	Composita	a	*4.48*	*-1.86*	F	5.43 ±0.30	-2.16 ±0.19
		b	5.09	-2.22	NL		
		d	5.66	-1.95	NL		
		e	5.55	-2.32	NL		
	Eridmatus	a	3.28	-0.52	NL	3.61 ±0.30	-1.09 ±0.50
		b	3.79	-1.41	NL		
		c	3.75	-1.33	NL		
7	*Crurithyris*	c	3.93	-2.47	vF	3.76 (0.34)	-2.66 (0.38)
		a'	3.59	-2.85	NL		
	Composita	c	4.22	-1.60	NL	4.46 ±0.21	-1.64 ±0.37
		d	4.60	-1.42	NL		
		e	4.36	-1.36	NL		
		b'	4.67	-2.18	NL		
	Eridmatus	a	3.16	-1.25	NL	3.92 ±0.10	-1.70 ±0.40
		b	4.25	-2.07	NL		
		c	3.57	-1.53	NL		
		d	4.69	-1.95	NL		
4	*Crurithyris*	a	4.10	-2.33	NL	3.78 ±0.40	-2.41 ±0.10
		b	3.92	-2.41	NL		
		e	3.32	-2.49	minor FLST		
	Composita	a	4.41	-1.44	NL	4.45 (0.07)	-1.51 (0.14)
		b	4.48	-1.58	NL		
	Eridmatus	a	3.67	-1.58	NL	3.60 (0.15)	-1.31 (0.54)
		c	3.52	-1.04	NL		
2	*Crurithyris*	b	3.21	-1.40	NL	3.65 ±0.40	-1.81 ±0.40
		c	3.83	-1.81	vF		
		e	3.90	-2.23	NL		
	Composita	a	4.62	-2.73	NL	4.62	-2.73

	Eridmatus	b	3.70	-1.85	NL	3.42 ±0.40	-1.59 ±0.70
		c'	3.70	-1.80	NL		
		d	3.35	-2.19	NL		
		e	2.94	-0.51	NL		
-325	*Composita*	a	4.18	-2.04	NL	4.18	-2.04
-340	*Crurithyris*	a	3.21	-2.07	NL	3.69 ±0.44	-2.44 ±0.51
		b	3.78	-2.23	NL		
		c	4.08	-3.02	NL		
-340	*Composita*	b	3.96	-2.46	NL		
FINIS SHALE							
Non-luminescent							
900	*Crurithyris*	a	4.16	-2.04		3.90 (0.49)	-1.90 (0.28)
		b	3.67	-1.76			
	Composita	a	5.73	-1.33	vF	5.78 (0.09)	-1.91 (1.16)
		b	5.82	-2.49	vF		
810	*Crurithyris*	a	4.08	-2.65	vFLSP	3.98 (0.21)	-2.59 (0.13)
		b	3.87	-2.52	NL		
710	*Crurithyris*	a	3.90	-2.80	NL	4.04 (0.28)	-2.78 (0.04)
		b	4.18	-2.76	NL		
610	*Crurithyris*	a	3.64	-2.61	NL	4.03 (0.78)	-2.41 (0.39)
		b	4.42	-2.22	vFLSP		
530	*Crurithyris*	b	3.93	-2.95	NL	3.93	-2.95
470	*Crurithyris*	a	3.98	-2.25	NL	4.25 (0.53)	-2.15 (0.20)
		b	4.51	-2.05	NL		
390	*Crurithyris*	a	3.93	-2.61	NL	4.07 (0.27)	-2.58 (0.05)
		b	4.20	-2.56	vF		
320	*Crurithyris*	a	3.85	-2.02	vFLSP	3.73 (0.25)	-2.41 (0.77)
		b	3.60	-2.79	NL		
0	*Crurithyris*	a	4.00	-2.56	vF	4.05 (0.11)	-2.43 (0.27)
		b	4.11	-2.29	vFLST		
	Neospirifer	a	4.20	-2.39	NL	4.12 (0.17)	-2.33 (0.12)
		b	4.03	-2.27	NL		
Luminescent							
900	*Crurithyris*	a	*3.59*	*-2.66*	L	*3.59*	*-2.66*
810	*Crurithyris*	a	*3.83*	*-2.44*	L	*3.90 (0.13)*	*-2.64 (0.40)*
		b	*3.96*	*-2.84*	L		
710	*Crurithyris*	a	*2.92*	*-3.70*	L	*2.73 (0.38)*	*-3.37 (0.67)*
		b	*2.54*	*-3.03*	L		
610	*Crurithyris*	a	*0.48*	*-3.04*	L	*1.17 (1.37)*	*-2.99 (0.11)*
		b	*1.85*	*-2.93*	L		
530	*Crurithyris*	b	*1.48*	*-4.62*	L	*1.48*	*-4.62*
470	*Crurithyris*	a	*0.04*	*-3.93*	L	*0.48 (0.88)*	*-4.28 (0.65)*
		b	*0.92*	*-3.28*	L		
390	*Crurithyris*	a	*3.46*	*-3.46*	L	*3.46*	*-3.46*
320	*Crurithyris*	a	*3.69*	*-2.42*	L	*3.69*	*-2.42*
NECESSITY CYCLE							
75	*Crurithyris*	a	3.64	-2.92	NL	3.82 (0.35)	-2.87 (0.10)
		b	3.99	-2.82	vFLSP		
	Composita	a	5.56	-2.59	NL	5.44 (0.25)	-2.62 (0.05)
		c	5.31	-2.64	NL		
	Eridmatus	a	3.73	-1.61	NL	3.73	-1.61
60	*Crurithyris*	a	3.74	-2.30	NL	3.70 (0.08)	-1.98 (0.61)

		b	3.66	-1.69	FLST		
	Composita	a	5.15	-2.68	NL	4.84 ±0.35	-2.62 ±0.46
		b	4.45	-2.13	NL		
		c	4.96	-3.04	NL		
	Eridmatus	a	3.68	-1.51	NL	3.51 ±0.23	-1.84 ±0.44
		b	3.25	-1.67	NL		
		c	3.61	-2.34	NL		
45	*Crurithyris*	a	4.51	-3.10	NL	4.51	-3.10
		b	*2.98*	*-2.50*	F		
	Composita	a	3.99	-2.50	NL	4.45 (0.91)	-2.23 (0.54)
		b	4.90	-1.96	NL		
	Eridmatus	a	3.95	-2.40	NL	3.95	-2.40
30	*Eridmatus*	a	2.76	-1.33	NL	2.95 (0.38)	-1.58 (0.49)
		b	3.14	-1.82	NL		
15	*Crurithyris*	a	2.69	-2.10	NL	2.69	-2.10
		b	*3.04*	*-3.29*	F		
		c	*2.96*	*-2.02*	F		
	Composita	a	4.32	-3.08	F BD	4.53 (0.42)	-2.86 (0.45)
		b	4.74	-2.63	F BD		
-86	*Crurithyris*	a	3.22	-2.12	NL	3.22	-2.12
	Composita	a	*4.91*	*-2.96*	F	5.39	-2.87
		b	5.39	-2.87	vF		
	Neospirifer	a	3.40	-3.63	NL	3.4	-3.63
-100	*Crurithyris*	a	*2.07*	*-3.44*	L		
	Composita	a	5.77	-2.47	NL	5.95 ±0.25	-2.44 ±0.12
		b	6.23	-2.55	vF		
		c	5.85	-2.31	NL		
	Neospirifer	a	4.29	-2.28	NL	4.29	-2.28
-115	*Composita*	b	4.51	-2.33	NL	4.51 ±0.21	-2.58 ±0.22
		c	4.31	-2.67	F, BD		
		d	4.72	-2.74	vF		
	Neospirifer	a	3.52	-2.31	vF MF	3.91 (0.79)	-2.38 (0.14)
		b	4.31	-2.45	NL		
		c	*3.99*	*-2.44*	L		
-131	*Composita*	a	4.12	-4.38	NL	4.12	-4.38
-146	*Crurithyris*	a	2.18	-2.36	vFLSP	2.18	-2.36
-162	*Crurithyris*	a	2.69	-3.06	NL	2.69	-3.06
		b	*3.29*	*-3.11*	F		
	Composita	a	3.76	-2.79	vF	3.76	-2.79
		b	*5.11*	*-2.77*	F		
	Neospirifer	a	3.48	-2.52	NL	3.71 (0.46)	-2.38 (0.28)
		b	3.94	-2.24	1,3 NL, 2,4 BD1		
-178	*Crurithyris*	a	3.41	-2.95	NL	3.67 (0.51)	-3.06 (0.22)
		b	3.92	-3.17	NL-vF		
	Composita	a	4.22	-1.00	NL	4.22 (0.01)	-2.08 (2.16)
		b	4.21	-3.16	vF BD		
	Neospirifer	a	4.06	-1.91	vF	3.85 (0.42)	-1.99 (0.16)
		b	3.64	-2.07	vF		
WAYLAND SHALE							
310	*Crurithyris*	a	4.63	-2.23	NL	4.65 (0.04)	-2.23 (0.05)
		b+c	4.67	-2.28	NL		
	Composita	a	4.11	-2.26	NL	4.76 (1.29)	-2.23 (0.06)
		b+c	5.40	-2.20	NL		
270	*Crurithyris*	a	4.67	-2.34	NL	4.39 ±0.25	-2.44 ±0.45

		b	4.30	-2.93	NL		
		c	4.20	-2.05	NL		
	Composita	a	5.27	-1.74	NL	5.23 ±0.09	-1.99 ±0.32
		b	5.30	-2.35	NL		
		c	5.13	-1.89	NL		
	Neospirifer	a	3.62	-2.11	NL	3.95 ±0.34	-2.14 ±0.37
		b	4.30	-2.52	NL		
		c	3.92	-1.78	NL-vFLSP		
220	*Crurithyris*	a	4.38	-3.01	NL	4.41 ±0.16	-2.89 ±0.10
		b	4.59	-2.86	NL		
		c	4.27	-2.81	NL		
	Composita	a	5.83	-2.86	NL	5.44 ±0.34	-2.87 ±0.90
		b	5.22	-3.77	NL		
		c	5.26	-1.98	NL		
170	*Crurithyris*	a	5.07	-2.29	NL	4.96 ±0.20	-2.39 ±0.16
		b	4.73	-2.30	NL		
		c	5.09	-2.57	NL		
	Neospirifer	a+b	4.96	-2.56	NL	4.96	-2.56
130	*Crurithyris*	a	4.05	-2.19	NL	4.08 ±0.18	-2.24 ±0.49
		b	4.28	-2.75	NL		
		c	3.92	-1.77	NL		
	Composita	a	3.29	-1.27	NL	4.57 ±1.11	-1.84 ±0.51
		b	5.16	-2.27	NL		
		c	5.26	-1.98	NL		
80	*Crurithyris*	a	5.33	-2.19	NL	5.43 ±0.09	-1.97 ±0.21
		b	5.50	-1.77	NL		
		c	5.45	-1.96	NL		
70	*Crurithyris*	a	4.57	-1.91	NL	4.95 ±0.35	-2.13 ±0.27
		b	5.02	-2.05	NL		
		c	5.26	-2.43	NL		
	Composita	a	4.96	-1.36	NL	5.61 ±0.56	-1.62 ±0.23
		b	5.93	-1.70	NL		
		c	5.94	-1.79	NL		
50	*Crurithyris*	a	3.82	-1.87	NL-vFLSP	3.82 ±0.02	-1.80 ±0.08
		b	3.84	-1.82	NL		
		c	3.80	-1.72	NL		
	Composita	a	4.63	-1.23	NL	4.44 ±0.27	-1.40 ±0.15
		b	4.13	-1.53	NL		
		c	4.57	-1.43	NL		
	Eridmatus	a	3.68	-1.62	NL	3.84 ±0.14	-1.63 ±0.02
		b	3.91	-1.66	NL		
		c	3.94	-1.62	NL		
30	*Crurithyris*	a	3.57	-2.62	NL	4.01 (0.87)	-2.32 (0.60)
		b	4.44	-2.02	NL		
	Composita	a	4.32	-1.49	NL	4.60 (0.55)	-1.55 (0.11)
		c	4.87	-1.60	NL		
	Eridmatus	a	3.73	-1.30	NL	4.07 (0.68)	-1.71 (0.81)
		b	4.41	-2.11	NL		
10	*Crurithyris*	a	3.91	-2.14	NL-FLSP	4.00 (0.18)	-2.33 (0.38)
		b	4.09	-2.52	NL		
0	*Crurithyris*	a	3.19	-1.12	NL	3.74 ±0.50	-1.72 ±0.67
		b	3.85	-1.59	NL		
		c	4.17	-2.45	NL		
	Composita	a	4.28	-2.22	NL	3.89 (0.79)	-1.82 (0.81)
		b	3.49	-1.43	NL		

Eridmatus	a	3.79	-2.50	NL	3.85 ±0.14	-1.90 ±0.53
	b	3.75	-1.69	NL-FLSP		
	c	4.01	-1.50	NL		

Key: DEGREE: BL = bright luminescence
L = luminescent
FL = faint luminescence
vFL = very faint luminescence
NL = completely non-luminescent

FEATURES: ST = luminescent streaks, usually on the order of 100 μ long
SP = luminescent specks
MF = microfractures
BD = luminescent bands

Footnotes: [1]1 through 4 are different samples from the same shell
[2]Isotopic values in italics do not meet criteria for non-luminescence and are not included in computation of mean values and isotope stratigraphy.