

**SUPPLEMENTARY MATERIAL:** “Late glacial-Holocene transition in northern Spain deduced from land snail shelly accumulations” by Yurena Yanes, Igor Gutiérrez-Zugasti and Antonio Delgado

**Appendix S1.** Shell taphonomy and body size of *Cepaea nemoralis* from northern Spain.

Individual ID	Age (cal yr BP)	Shell taphonomy					Shell size (mm)					
		Breakage	Corrasion	Coating	Color loss	TTG	A	B	C	D	E	F
MO-1	modern	0	1	0	0	1	19.47	26.12	16.69	13.33	9.84	12.19
MO-2	modern	0	0	0	0	0	17.37	24.96	15.72	12.74	9.57	11.72
MO-3	modern	0	1	0	0	1	19.10	25.99	16.50	12.95	10.97	12.75
MO-4	modern	0	0	0	0	0	19.07	24.71	16.12	12.66	10.24	12.04
MO-5	modern	0	1	0	0	1	20.83	26.84	17.48	13.46	10.07	12.69
MO-6	modern	0	0	0	0	0	18.56	25.83	15.94	12.31	10.18	11.87
MO-7	modern	0	1	0	0	1	18.01	25.53	15.59	12.88	10.82	12.70
MO-8	modern	0	0	0	0	0	18.61	24.87	15.62	12.86	9.64	12.48
MO-9	modern	0	0	0	0	0	17.57	23.95	15.26	12.35	9.34	11.73
MO-10	modern	0	0	0	0	0	18.78	25.68	15.74	12.42	10.13	12.19
MO-11	modern	0	0	0	0	0	17.05	24.12	15.47	12.19	10.91	12.16
MO-12	modern	0	0	0	0	0	17.94	26.31	15.49	13.12	10.87	13.37
AR-1	6380 ±70	0	1	0	1	2	20.59	26.89	18.03	13.64	11.55	12.38
AR-2	6380 ±70	0	1	0	1	2	18.44	25.37	15.94	12.63	9.49	10.86
AR-3	6380 ±70	0	1	0	1	2	18.74	24.68	16.09	12.48	9.65	11.24
AR-4	6380 ±70	0	1	0	1	2	17.21	24.99	15.22	12.61	9.70	10.76
AR-5	6380 ±70	0	1	0	1	2	19.78	25.62	16.35	12.85	9.53	11.61
AR-6	6380 ±70	0	1	0	1	2	17.59	25.59	15.49	12.87	10.40	11.64
AR-7	6380 ±70	0	1	0	0	1	17.47	23.95	14.99	12.08	9.57	10.84
AR-8	6380 ±70	0	1	0	0	1	19.16	26.78	16.64	12.63	9.81	11.73
AR-9	6380 ±70	0	1	0	1	2	17.53	25.50	15.80	12.81	9.84	11.60
AR-10	6380 ±70	0	1	0	1	2	17.50	24.87	15.94	12.37	9.39	11.02
AR-11	6380 ±70	0	1	0	1	2	18.06	25.23	16.11	12.84	9.70	10.98
AR-12	6380 ±70	0	1	0	1	2	18.59	25.90	15.84	12.51	10.49	10.88
AR-13	6380 ±70	0	1	0	1	2	18.55	24.57	15.63	12.86	9.05	10.73
AR-14	6380 ±70	0	1	0	1	2	19.31	25.39	16.23	13.04	10.50	12.43
AR-15	6380 ±70	0	1	0	1	2	20.21	23.87	17.48	13.60	10.48	11.04
AR-16	6380 ±70	0	1	0	1	2	18.66	25.08	15.72	12.48	10.54	11.20
AR-17	6380 ±70	0	1	0	1	2	17.35	22.61	15.23	12.12	9.18	10.13
AR-18	6380 ±70	0	1	0	1	2	17.57	24.30	15.06	12.14	9.83	11.45
AR-19	6380 ±70	0	1	0	1	2	19.17	26.90	17.06	13.66	11.40	12.45
AR-20	6380 ±70	0	1	0	1	2	18.33	25.26	15.69	12.38	9.48	11.08
AR-21	6380 ±70	0	1	0	1	2	17.59	22.98	14.58	11.58	9.07	9.97
AR-22	6380 ±70	0	1	0	1	2	16.51	22.95	14.56	11.62	8.68	10.42
AR-23	6380 ±70	0	1	0	1	2	17.17	23.49	14.55	12.09	9.16	10.55

TTG: total taphonomic grade; A=length; B=width; C=height of two last spires; D=height of last spire; E=aperture height; F=aperture width

**Appendix S1. Continued.**

Individual ID	Age cal yr BP)		Shell taphonomy					Shell size (mm)					
			Breakage	Corrasion	Coating	Color loss	TTG	A	B	C	D	E	F
AR-24	6380	±70	0	1	0	1	2	17.47	24.21	15.00	11.92	10.11	11.11
AR-25	6380	±70	0	1	0	1	2	17.68	22.98	15.31	11.63	9.38	9.95
AR-26	6380	±70	0	1	0	1	2	15.19	21.88	13.46	10.99	9.23	9.89
AR-27	6380	±70	1	1	0	1	3	15.52	25.17	15.13	12.51	9.82	12.01
AR-28	6380	±70	1	1	0	1	3	14.26	14.28	12.33	10.34	8.71	7.04
AR-29	6380	±70	1	1	0	1	3	14.19	17.49	12.25	9.86	8.89	8.36
AR-30	6380	±70	0	1	0	1	2	14.20	17.50	12.77	10.40	10.08	8.81
CB3-1	6580	±60	0	1	1	1	3	20.49	28.65	16.85	13.94	11.53	13.64
CB3-2	6580	±60	1	1	1	1	4	20.88	24.34	16.45	13.66	10.44	12.44
CB3-3	6580	±60	1	1	1	1	4	20.71	27.00	17.09	13.70	9.72	11.48
CB3-4	6580	±60	1	1	1	1	4	21.46	28.60	18.54	14.89	11.65	12.40
CB3-5	6580	±60	0	1	0	1	2	19.85	26.76	16.89	13.57	10.00	12.25
CB3-6	6580	±60	0	1	1	1	3	19.70	27.53	16.49	13.62	10.09	12.71
CB3-7	6580	±60	0	1	0	1	2	17.44	26.04	14.62	12.20	9.61	11.47
CB3-8	6580	±60	0	1	1	1	3	18.24	25.40	15.36	12.74	9.66	11.52
CB3-9	6580	±60	1	1	1	1	4	16.94	23.40	14.58	11.65	8.29	10.42
CB3-10	6580	±60	1	1	1	1	4	16.90	31.28	14.68	12.49	11.02	9.53
CB3-11	6580	±60	0	1	1	1	3	19.39	27.37	16.82	14.45	10.02	12.25
CB3-12	6580	±60	0	1	0	1	2	19.01	26.14	16.08	13.08	10.35	12.49
CB3-13	6580	±60	1	1	0	1	3	13.04	16.75	11.50	9.92	8.80	7.29
CB3-14	6580	±60	0	1	0	1	2	19.79	28.29	17.51	14.13	11.11	12.95
CB3-15	6580	±60	0	1	1	1	3	20.55	28.45	16.91	13.57	9.90	12.16
CB3-16	6580	±60	0	1	0	1	2	22.60	28.06	18.64	14.42	10.82	12.89
CB3-17	6580	±60	1	1	1	1	4	18.69	25.99	16.15	13.62	9.28	11.86
CB3-18	6580	±60	1	1	0	1	3	17.17	24.51	14.92	12.20	8.81	11.22
CB3-19	6580	±60	0	1	0	1	2	19.57	26.73	15.76	12.57	9.63	11.38
CB3-20	6580	±60	1	1	0	1	3	16.83	25.09	15.48	13.84	9.51	10.23
CB3-21	6580	±60	1	1	0	1	3	18.17	22.36	16.21	13.01	10.43	9.64
CB3-22	6580	±60	0	1	1	1	3	17.67	23.38	14.35	11.77	8.91	10.92
CR6-1	7520	±50	0	1	1	1	3	19.97	28.40	17.22	13.86	10.76	12.92
CR6-2	7520	±50	0	1	1	1	3	19.00	27.01	15.85	13.04	9.91	12.43
CR6-3	7520	±50	0	1	1	1	3	20.64	30.26	17.26	14.54	11.41	12.79
CR6-4	7520	±50	0	1	1	1	3	18.16	26.35	15.63	14.00	9.26	11.49
CR6-5	7520	±50	0	1	1	1	3	18.33	25.62	16.20	13.15	9.87	11.55
CR6-6	7520	±50	0	1	1	1	3	18.65	25.21	16.03	13.39	9.62	11.65
CR6-7	7520	±50	1	1	0	1	3	19.54	23.04	16.46	13.99	13.02	10.65
CR6-8	7520	±50	1	1	0	1	3	17.52	21.12	15.08	11.11	7.77	10.51
CR6-9	7520	±50	1	1	1	1	4	17.57	20.57	15.15	13.26	10.48	9.33

TTG: total taphonomic grade; A=length; B=width; C=height of two last spires; D=height of last spire; E=aperture height; F=aperture width

**Appendix S1. Continued.**

Individual ID	Age cal yr BP)		Shell taphonomy					Shell size (mm)					
			Breakage	Corrasion	Coating	Color loss	TTG	A	B	C	D	E	F
CR6-10	7520	±50	1	1	1	1	4	16.18	24.66	14.48	12.13	9.49	11.15
CR6-11	7520	±50	1	1	1	1	4	13.70	19.06	12.23	10.69	10.08	8.62
CR6-12	7520	±50	0	1	1	1	3	22.18	29.66	19.33	16.17	13.25	14.87
CR6-13	7520	±50	0	1	0	1	2	20.11	28.14	17.14	14.23	10.43	12.73
CR6-14	7520	±50	0	1	0	1	2	17.89	25.48	15.41	13.16	10.51	11.25
CR6-15	7520	±50	1	1	0	1	3	18.60	23.23	16.02	13.52	8.59	9.93
CR6-16	7520	±50	0	1	0	1	2	16.91	21.62	14.81	11.54	9.67	10.77
CR6-17	7520	±50	0	1	1	1	3	17.16	24.93	14.84	12.77	9.18	11.47
CR6-18	7520	±50	0	1	1	1	3	20.32	27.69	16.97	13.42	10.23	12.38
CR6-19	7520	±50	1	1	0	1	3	19.62	16.45	16.66	13.15	8.51	11.50
CR6-20	7520	±50	0	1	1	1	3	19.11	26.52	17.08	14.30	11.08	12.79
CR6-21	7520	±50	0	1	0	1	2	20.27	27.10	17.40	14.68	10.50	12.21
CR6-22	7520	±50	0	1	1	1	3	20.33	27.17	17.49	14.01	11.49	12.82
CR6-23	7520	±50	1	1	1	1	4	19.29	26.07	16.78	13.36	10.10	11.34
CR6-24	7520	±50	1	1	0	1	3	17.78	25.54	15.31	12.17	8.53	12.32
CR6-25	7520	±50	1	1	0	1	3	18.33	22.10	15.78	12.26	11.92	8.90
CR6-26	7520	±50	1	1	1	1	4	16.26	20.47	14.61	12.03	10.70	9.95
CR6-27	7520	±50	1	1	0	1	3	14.15	17.68	12.34	10.27	8.66	8.45
CR6-28	7520	±50	1	1	0	1	3	13.96	17.99	12.37	10.49	9.08	8.84
CR6-29	7520	±50	1	1	0	1	3	12.07	15.25	10.91	9.39	8.80	7.39
CR6-30	7520	±50	1	1	0	1	3	13.60	16.16	11.64	10.30	7.65	7.69
EM-1	8440	±30	0	1	0	0	1	19.22	26.45	16.41	13.17	9.85	11.41
EM-2	8440	±30	1	1	0	0	2	17.29	20.30	14.60	12.48	10.67	9.16
EM-3	8440	±30	1	1	0	0	2	14.18	18.85	13.21	10.92	9.84	8.66
EM-4	8440	±30	1	1	0	0	2	18.78	23.67	16.58	13.09	12.00	10.79
EM-5	8440	±30	0	1	0	0	1	20.72	25.73	17.73	13.90	10.93	12.61
EM-6	8440	±30	0	1	0	0	1	19.95	27.70	17.02	13.31	10.27	12.76
EM-7	8440	±30	0	1	0	0	1	19.85	19.48	17.32	13.63	10.25	12.19
EM-8	8440	±30	0	1	0	0	1	18.13	23.58	15.83	12.16	9.82	11.40
EM-9	8440	±30	0	1	0	0	1	19.19	26.24	16.80	12.94	10.49	12.13
EM-10	8440	±30	0	1	0	0	1	20.21	26.81	17.37	12.79	10.47	12.40
EM-11	8440	±30	0	1	0	1	2	19.06	26.20	16.21	12.72	9.85	12.91
EM-12	8440	±30	0	1	0	0	1	20.23	27.36	17.94	13.65	10.03	12.96
EM-13	8440	±30	0	1	0	0	1	20.03	27.30	17.09	13.56	10.70	12.20
EM-14	8440	±30	0	1	0	0	1	19.95	25.98	17.58	13.29	10.85	12.13
EM-15	8440	±30	0	1	0	0	1	18.73	24.76	16.57	12.57	10.20	10.60
EM-16	8440	±30	0	1	0	0	1	19.25	16.84	16.76	13.88	9.33	11.75
EM-17	8440	±30	0	1	0	0	1	19.18	26.55	16.41	13.32	10.39	11.68

TTG: total taphonomic grade; A=length; B=width; C=height of two last spires; D=height of last spire; E=aperture height; F=aperture width

**Appendix S1. Continued.**

Individual ID	Age cal yr BP)		Shell taphonomy					Shell size (mm)					
			Breakage	Corrasion	Coating	Color loss	TTG	A	B	C	D	E	F
EM-18	8440	±30	0	1	0	0	1	20.22	27.46	18.11	13.89	11.28	13.12
EM-19	8440	±30	0	1	0	1	2	18.64	26.27	16.53	13.21	10.64	11.70
EM-20	8440	±30	0	1	0	0	1	20.00	25.60	16.97	12.65	10.09	11.47
EM-21	8440	±30	1	1	0	0	2	19.78	23.29	16.39	12.96	9.22	9.88
EM-22	8440	±30	1	1	0	0	2	17.15	21.16	14.29	11.68	11.35	9.54
EM-23	8440	±30	1	1	0	0	2	n/a	20.90	n/a	n/a	n/a	n/a
EM-24	8440	±30	1	1	0	1	3	15.63	n/a	n/a	n/a	n/a	n/a
EM-25	8440	±30	1	1	0	0	2	n/a	27.33	18.32	14.51	11.04	12.65
EM-26	8440	±30	1	1	0	0	2	12.92	16.96	n/a	n/a	8.09	7.31
EM-27	8440	±30	1	1	0	1	3	15.17	18.70	n/a	n/a	10.60	8.93
EM-28	8440	±30	1	1	0	1	3	13.21	16.73	n/a	n/a	8.25	7.39
EM-29	8440	±30	1	1	0	0	2	11.99	15.54	n/a	n/a	7.62	6.84
EM-30	8440	±30	1	1	0	1	3	12.60	16.17	n/a	n/a	8.74	6.91
LF-1	10930	±200	0	1	0	1	2	19.34	26.38	16.58	13.26	10.13	12.04
LF-2	10930	±200	0	1	0	1	2	21.36	27.30	17.82	13.67	10.52	12.21
LF-3	10930	±200	0	1	0	1	2	22.25	30.10	18.92	15.06	12.36	13.92
LF-4	10930	±200	0	1	0	1	2	20.26	26.90	16.71	13.28	10.92	12.23
LF-5	10930	±200	0	1	0	1	2	20.55	26.00	17.17	13.17	10.81	11.87
LF-6	10930	±200	0	1	0	1	2	20.84	25.79	17.05	13.08	11.64	13.04
LF-7	10930	±200	0	1	0	1	2	19.62	26.11	16.22	12.81	10.42	12.57
LF-8	10930	±200	1	1	0	1	3	20.85	26.20	17.95	13.65	11.09	12.36
LF-9	10930	±200	0	1	0	1	2	20.58	26.27	17.49	13.45	10.35	12.32
LF-10	10930	±200	0	1	0	1	2	21.60	27.32	18.05	13.40	10.45	12.64
LF-11	10930	±200	0	1	0	1	2	19.75	27.00	17.06	13.07	10.43	12.72
LF-12	10930	±200	0	1	0	1	2	19.36	24.70	16.12	12.26	9.72	11.08
LF-13	10930	±200	0	1	0	1	2	22.35	28.76	18.76	14.12	11.41	13.09
LF-14	10930	±200	0	1	0	1	2	19.41	27.62	16.37	13.09	10.20	12.29
LF-15	10930	±200	0	1	0	1	2	21.34	27.94	18.56	14.47	11.36	12.48
LF-16	10930	±200	0	1	0	1	2	19.44	24.42	16.04	12.14	10.33	11.81
LF-17	10930	±200	0	1	0	1	2	20.40	28.74	18.13	14.56	11.88	13.29
LF-18	10930	±200	0	1	0	1	2	19.37	28.07	17.09	13.69	11.15	13.12
LF-19	10930	±200	0	1	0	1	2	19.78	29.34	17.41	14.03	10.80	12.90
LF-20	10930	±200	0	1	0	1	2	19.44	25.08	15.77	12.19	10.12	11.16
LF-21	10930	±200	0	1	0	1	2	20.46	24.90	16.63	12.62	10.21	11.06
LF-22	10930	±200	0	1	0	1	2	22.82	27.15	19.14	14.41	10.88	12.65
LF-23	10930	±200	0	1	0	1	2	19.92	25.79	16.75	13.01	11.19	12.20
LF-24	10930	±200	0	1	0	1	2	20.11	27.75	18.06	13.72	11.11	12.64
LF-25	10930	±200	0	1	0	1	2	20.94	26.00	18.01	13.58	10.96	11.53

TTG: total taphonomic grade; A=length; B=width; C=height of two last spires; D=height of last spire; E=aperture height; F=aperture width

**Appendix S1. Continued.**

Individual ID	Age cal yr BP	Shell taphonomy					Shell size (mm)					
		Breakage	Corrasion	Coating	Color loss	TTG	A	B	C	D	E	F
LF-26	10930 ±200	0	1	0	1	2	20.96	26.07	17.49	13.31	10.26	12.58
LF-27	10930 ±200	0	1	0	1	2	21.13	25.34	17.67	13.34	10.93	11.43
LF-28	10930 ±200	0	1	0	1	2	19.42	26.35	16.71	13.23	10.27	12.21
LF-29	10930 ±200	0	1	0	1	2	18.18	25.93	15.80	12.56	10.71	12.77
LF-30	10930 ±200	0	1	0	1	2	19.88	26.61	17.56	13.62	10.36	12.73
EP-1	12100 ±280	0	1	0	1	2	19.95	27.70	17.01	13.61	11.27	12.02
EP-2	12100 ±280	0	1	0	1	2	22.01	30.17	17.83	14.08	12.22	12.91
EP-3	12100 ±280	0	1	0	1	2	21.50	28.82	17.80	13.52	11.11	12.20
EP-4	12100 ±280	0	1	0	1	2	20.74	29.10	17.90	13.94	11.19	12.20
EP-5	12100 ±280	0	1	0	1	2	20.68	27.21	16.87	12.90	10.51	12.22
EP-6	12100 ±280	0	1	0	1	2	20.55	27.54	17.37	14.08	10.89	12.78
EP-7	12100 ±280	0	1	0	1	2	19.40	26.82	16.38	12.74	10.43	11.86
EP-8	12100 ±280	0	1	0	1	2	19.28	26.23	16.78	13.27	9.77	11.42
EP-9	12100 ±280	0	1	0	1	2	22.35	27.85	17.74	13.65	10.60	11.48
EP-10	12100 ±280	0	1	0	1	2	21.40	29.49	18.35	13.99	10.21	12.64
EP-11	12100 ±280	0	1	0	1	2	21.82	29.30	17.88	14.83	11.75	12.06
EP-12	12100 ±280	0	1	0	1	2	21.82	29.10	18.10	14.18	11.04	12.33
EP-13	12100 ±280	0	1	0	1	2	20.22	28.27	16.26	13.07	10.14	13.06
EP-14	12100 ±280	0	1	0	1	2	21.41	27.22	17.53	13.53	10.69	11.38
EP-15	12100 ±280	0	1	0	1	2	22.17	31.50	18.85	14.63	12.05	14.66
EP-16	12100 ±280	0	1	0	1	2	21.23	28.01	17.52	13.25	10.39	12.51
EP-17	12100 ±280	0	1	0	1	2	19.80	27.10	16.73	13.61	10.64	11.18
EP-18	12100 ±280	0	1	0	1	2	20.99	25.56	17.21	13.71	10.96	11.60
EP-19	12100 ±280	0	1	0	1	2	21.66	27.00	17.96	13.58	10.52	12.06
EP-20	12100 ±280	0	1	0	1	2	21.62	28.50	17.81	13.90	11.45	12.27
EP-21	12100 ±280	0	1	0	1	2	20.37	26.97	17.18	13.22	10.18	11.88
EP-22	12100 ±280	0	1	0	1	2	21.24	27.13	17.07	13.18	10.35	11.19
EP-23	12100 ±280	0	1	0	1	2	18.85	26.95	16.62	13.18	10.39	13.10
EP-24	12100 ±280	0	1	0	1	2	22.05	28.19	18.63	14.31	11.10	12.41
EP-25	12100 ±280	0	1	0	1	2	21.39	24.69	18.37	13.17	10.73	10.55
EP-26	12100 ±280	0	1	0	1	2	19.54	26.56	16.00	12.68	10.68	11.66
EP-27	12100 ±280	0	1	0	1	2	20.02	27.01	16.18	13.22	10.48	10.89
EP-28	12100 ±280	0	1	0	1	2	19.47	20.55	16.91	13.36	9.75	11.22
EP-29	12100 ±280	1	1	0	1	3	21.84	27.28	18.46	15.86	11.32	12.82
EP-30	12100 ±280	0	1	0	1	2	20.74	26.79	16.90	13.43	10.22	10.75

TTG: total taphonomic grade; A=length; B=width; C=height of two last spires; D=height of last spire; E=aperture height; F=aperture width

**Appendix S2.** Carbon and oxygen stable isotope values of entire shells of *Cepaea nemoralis* from northern Spain.

Shell ID	Age (cal yr BP)	$\delta^{18}\text{O}\text{‰(PDB)}$	$\delta^{13}\text{C}\text{‰(PDB)}$
MO-1	modern	-0.6	-10.2
MO-2	modern	-1.4	-8.5
MO-3	modern	-1.4	-9.8
MO-4	modern	-1.0	-11.0
MO-5	modern	-2.9	-13.1
MO-6	modern	-0.8	-10.2
MO-7	modern	-0.4	-10.3
MO-8	modern	-0.3	-10.4
MO-9	modern	-1.0	-9.8
MO-10	modern	-1.0	-10.5
MO-11	modern	-1.3	-10.3
MO-12	modern	-0.6	-9.1
AR-2	6380 ±70	-1.3	-7.5
AR-11	6380 ±70	-0.3	-7.4
AR-16	6380 ±70	-1.1	-11.4
AR-17	6380 ±70	-1.1	-10.0
AR-21	6380 ±70	-1.5	-9.7
AR-24	6380 ±70	-3.6	-13.4
AR-27	6380 ±70	-0.9	-5.9
AR-28	6380 ±70	-2.5	-9.3
AR-29	6380 ±70	-0.7	-10.8
AR-30	6380 ±70	-1.3	-10.2
CR3-7	6580 ±60	-2.6	-9.0
CR3-10	6580 ±60	-0.2	-8.0
CR3-11	6580 ±60	-2.1	-5.5
CR3-12	6580 ±60	-0.2	-5.2
CR3-13	6580 ±60	-0.1	-5.4
CR3-18	6580 ±60	-0.7	-5.0
CR3-20	6580 ±60	0.1	-6.6
CR3-21	6580 ±60	-0.7	-6.7
CR6-8	7520 ±50	-0.5	-5.9
CR6-13	7520 ±50	-2.1	-5.7
CR6-14	7520 ±50	-0.1	-5.2
CR6-16	7520 ±50	-1.1	-7.1
CR6-17	7520 ±50	-0.8	-7.9
CR6-21	7520 ±50	-1.0	-6.6
CR6-25	7520 ±50	-0.2	-6.3
EM-2	8440 ±30	-0.3	-8.6
EM-3	8440 ±30	-0.4	-7.6

**Appendix S2. Continued.**

Shell ID	Age (cal yr BP)	$\delta^{18}\text{O}\text{‰(PDB)}$	$\delta^{13}\text{C}\text{‰(PDB)}$
EM-21	8440 ±30	-0.8	-9.1
EM-22	8440 ±30	-0.3	-12.1
EM-23	8440 ±30	-0.4	-10.1
EM-24	8440 ±30	-0.5	-9.9
EM-25	8440 ±30	-0.6	-11.4
EM-26	8440 ±30	-0.5	-5.3
EM-28	8440 ±30	-1.4	-11.4
EM-29	8440 ±30	-1.2	-11.0
EM-30	8440 ±30	0.1	-8.0
LF-2	10930 ±200	0.6	-7.4
LF-4	10930 ±200	0.3	-8.4
LF-6	10930 ±200	-1.9	-11.7
LF-11	10930 ±200	0.4	-9.3
LF-12	10930 ±200	0.7	-8.2
LF-14	10930 ±200	-0.2	-8.0
LF-16	10930 ±200	0.5	-8.0
LF-21	10930 ±200	-1.7	-7.7
LF-25	10930 ±200	0.7	-8.0
LF-29	10930 ±200	1.0	-8.2
EP-1	12100 ±280	-0.2	-5.7
EP-3	12100 ±280	-0.2	-6.0
EP-4	12100 ±280	-0.2	-6.0
EP-5	12100 ±280	0.4	-6.3
EP-12	12100 ±280	-0.3	-6.3
EP-18	12100 ±280	0.1	-6.4
EP-19	12100 ±280	0.1	-7.2
EP-21	12100 ±280	-0.7	-6.8
EP-22	12100 ±280	-0.2	-6.8
EP-25	12100 ±280	-0.9	-4.9
EP-29	12100 ±280	0.1	-5.0

**Appendix S3.** Intrashell carbon and oxygen stable isotope values of three *Cepaea nemoralis* individuals from northern Spain.

Sample ID	$\delta^{13}\text{C}\text{‰(PDB)}$	$\delta^{18}\text{O}\text{‰(PDB)}$	Distance from lip (mm)
<b>Live-collected specimen</b>			
MO-1-lip	-12.0	-1.2	0
MO-1-1	-10.1	-1.3	2
MO-1-2	-10.4	-0.8	4
MO-1-3	-10.5	-0.9	6
MO-1-4	-10.2	0.1	8
MO-1-5	-10.3	-0.5	10
MO-1-6	-10.5	-0.5	12
MO-1-7	-10.5	-0.2	14
MO-1-8	-10.7	-0.2	16
MO-1-9	-10.6	-0.4	18
MO-1-10	-10.7	-0.6	20
MO-1-11	-11.4	-0.7	22
MO-1-12	-10.8	-0.6	24
MO-1-13	-11.5	-1.0	26
MO-1-14	-11.4	-0.9	28
MO-1-15	-11.0	-1.0	30
MO-1-16	-10.4	-1.1	32
MO-1-17	-10.3	-1.1	34
MO-1-18	-9.9	-1.0	36
MO-1-19	-10.1	-0.9	38
MO-1-20	-10.3	-0.9	40
MO-1-21	-10.1	-1.0	42
MO-1-22	-10.5	-0.8	44
MO-1-23	-10.6	-1.0	46
MO-1-24	-9.2	-0.3	48
MO-1-25	-9.2	-0.7	50
MO-1-26	-9.3	-0.5	52
MO-1-27	-9.3	-0.6	54
MO-1-28	-10.0	-0.9	56
MO-1-29	-10.0	-0.9	58
MO-1-30	-8.5	-0.5	60
MO-1-31	-8.8	-1.1	62
MO-1-32	-8.5	-0.2	64
MO-1-33	-8.7	0.0	66
MO-1-34	-7.8	-0.4	68
MO-1-35	-7.8	-0.7	70
MO-1-36	-7.4	-0.5	72
MO-1-37	-7.2	-0.4	74
MO-1-38	-7.2	-0.6	76
MO-1-39	-7.3	-0.5	78
MO-1-40	-7.6	-0.3	80
MO-1-41	-7.7	-0.6	82
MO-1-protoconch	-7.6	-0.6	84
<b>6380 yr old specimen</b>			
AR-1-lip	-10.4	-0.2	0
AR-1-1	-10.3	0.4	2
AR-1-2	-10.2	-0.2	4
AR-1-3	-10.2	-0.3	6
AR-1-4	-9.9	-0.4	8
AR-1-5	-10.0	-0.3	10



**Appendix S3. Continued.**

<b>Sample ID</b>	<b><math>\delta^{13}\text{C}\text{‰(PDB)}</math></b>	<b><math>\delta^{18}\text{O}\text{‰(PDB)}</math></b>	<b>Distance from lip (mm)</b>
AR-1-6	-10.5	-0.4	12
AR-1-7	-10.3	0.2	14
AR-1-8	-10.2	0.3	16
AR-1-9	-9.9	0.3	18
AR-1-10	-9.9	0.0	20
AR-1-11	-9.4	0.4	22
AR-1-12	-9.7	0.0	24
AR-1-13	-9.4	0.1	26
AR-1-14	-9.5	0.1	28
AR-1-15	-9.4	0.1	30
AR-1-16	-9.5	0.0	32
AR-1-17	-10.0	-0.3	34
AR-1-18	-9.6	-1.1	36
AR-1-19	-9.6	-0.6	38
AR-1-20	-9.5	-0.3	40
AR-1-21	-9.2	0.0	42
AR-1-22	-8.6	0.9	44
AR-1-23	-8.8	-0.3	46
AR-1-24	-8.8	-0.5	48
AR-1-25	-8.5	-0.1	50
AR-1-26	-8.7	-0.4	52
AR-1-27	-8.7	-0.9	54
AR-1-28	-9.0	-0.7	56
AR-1-29	-9.4	-0.7	58
AR-1-30	-9.1	-0.6	60
AR-1-31	-9.4	-0.7	62
AR-1-32	-9.2	-0.3	64
AR-1-33	-9.4	-0.2	66
AR-1-34	-9.2	-0.2	68
AR-1-35	-9.0	-0.4	70
AR-1-36	-8.8	-0.6	72
AR-1-37	-8.9	-0.7	74
AR-1-38	-9.0	-0.7	76
AR-1-protoconch	-8.5	-0.9	78
<b>12100 yr old specimen</b>			
EP-1-lip	-7.7	-0.1	0
EP-1-1	-7.6	0.1	2
EP-1-2	-7.5	-0.3	4
EP-1-3	-7.4	-0.1	6
EP-1-4	-7.5	0.1	8
EP-1-5	-7.7	0.1	10
EP-1-6	-7.7	0.0	12
EP-1-7	-7.8	0.2	14
EP-1-8	-7.6	-0.2	16
EP-1-9	-7.5	0.1	18
EP-1-10	-7.5	-0.1	20
EP-1-11	-7.5	-0.8	22
EP-1-12	-7.9	-2.2	24
EP-1-13	-8.2	-1.2	26
EP-1-14	-7.7	-0.5	28
EP-1-15	-7.6	-0.4	30
EP-1-16	-7.5	-0.2	32

**Appendix S3. Continued.**

<b>Sample ID</b>	<b><math>\delta^{13}\text{C}\text{‰(PDB)}</math></b>	<b><math>\delta^{18}\text{O}\text{‰(PDB)}</math></b>	<b>Distance from lip (mm)</b>
EP-1-17	-7.7	-0.5	34
EP-1-18	-7.6	-0.2	36
EP-1-19	-8.0	-0.7	38
EP-1-20	-7.8	0.0	40
EP-1-21	-7.7	-0.1	42
EP-1-22	-7.7	-0.2	44
EP-1-23	-8.0	-0.4	46
EP-1-24	-8.0	-0.2	48
EP-1-25	-7.3	0.6	50
EP-1-26	-7.2	0.8	52
EP-1-27	-7.1	0.3	54
EP-1-28	-7.4	0.7	56
EP-1-29	-7.7	1.3	58
EP-1-30	-6.9	1.1	60
EP-1-31	-7.3	0.8	62
EP-1-32	-6.9	0.7	64
EP-1-33	-6.7	0.8	66
EP-1-34	-6.9	1.1	68
EP-1-35	-7.3	0.9	70
EP-1-36	-7.0	0.5	72
EP-1-37	-7.3	0.4	74
EP-1-38	-5.6	0.9	76
EP-1-39	-5.7	0.8	78
EP-1-40	-5.8	0.7	80
EP-1-41	-5.8	0.8	82
EP-1-42	-5.9	0.9	84
EP-1-43	-5.9	0.8	86
EP-1-44	-5.9	0.9	88
EP-1-45	-5.6	0.6	90
EP-1-PROTOCONCH	-5.9	0.5	92