Supplementary Laboratory Methods

One shell valve was mounted intact onto a glass slide using Crystalbond™ adhesive. The outer 10 μm of the shell was milled away before collecting samples for radiocarbon and stable isotopes to avoid possible surface contamination. The mounted valves were sampled with a Merchantek/New Wave Research micromill (shells 368497, 1926 AD) or a slow-speed drill (shells Doebic 1-2, 1625 AD and Dohlt 34-35, 515 AD) using carbide milling bits. Radiocarbon samples were milled using a 0.10-mm-diameter bit, and ~5 mg of carbonate was obtained per sample. After collection, the carbonate powder was weighed and stored in aluminum foil.

Samples were hydrolyzed using orthophosphoric acid and heated under vacuum to reduce reaction time (368497) or reacted with hydrophosphoric acid at room temperature *in vacuo* (Doebic 1-2 and Dohlt 34-35). The resulting CO_2 was sealed in glass vials converted to graphite using the methodology of Slota et al. (1987) and analyzed for radiocarbon with a $\delta^{13}C$ correction at the NSF-Arizona Accelerator Mass Spectrometry (AMS) Facility.

Peruvian ΔR was calculated by using the formula (Jones et al. 2007)

$$\Delta R(t) = M_m(t) - M_{calib}(t),$$

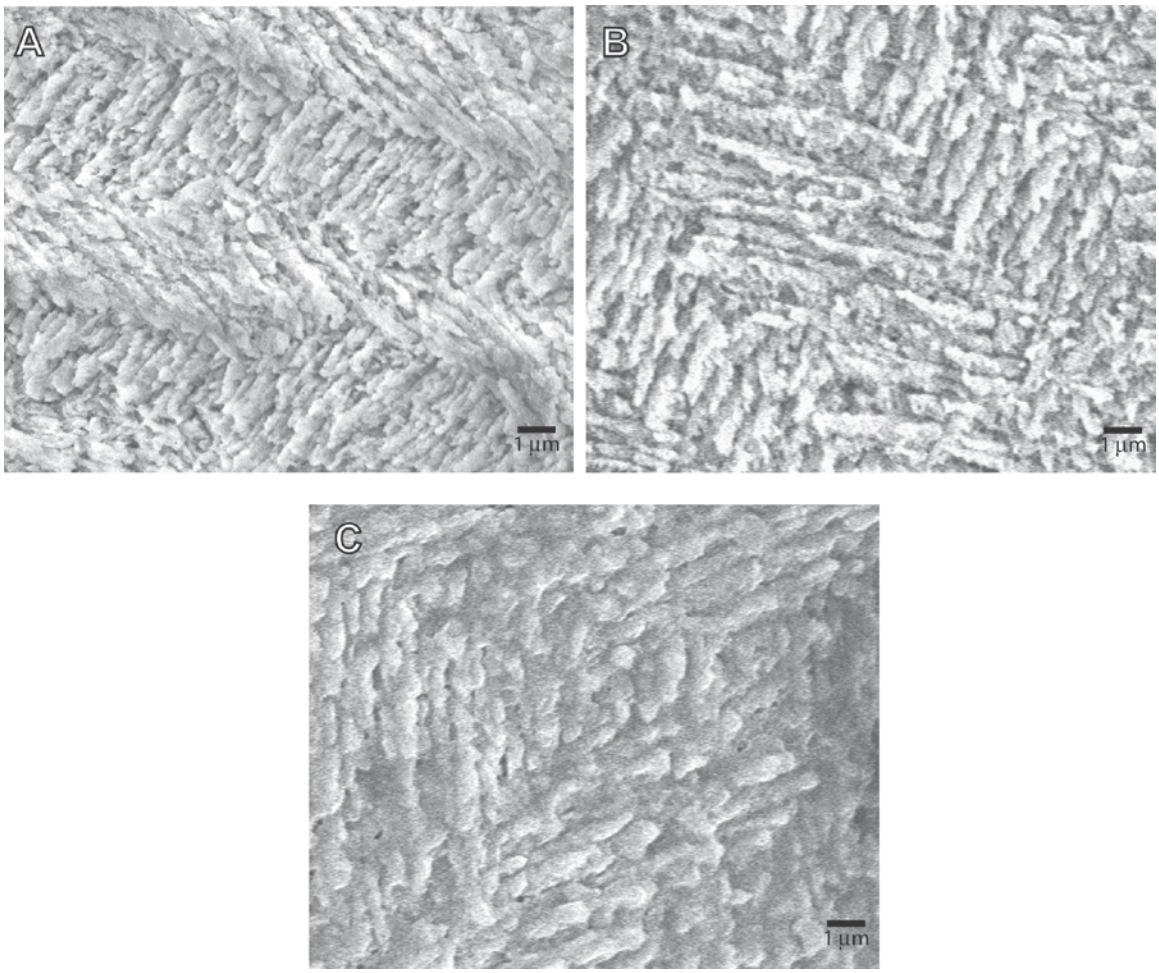
Where $M_m(t)$ is the measured radiocarbon age for the mollusk shell, and $M_{calib}(t)$ is a theoretical global ocean radiocarbon age at time t obtained from a calibration curve such as Marine04 (Hughen et al. 2004). Simple averages for ΔR were calculated for these samples.

Lab #	Sample #	Years AD	mm	$\delta^{13}C$	^{14}C Age	ΔR
AA69002	368497-01	1926	11.4	0.89	605±36	154±43
AA69003	368497-02		10.3	0.45	575±53	124±58
AA69004	368497-03		9.2	0.27	497±71	46±75
AA69005	368497-04		8.2	0.80	642±46	191±51
AA69006	368497-05		7.3	1.00	584±53	133±58
AA69007	368497-06		5.8	0.50	578±50	127±55
AA69008	368497-07		4.7	0.44	569±69	118±73
AA69009	368497-08		3.8	0.59	602±77	151±80
AA69010	368497-09		2.5	0.64	521±34	70±41
AA69011	368497-10		1.3	0.94	688±55	237±60
AA87662	Doebic1-01	1625	14.3	0.47	831±35	123±42
AA87663	Doebic1-02		10.7	0.40	875±64	167±68
AA87664	Doebic1-03		8.2	0.90	878±47	170±52
AA87665	Doebic1-04		5.2	0.90	822±65	114±69
AA87666	Doebic1-05		3.6	0.80	818±67	110±71
AA87667	Doebic2-01		15.6	0.51	830±31	122±39
AA87668	Doebic2-02		11.6	0.46	779±44	71±50
AA87669	Doebic2-03		9.2	0.40	820±71	112±75
AA87670	Doebic2-04		6.7	0.80	914±40	206±46
AA87680	Dohlt35-1.01	515	13.3	0.81	1881±51	-18±57
AA87681	Dohlt35-1.02		10.9	0.71	1782±36	-117±44
AA87682	Dohlt35-1.03		8.4	0.48	1701±57	-198±63
AA87683	Dohlt35-2.02		12.3	0.87	1592±41	-307±49
AA87684	Dohlt35-2.03		10.2	0.97	1697±42	-202±49
AA87687	Dohlt35-3.01		11.6	0.91	1893±36	-6±44
AA87688	Dohlt35-3.02		9.2	1.10	1972±37	73±45
AA87689	Dohlt35-3.03		3.5	1.04	1963±36	64±44
AA87678	Dohlt34-1.01		12.3	0.80	1674±51	-225±57
AA87679	Dohlt34-2.01		12.3	0.98	1669±37	-230±45
AA87685	Dohlt34-3.01		11.8	0.04	1920±37	21± 45
AA87686	Dohlt34-3.02		5.3	1.40	1915±41	16±49

Supplementary Table 1 Radiocarbon data for *D. obesulus* showing ages of the shells in calendar years, sample collection distances from the umbones in mm, $\delta^{13}C$ values used for $\delta^{13}C$ correction of each radiocarbon sample, uncalibrated radiocarbon ages, and reservoir corrections. Uncalibrated ages and reservoir corrections are reported with 1σ errors. ΔR calculations use modeled marine mixed layer radiocarbon ages from Marine04 (Hughen et al., 2004) of 451 ± 23 yrs for AD 1926, 708 ± 23 yrs for AD 1625, and 1899 ± 26 yrs for AD 515.

Sample	Mm(t)	σ (yrs)	Mcalib(t)	σ (yrs)	ΔR(t)	σ ± yrs
368497-01	605	36	451	23	154	43
368497-02	575	53	451	23	124	58
368497-03	497	71	451	23	46	75
368497-04	642	46	451	23	191	51
368497-05	584	53	451	23	133	58
368497-06	578	50	451	23	127	55
368497-07	569	69	451	23	118	73
368497-08	602	77	451	23	151	80
368497-09	521	34	451	23	70	41
368497-10	688	55	451	23	237	60
Doebic1-1	831	35	708	23	123	42
Doebic1-2	875	64	708	23	167	68
Doebic1-3	878	47	708	23	170	52
Doebic1-4	822	65	708	23	114	69
Doebic1-5	818	67	708	23	110	71
Doebic2-1	830	31	708	23	122	39
Doebic2-2	779	44	708	23	71	50
Doebic2-3	820	71	708	23	112	75
Doebic2-4	914	40	708	23	206	46
Dohlt35-1.1	1881	51	1899	26	-18	57
Dohlt35-1.2	1782	36	1899	26	-117	44
Dohlt35-1.3	1701	57	1899	26	-198	63
Dohlt35-2.2	1592	41	1899	26	-307	49
Dohlt35-2.3	1697	42	1899	26	-202	49
Dohlt35-3.1	1893	36	1899	26	-6	44
Dohlt35-3.2	1972	37	1899	26	73	45
Dohlt35-3.3	1963	36	1899	26	64	44
Dohlt34-1.1	1674	51	1899	26	-225	57
Dohlt34-2.1	1669	37	1899	26	-230	45
Dohlt34-3.1	1920	37	1899	26	21	45
Dohlt34-3.2	1915	41	1899	26	16	49

Supplementary Table 2 showing radiocarbon and theoretical global ocean ages used for calculating (Jones et al. 2007) shell ΔR values at different Holocene periods. Mm(t) and M_{calib}(t) errors were combined using the formula $\sigma_{total} = \sqrt{\sigma^2_{Mm(t)} + \sigma^2_{M_{calib}(t)}}$ (Stuiver et al. 1986) to produced ΔR σ values.



Supplementary Figure 1 Showing SEM images from archaeological and modern pre-bomb *Donax obesulus* shells. Specimens dates are 515 AD (A), 1625 AD (B), and 1926 AD (C). Observe well-preserved aragonite herring-bone structures indicating absence of diagenesis in analyzed shells.