

Supplementary information for:

Germination of *Pyrodinium bahamense* cysts from a pristine lagoon in San José Island, Gulf of California: implications of long-term survival

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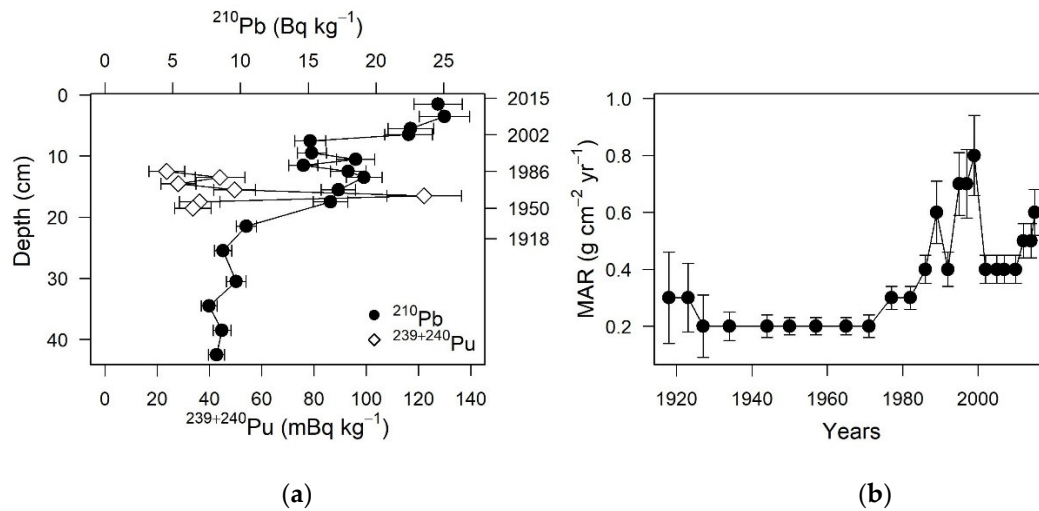


Figure S1. ^{210}Pb -derived chronology of the San José core (San José Island, SW Gulf of California): a) depth profiles of ^{210}Pb and $^{239+240}\text{Pu}$ activities, and b) mass accumulation rates (MAR). Modified from Cuellar-Martinez et al. [58].

Table S1. Germination rate of *Pyrodinium bahamense* cysts isolated from San José Lagoon SW Gulf of California surface sediments.

Culture medium	Replicate no.	Incubation days	Germination rate	Light/Dark incubation
Natural seawater	1	10	21.3	Light
Natural seawater	2	10	15.6	Light
Natural seawater	3	10	25.0	Light
Natural seawater	4	10	49.4	Light
Natural seawater	5	10	27.8	Light
Natural seawater	6	20	32.5	Light
Natural seawater	7	20	36.3	Light
Natural seawater	8	20	40.0	Light

Culture medium	Replicate no.	Incubation days	Germination rate	Light/Dark incubation
Natural seawater	9	20	71.9	Light
Natural seawater	10	20	45.2	Light
f/2 medium	1	10	32.0	Light
f/2 medium	2	10	17.0	Light
f/2 medium	3	10	60.0	Light
f/2 medium	4	10	60.0	Light
f/2 medium	5	10	42.3	Light
f/2 medium	6	20	60.6	Light
f/2 medium	7	20	62.5	Light
f/2 medium	8	20	63.0	Light
f/2 medium	9	20	40.0	Light
f/2 medium	10	20	56.0	Light
Natural seawater	1	20	10.0	Dark
Natural seawater	2	20	0.0	Dark
Natural seawater	3	20	40.0	Dark
Natural seawater	4	20	43.8	Dark
Natural seawater	5	20	23.4	Dark
f/2 medium	1	20	51.2	Dark
f/2 medium	2	20	43.7	Dark
f/2 medium	3	20	6.2	Dark
f/2 medium	4	20	33.7	Dark
f/2 medium	5	20	33.7	Dark

Table S2. Number of dinoflagellate cysts isolated (germinated) from selected sections of the San José core.

Species* (Biological and palynological names)	Section (cm)		1–2	4–5	7–8	10– 11	13– 14	16– 17	19– 20	22– 23	25–26	Total
	Age u**	±	2014	2007	1999	1992	1982	1965	1944	1923	Beyond ²¹⁰ Pb- dating***	
			± 0.2	± 0.5	± 0.9	± 1.2	± 1.6	± 2.8	± 5.0	± 8.0		
<i>Alexandrium</i> spp.			1 (1)	-	-	1 (0)	-	3 (2)	-	-	-	5 (3)
<i>Gonyaulax digitale</i> (<i>Spiniferites bentorii</i>)			1 (0)	-	-	-	-	-	-	-	-	1 (0)
<i>G. scrippsae</i> (<i>Spiniferites belerius</i>)			2 (1)	-	-	1 (0)	-	-	-	-	-	2 (1)
<i>G. spinifera</i> (<i>Spiniferites mirabilis</i>)			-	-	-	1 (0)	-	-	-	-	-	1 (0)
<i>G. spinifera</i> (<i>Tectatodinium pellitum</i>)			1 (0)	1 (0)	-	1 (0)	-	1 (1)	1 (0)	1 (1)	6 (3)	12 (5)
<i>G. spinifera</i> complex (<i>Spiniferites hyperacanthus</i>)			-	-	-	-	-	1 (1)	-	-	-	1 (1)
<i>G. spinifera</i> complex (<i>Spiniferites</i> spp.)			-	-	-	4 (3)	-	-	-	1 (1)	-	5 (4)
<i>Lingulodinium polyedra</i> (<i>Lingulodinium machaerophorum</i>)			-	-	-	2 (1)	-	-	-	-	-	2 (1)
Not identified 1			1 (1)	-	-	-	-	-	-	-	-	1 (1)
Not identified 2			-	1 (0)	-	-	-	-	-	-	-	1 (0)
<i>Protoceratium reticulatum</i> (<i>Operculodinium centrocarpum</i>)			-	-	-	-	1 (1)	-	-	-	-	1 (1)
<i>Protoperidinium</i> spp. (<i>Brigantedinium</i> spp.)			1 (0)	-	-	-	1 (0)	-	-	-	2 (0)	4 (0)
<i>Pyrodinium bahamense</i> (<i>Polysphaeridium zoharyi</i>)			7 (3)	8 (2)	5 (2)	6 (4)	4 (1)	7 (1)	6 (2)	-	5 (4)	48 (19)
<i>Pyrophacus steinii</i> (<i>Tuberculodinium vacampoe</i>)			1 (1)	-	-	1 (0)	-	-	-	-	-	2 (1)
<i>Scrippsiella</i> spp.			-	-	-	3 (1)	-	2 (1)	2 (1)	-	-	7 (3)

*Palynological names in parenthesis; ** Indicates age uncertainty, in years; *** Age beyond the ²¹⁰Pb-chronology (> 1918 ± 9.0 yr in the 23-24 cm section)

Table S3. Maximum age at which germination of dinoflagellate cysts occurred in sediments from ²¹⁰Pb-dated cores.

Dinoflagellate species	Core name	Collection sites	Approximate age (years ± uncertainty)	References
<i>Scrippsiella</i> spp. e	KF2	Koljö Fjord, Sweden	40±4	[51]
<i>Lingulodinium polyedra</i> (F.Stein) J.D.Dodge 1989	and K4		80±12	
<i>Protoceratium reticulatum</i> (Claparède & Lachmann) Bütschli 1885				
<i>Pentaphapsodinium dalei</i> Indelicato & A.R.Loeblich 1986	Not specified	Koljö Fjord, Sweden	87±12	[52]
<i>Alexandrium tamarense</i> (Lebour) Balech 1995	Not specified	Funka Bay, Japan	106±10	[53]
<i>Protoperidinium</i> spp.	KF2	Koljö Fjord, Sweden and		[54]
<i>Gonyaulax</i> spp.		Mariager Fjord, Northern Denmark	10±3 ¹	
<i>Scrippsiella acuminata</i> Kretschmann, Zinssmeister, Kirsch, Kusber & Gottschling 2015	K4		30±4 ¹	
			80±12 ¹	
			50 ²	
<i>Preperidinium meunieri</i> (Pavillard) Elbrächter 1993	KF2			[78]
<i>Apocalathium malmogiense</i> (G.Sjöstedt) Craveiro, Daugbjerg, Moestrup & Calado 2016	LL7	Gulf of Finland, Baltic sea	105±8	
<i>Alexandrium minutum</i> Halim 1960 ³	KS03	Bay of Brest Brittany, France	156±27	
<i>Heterocapsa minima</i> A.J.Pomroy 1989 ³				[80]
<i>Scrippsiella acuminata</i> ³				
<i>Pyrodinium bahamense</i> L.Plate 1906	San José core	San José Lagoon, Mexico	>100 ⁴	This study

¹Uncertainty was obtained from the dating presented by Lundholm et al. [51]; ² Age uncertainty not available; ³ Germination with biostimulants; ⁴ Age beyond the ²¹⁰Pb-chronology (> 1918 ± 9.0 yr).