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### Benthic foraminifera and brachiopods from a marine cave in Spain: environmental significance

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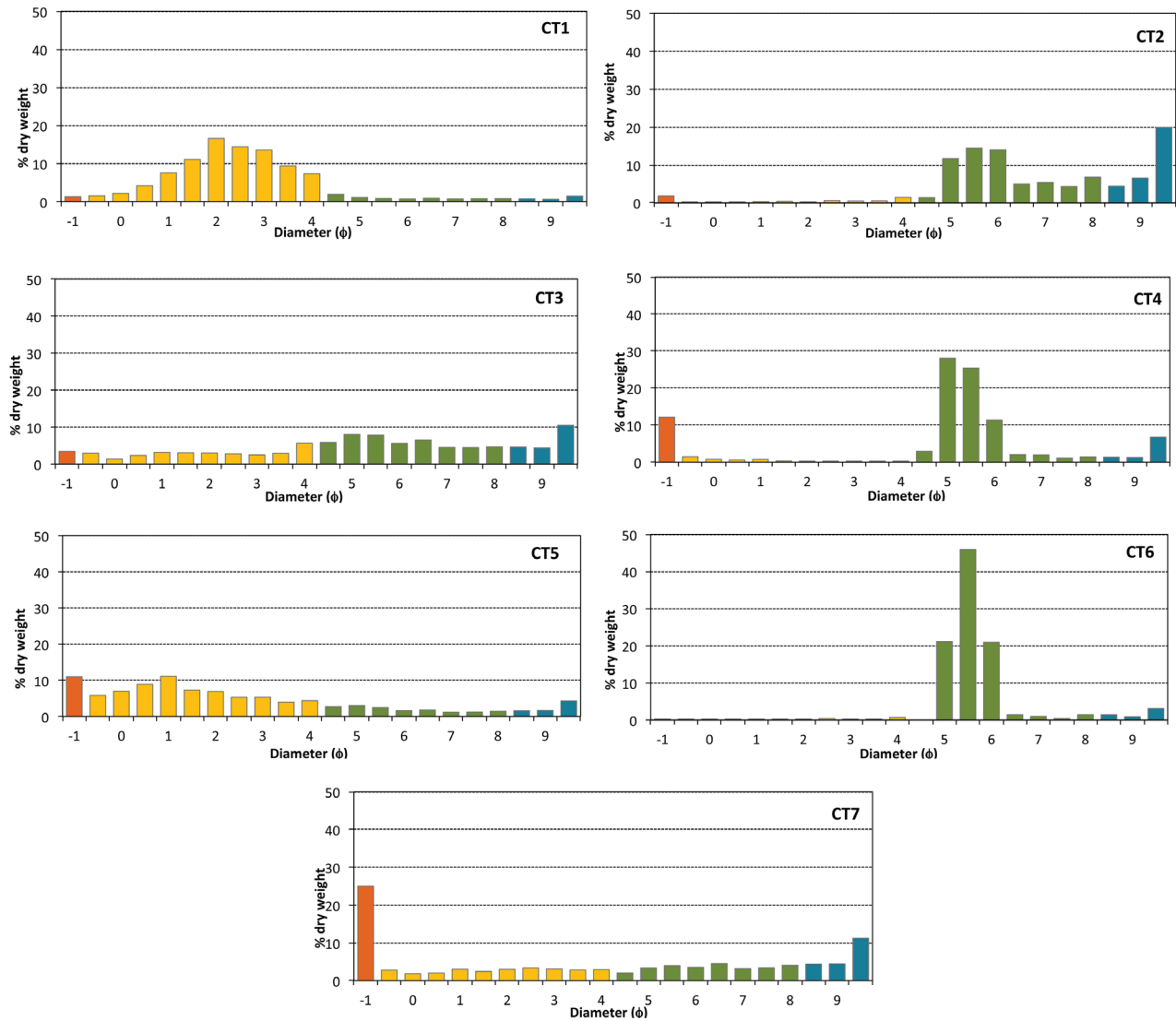
BERGAMIN, L., TADDEI RUGGIERO, E., PIERFRANCESCHI, G., ANDRES, B., CONSTANTINO, R., CROVATO, C., D'AMBROSI, A., MARASSICH, A., & ROMANO, E. (2020). Benthic foraminifera and brachiopods from a marine cave in Spain: environmental significance. *Mediterranean Marine Science*, 21(3), 506–518. <https://doi.org/10.12681/mms.23482>

## Integrated environmental study in the CT12 marine cave (Eastern Spanish coast) through benthic fauna and sediment texture

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**Fig. S1:** Grainsize distribution curve; gravel (orange), sand (yellow), silt (green), clay (blue).



**Table S1.** Results of grain size analysis with sediment fractions at 0.5  $\phi$  interval.

<b>f</b>	<b>CT1</b>	<b>CT2</b>	<b>CT3</b>	<b>CT4</b>	<b>CT5</b>	<b>CT6</b>	<b>CT7</b>
-1.0	1.3	1.8	3.4	12.2	11.0	0.0	25.0
-0.5	1.5	0.2	2.9	1.5	5.9	0.1	2.8
0.0	2.2	0.1	1.4	0.7	7.0	0.1	1.8
0.5	4.2	0.2	2.4	0.5	8.9	0.1	2.0
1.0	7.6	0.3	3.2	0.7	11.1	0.1	3.0
1.5	11.1	0.4	3.1	0.3	7.3	0.2	2.4
2.0	16.6	0.3	3.0	0.1	6.9	0.2	3.0
2.5	14.4	0.6	2.8	0.1	5.3	0.4	3.3
3.0	13.5	0.5	2.5	0.1	5.3	0.2	3.1
3.5	9.4	0.5	2.9	0.1	4.0	0.3	2.8
4.0	7.4	1.5	5.7	0.1	4.4	0.7	2.9
4.5	1.9	1.4	5.9	2.9	2.7	0.0	2.0
5.0	1.1	11.7	8.0	28.1	3.0	21.1	3.4
5.5	0.9	14.4	7.8	25.4	2.5	45.9	3.9
6.0	0.7	14.0	5.6	11.4	1.6	20.9	3.5
6.5	0.9	5.0	6.5	2.0	1.8	1.5	4.5
7.0	0.7	5.3	4.5	1.9	1.2	1.0	3.2
7.5	0.8	4.3	4.5	1.1	1.2	0.4	3.4
8.0	0.8	6.8	4.7	1.4	1.4	1.5	4.0
8.5	0.8	4.4	4.6	1.3	1.6	1.5	4.4
9.0	0.6	6.6	4.4	1.3	1.7	0.9	4.4
11.0	1.4	19.9	10.5	6.8	4.3	3.1	11.2

**Table S2.** Foraminifera absolute abundance standardized at 1 g dry sediment. Faunal parameters are also given at the table bottom.

	CT1	CT2	CT3	CT4	CT5	CT6	CT7
<i>Adelosina cliariensis</i> (Heron-Allen & Earland, 1930)	0	0	0	0	0	0	25
<i>Adelosina mediterraneensis</i> (Le Calvez & Le Calvez, 1958)	4	0	0	0	0	0	0
<i>Affinetrina planciana</i> (d'Orbigny, 1839)	0	33	0	0	0	0	0
<i>Articulina carinata</i> Wiesner, 1923	0	0	0	0	0	20	0
<i>Asterigerinata mamilla</i> (Williamson, 1858)	32	33	25	25	0	0	0
<i>Astrononion stelligerum</i> (d'Orbigny, 1839)	4	67	50	13	67	0	0
<i>Aubignyna perlucida</i> (Heron-Allen & Earland, 1913)	0	67	25	75	0	40	0
<i>Bolivina alata</i> (Seguenza, 1862)	0	0	0	0	0	20	0
<i>Bolivina catanensis</i> Seguenza, 1862	0	33	0	25	0	0	0
<i>Bolivina earlandi</i> Parr, 1950	0	33	0	13	17	20	50
<i>Bolivina pseudoplicata</i> Heron-Allen & Earland, 1930	0	67	0	13	0	0	0
<i>Bolivina striatula</i> Cushman, 1922	0	0	0	38	0	0	0
<i>Bolivina variabilis</i> (Williamson, 1858)	0	700	50	375	0	80	50
<i>Bulimina aculeata</i> d'Orbigny, 1826	0	0	0	0	0	0	25
<i>Bulimina elongata</i> d'Orbigny, 1846	4	0	0	13	0	0	0
<i>Bulimina marginata</i> d'Orbigny, 1826	0	33	0	0	0	0	75
<i>Buliminella elegantissima</i> (d'Orbigny, 1839)	0	33	0	0	0	0	0
<i>Carterina spiculotesta</i> (Carter, 1877)	0	33	0	0	0	0	0
<i>Cibicides refulgens</i> Montfort, 1808	68	33	125	88	100	20	25
<i>Cibicoides lobatulus</i> (Walker & Jacob, 1798)	112	433	125	125	100	60	50
<i>Cibicoides variabilis</i> (d'Orbigny, 1826)	64	0	0	0	0	0	0
<i>Conorbella erecta</i> (Sidebottom, 1908)	16	0	0	0	0	0	0
<i>Cornuspira involvens</i> (Reuss, 1850)	0	33	0	0	0	0	0
<i>Cribrostomoides jeffreysii</i> (Williamson, 1858)	0	0	25	0	0	20	0
<i>Cycloforina</i> sp.	4	0	0	0	0	0	0
<i>Cymbaloporetta</i> sp.	4	0	0	0	0	0	0
<i>Discamina compressa</i> (Goess, 1882)	0	0	0	0	0	0	25
<i>Discorbis torrei</i> (Bermudez, 1935)	0	0	0	0	0	40	0
<i>Elphidium aculeatum</i> (d'Orbigny, 1846)	48	0	0	0	0	0	0
<i>Elphidium advenum</i> (Cushman, 1922)	4	0	25	0	0	0	0
<i>Elphidium crispum</i> (Linnaeus, 1758)	4	0	0	0	0	0	0
<i>Elphidium fichtelianum</i> (d'Orbigny, 1846)	8	0	0	0	0	0	0
<i>Elphidium pulvereum</i> Todd, 1958	4	0	0	0	0	0	0
<i>Eponides repandus</i> (Fichtel & Moll, 1798)	0	267	50	13	0	20	0
<i>Fissurina orbignyana</i> Seguenza, 1862	0	33	0	38	0	20	0
<i>Fissurina</i> sp.	0	33	0	13	0	0	0
<i>Fursenkoina subacuta</i> (d'Orbigny, 1852)	0	0	0	0	0	20	0
<i>Gavelinopsis praegeri</i> (Heron-Allen & Earland, 1930)	168	233	25	75	17	80	25
<i>Globocassidulina crassa</i> (d'Orbigny, 1839)	0	33	0	63	0	40	0
<i>Globocassidulina subglobosa</i> (Brady, 1881)	0	233	0	175	0	80	0
<i>Gyroidina umbonata</i> (Silvestri, 1898)	0	0	0	13	0	40	0
<i>Haynesina depressula</i> (Walker & Jacob, 1798)	0	33	0	63	0	0	25
<i>Haynesina germanica</i> (Ehrenberg, 1840)	0	0	0	0	0	40	0
<i>Laevidentalina communis</i> (d'Orbigny, 1826)	0	33	0	0	0	0	0
<i>Lagena</i> sp.	0	0	0	13	0	0	0

continued

Table S2 continued

	CT1	CT2	CT3	CT4	CT5	CT6	CT7
<i>Lagenammia fusiformis</i> (Williamson, 1858)	0	33	0	13	17	0	0
<i>Lamarckina scabra</i> (Brady, 1884)	8	33	0	0	0	0	0
<i>Lenticulina gibba</i> (d'Orbigny, 1839)	0	67	0	0	0	0	25
<i>Lepidodeuterammia ochracea</i> (Williamson, 1858)	0	0	0	0	0	20	0
<i>Leptohalysis scottii</i> (Chaster, 1892)	0	0	0	13	0	0	0
<i>Melonis barleeanus</i> (Williamson, 1858)	0	0	0	13	0	0	0
<i>Miliolinella semicostata</i> (Wiesner, 1923)	0	0	0	25	0	0	0
<i>Miliolinella subrotunda</i> (Montagu, 1803)	120	500	375	200	183	120	125
<i>Neoconorbina terquemi</i> (Rzehak, 1888)	4	0	0	0	0	0	0
<i>Patellina corrugata</i> Williamson, 1858	4	2,867	1,300	1,488	1,250	2,040	2,900
<i>Peneroplis pertusus</i> (Forsskal in Niebuhr, 1775)	16	0	0	0	0	0	0
<i>Peneroplis planatus</i> (Fichtel & Moll, 1798)	8	0	0	0	0	0	0
<i>Pileolina patelliformis</i> (Brady, 1884)	0	33	0	25	0	0	0
<i>Planorbulina mediterraneensis</i> d'Orbigny, 1826	36	0	25	0	0	0	50
<i>Pseudotriloculina cuneata</i> (Karrer, 1867)	0	0	0	0	0	100	0
<i>Pseudotriloculina lecalvezae</i> (Kaasschieter, 1961)	0	0	0	0	0	40	0
<i>Pseudotriloculina</i> sp.	8	0	150	0	0	0	0
<i>Pyrgo inornata</i> (d'Orbigny, 1846)	0	0	0	13	0	0	0
<i>Quinqueloculina auberiana</i> d'Orbigny, 1839	20	67	50	50	0	0	0
<i>Quinqueloculina berthelotiana</i> d'Orbigny, 1839	12	33	25	0	33	20	0
<i>Quinqueloculina bosciiana</i> d'Orbigny, 1839	0	167	0	13	0	40	0
<i>Quinqueloculina irregularis</i> d'Orbigny in Terquem, 1878	16	0	0	0	0	0	0
<i>Quinqueloculina laevigata</i> d'Orbigny, 1839	0	0	0	0	0	20	0
<i>Quinqueloculina lata</i> Terquem, 1876	8	0	50	25	17	20	0
<i>Quinqueloculina milletti</i> Wiesner, 1923	0	0	0	0	0	60	0
<i>Quinqueloculina parvula</i> Schlumberger, 1894	8	200	75	138	100	20	25
<i>Quinqueloculina pygmaea</i> Reuss, 1850	0	33	0	13	0	40	0
<i>Quinqueloculina seminulum</i> (Linnaeus, 1758)	0	0	175	125	183	20	25
<i>Quinqueloculina stelligera</i> (Terquem, 1882)	12	67	250	13	83	40	25
<i>Quinqueloculina ungeriana</i> d'Orbigny, 1846	44	0	0	0	0	0	0
<i>Quinqueloculina</i> cf <i>venusta</i> Karrer, 1868	0	0	225	0	17	0	25
<i>Rosalina bradyi</i> (Cushman, 1915)	56	100	225	88	133	40	75
<i>Rosalina floridana</i> (Cushman, 1922)	16	133	0	50	0	20	0
<i>Rosalina obtusa</i> d'Orbigny, 1846	0	33	0	0	17	0	0
<i>Rosalina posidonicola</i> (Colom, 1942)	0	0	0	25	0	0	0
<i>Sahulina conica</i> (d'Orbigny, 1839)	44	0	25	0	0	0	25
<i>Sejunctella</i> sp.	0	967	400	125	233	120	250
<i>Sigmoilina costata</i> Schlumberger, 1893	0	67	0	38	33	0	0
<i>Sigmoilina grata</i> (Terquem, 1878)	4	133	0	13	17	0	0
<i>Sigmoilopsis schlumbergeri</i> (Silvestri, 1904)	0	67	450	150	550	40	75
<i>Siphonina reticulata</i> (Czjžek, 1848)	0	133	25	38	150	20	100
<i>Spirillina vivipara</i> Ehrenberg, 1843	4	1,967	1,875	1,000	767	1,540	1,875
<i>Spiroloculina ornata</i> d'Orbigny, 1839	8	267	225	175	467	20	75
<i>Spirophthalmidium emaciatum</i> (Haynes, 1973)	0	1,133	250	225	17	420	400

continued

Table S2 continued

	CT1	CT2	CT3	CT4	CT5	CT6	CT7
<i>Spiroplectinella earlandi</i> (Parker, 1952)	0	100	75	0	67	0	50
<i>Spiroplectinella wrighti</i> (Silvestri, 1903)	16	0	0	0	17	0	0
<i>Spirosigmoilina tenuis</i> (Czjzek, 1848)	0	0	0	50	0	0	25
<i>Textularia agglutinans</i> d'Orbigny, 1839	16	0	0	0	0	0	0
<i>Textularia bocki</i> Höglund, 1947	100	0	0	13	33	0	0
<i>Tretomphaloides concinnus</i> (Brady, 1884)	4	0	0	0	0	0	0
<i>Triloculina plicata</i> Terquem, 1878	4	33	0	0	0	0	25
<i>Triloculina schreiberiana</i> d'Orbigny, 1839	24	0	0	0	0	0	0
<i>Tubinella inornata</i> (Brady, 1884)	0	2,533	1,225	350	433	620	975
<i>Vertebralina striata</i> d'Orbigny, 1826	12	0	0	0	0	0	0
Unknown specimen	0	0	0	0	0	20	0
<b>Taxa_S</b>	<b>44</b>	<b>48</b>	<b>31</b>	<b>49</b>	<b>28</b>	<b>41</b>	<b>30</b>
<b>Dominance_D</b>	<b>0.06</b>	<b>0.11</b>	<b>0.12</b>	<b>0.11</b>	<b>0.12</b>	<b>0.19</b>	<b>0.23</b>
<b>Shannon_H</b>	<b>3.14</b>	<b>2.75</b>	<b>2.59</b>	<b>2.85</b>	<b>2.55</b>	<b>2.31</b>	<b>1.99</b>
<b>FN</b>	<b>1,180</b>	<b>14,300</b>	<b>8,000</b>	<b>5,763</b>	<b>5,117</b>	<b>6,120</b>	<b>7,525</b>

Table S3. Relative abundance of commonly occurring foraminiferal species.

	CT1	CT2	CT3	CT4	CT5	CT6	CT7
<i>Bolivina variabilis</i>	0.0	4.9	0.6	6.5	0.0	1.3	0.7
<i>Cibicides refulgens</i> *	5.8	0.2	1.6	1.5	2.0	0.3	0.3
<i>Cibicidoides lobatulus</i> *	9.5	3.0	1.6	2.2	2.0	1.0	0.7
<i>Gavelinopsis praegeri</i> *	14.2	1.6	0.3	1.3	0.3	1.3	0.3
<i>Miliolinella subrotunda</i> *	10.2	3.5	4.7	3.5	3.6	2.0	1.7
<i>Patellina corrugata</i> *	0.3	20.0	16.3	25.8	24.4	33.3	38.5
<i>Rosalina</i> spp. *	6.1	1.9	2.8	2.4	2.9	1.0	1.0
<i>Sejunctella</i> sp. *	0.0	6.8	5.0	2.2	4.6	2.0	3.3
<i>Sigmoilopsis schlumbergeri</i>	0.0	0.5	5.6	2.6	10.7	0.7	1.0
<i>Spirillina vivipara</i> *	0.3	13.8	23.4	17.4	15.0	25.2	24.9
<i>Spirophthalmidium emaciatum</i>	0.0	7.9	3.1	3.9	0.3	6.9	5.3
<i>Textularia bocki</i>	8.5	0.0	0.0	0.2	0.7	0.0	0.0
<i>Tubinella inornata</i> *	0.0	17.7	15.3	6.1	8.5	10.1	13.0

\* epifaunal clinging-attached taxa according to Murray (2006).

Table S4. Absolute abundance of Brachiopoda.

	CT1	CT2	CT3	CT4	CT5	CT6	CT7
<i>Argyrotheca cistellula</i> (Searles-Wood, 1841)	14	15	51	20	19	32	22
<i>Argyrotheca cuneata</i> (Risso, 1826)	45	7	22	21	41	9	5
<i>Gwynia capsula</i> (Jeffreys, 1859)	0	0	0	0	0	7	0
<i>Joania cordata</i> (Risso, 1826)	29	0	0	0	0	0	0
<i>Megathiris detruncata</i> (Gmelin, 1791)	1	0	0	1	11	0	0
<i>Novocrania anomala</i> (Mueller, 1776)	22	5	10	4	78	0	0
<i>Tethyrynchia mediterranea</i> (Logan, 1994)	2	12	42	5	32	16	29
<b>Total # individuals</b>	<b>113</b>	<b>39</b>	<b>125</b>	<b>51</b>	<b>181</b>	<b>64</b>	<b>56</b>
<b>Number of species</b>	<b>6</b>	<b>4</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>3</b>