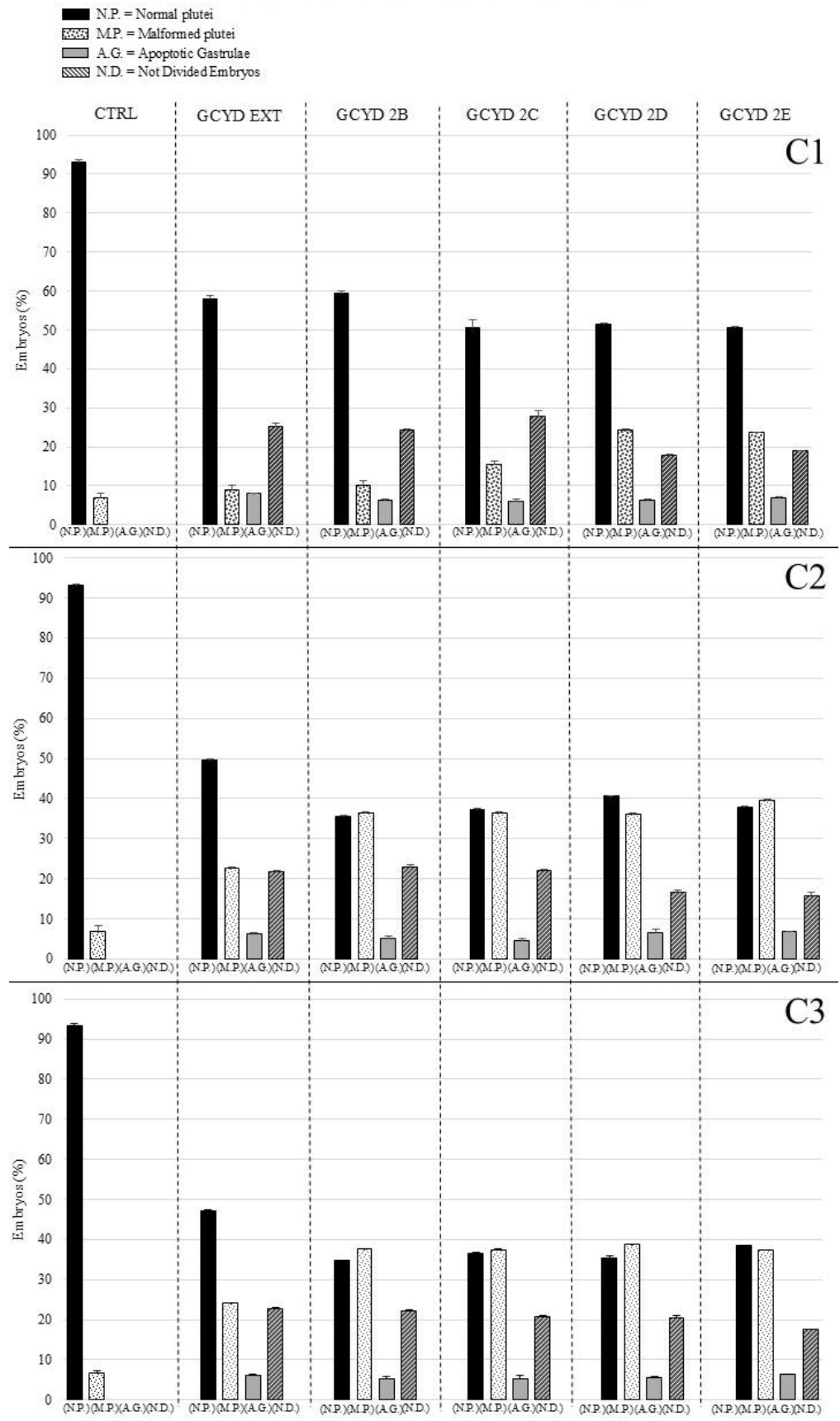
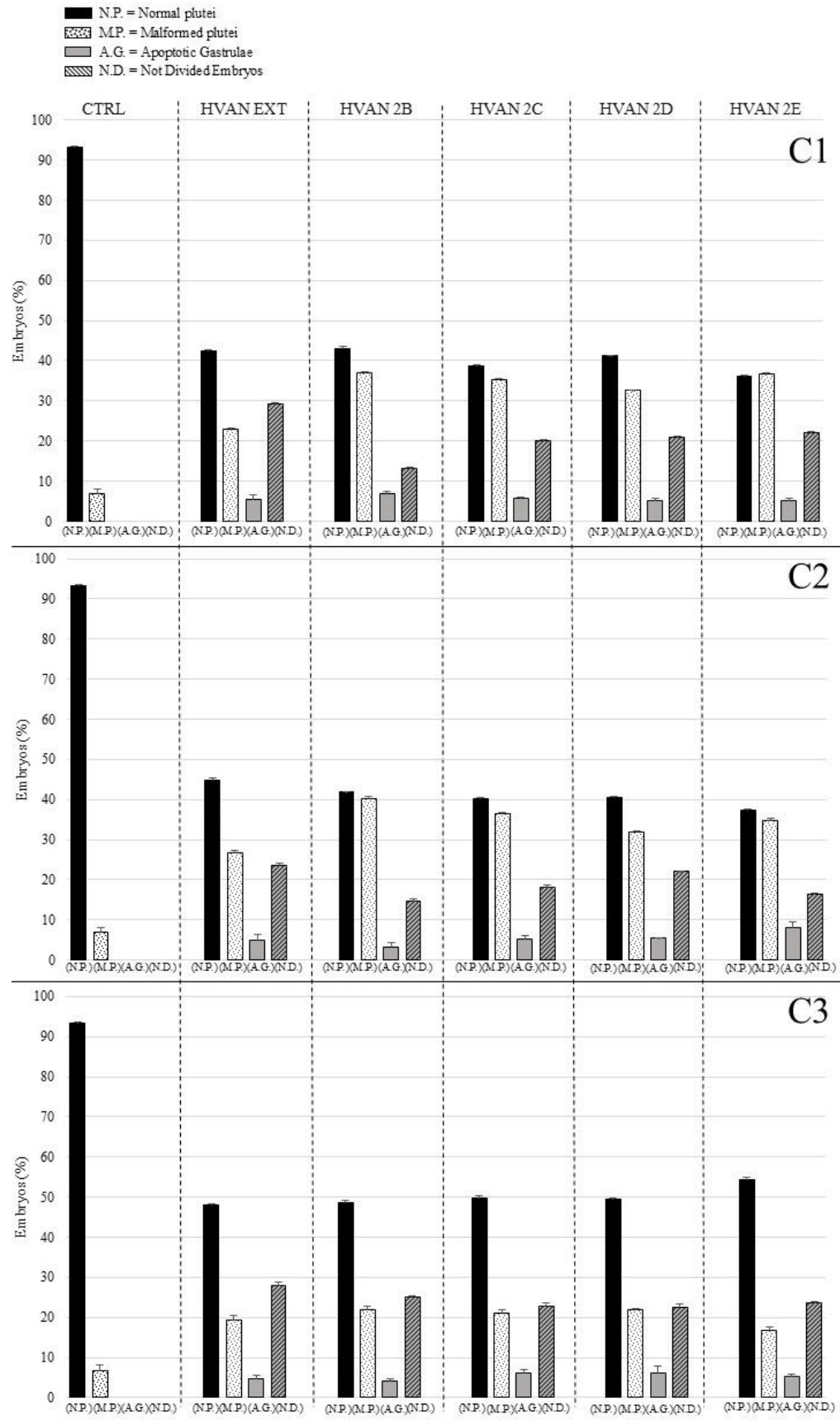


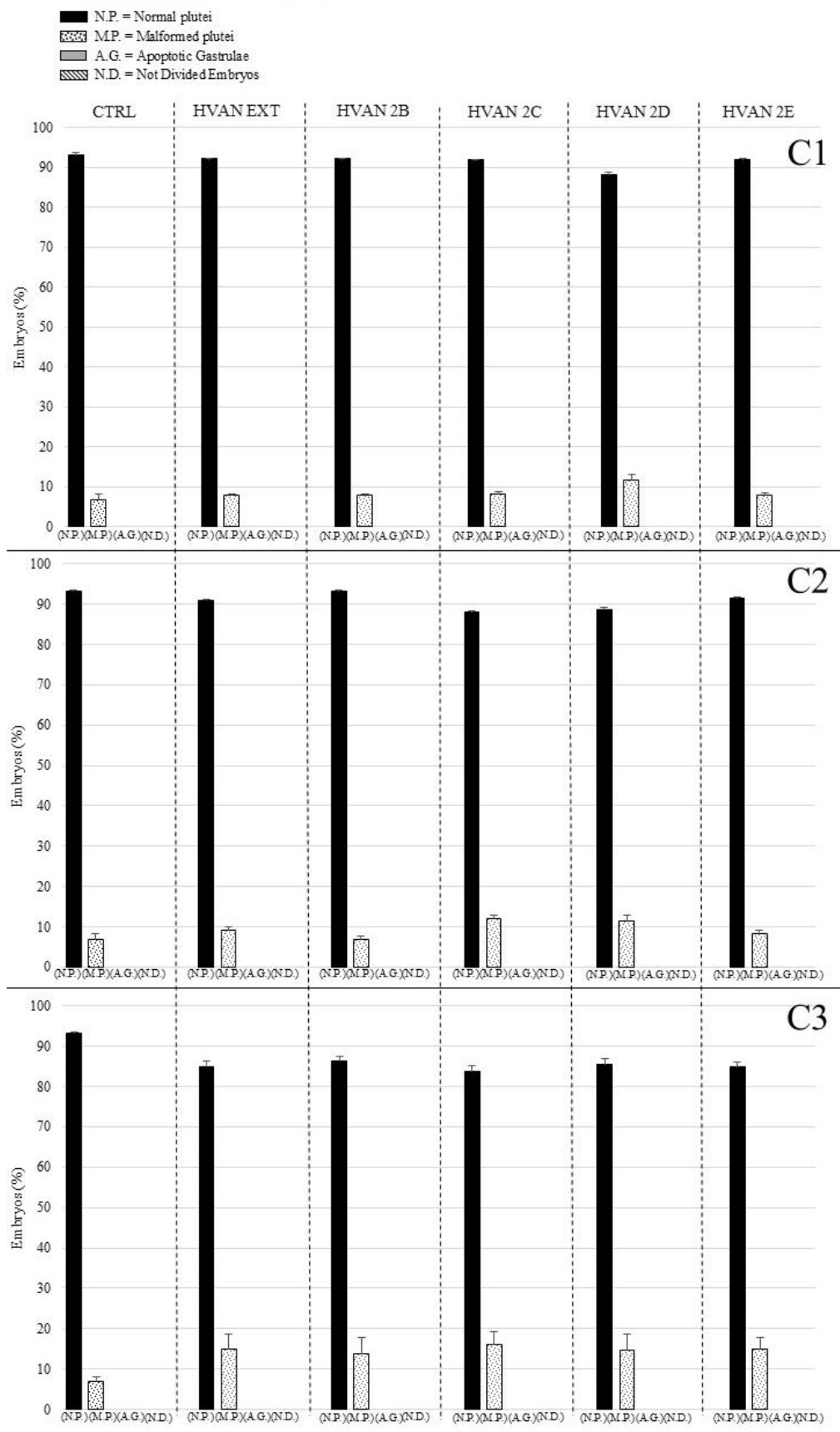
Supplementary Figure S1. Post-fertilization experiments with the fractions GCYD EXT, GCYD 2B, GCYD 2C, GCYD 2D, GCYD 2E from *Geodia cydonium* at the three concentrations: C1=0,125 mg/L; C2=0,25 mg/L; C3=0,500 mg/L.



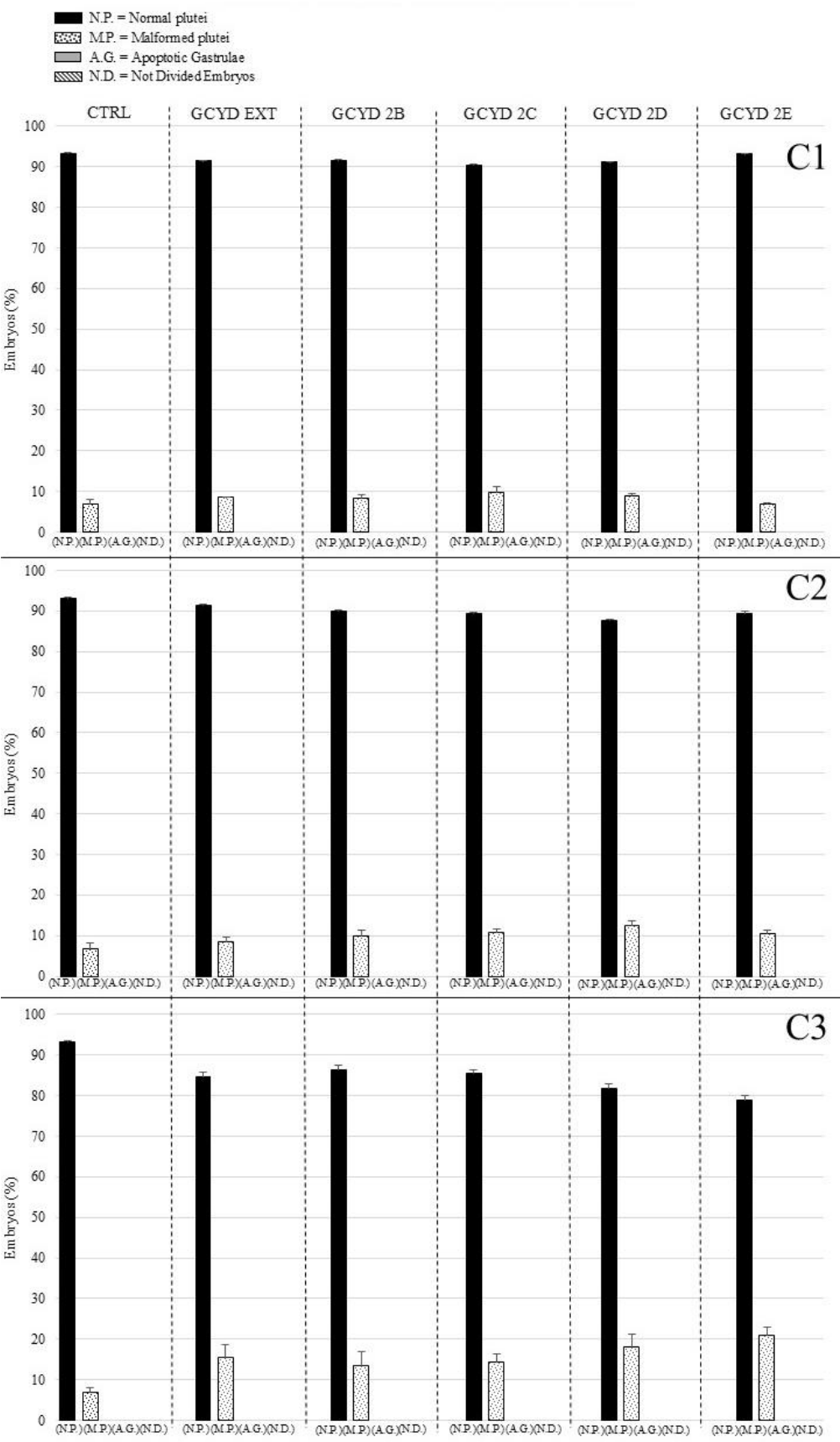
Supplementary Figure S2. Post-fertilization experiments with the fractions HVAN EXT, HVAN 2B, HVAN 2C, HVAN 2D, HVAN 2E from *Haliclona* (*Halichoclona*) *vansoesti* at the three concentrations: C1=0,125 mg/L; C2=0,25 mg/L; C3=0,500 mg/L.



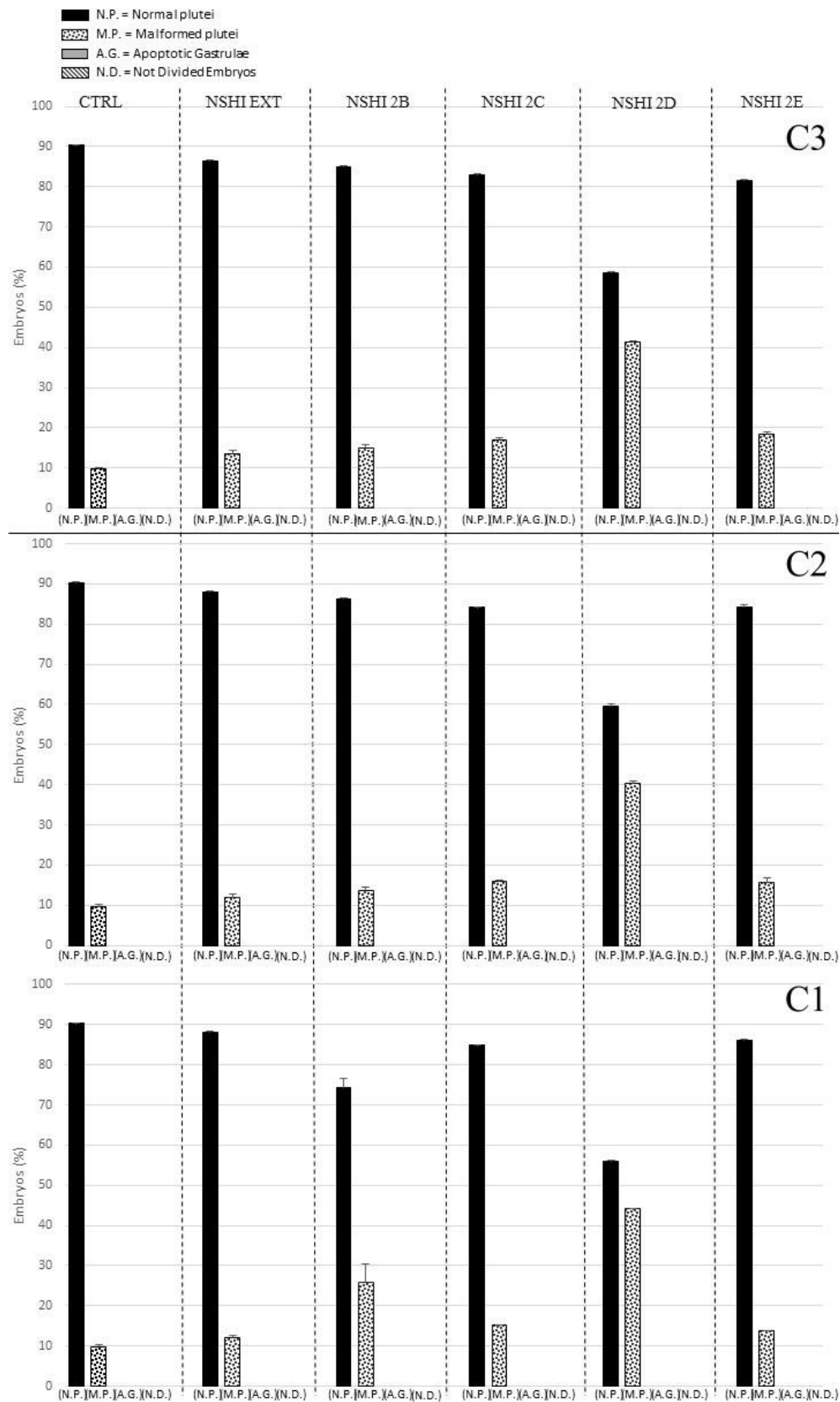
Supplementary Figure S3. Pre-fertilization experiments with the fractions HVAN EXT, HVAN 2B, HVAN 2C, HVAN 2D, HVAN 2E from *H. (Halichoclona) vansoesti* at the three concentrations: C1=0,125 mg/L; C2=0,25 mg/L; C3=0,500 mg/L.



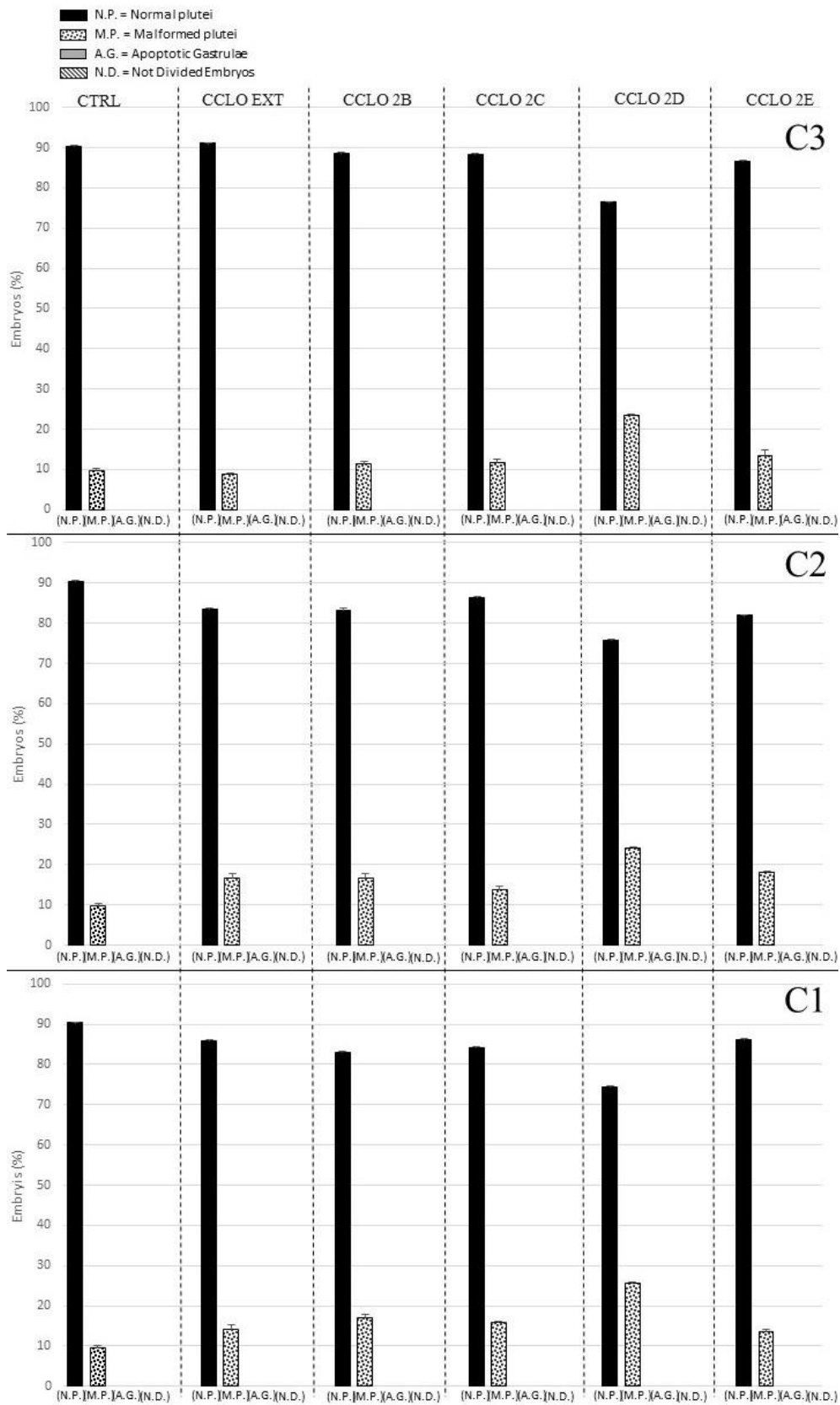
Supplementary Figure S4. Pre-fertilization experiments with the fractions GCYD EXT, GCYD 2B, GCYD 2C, GCYD 2D, GCYD 2E from *G. cydonium* at the three concentrations: C1=0,125 mg/L; C2=0,25 mg/L; C3=0,500 mg/L.



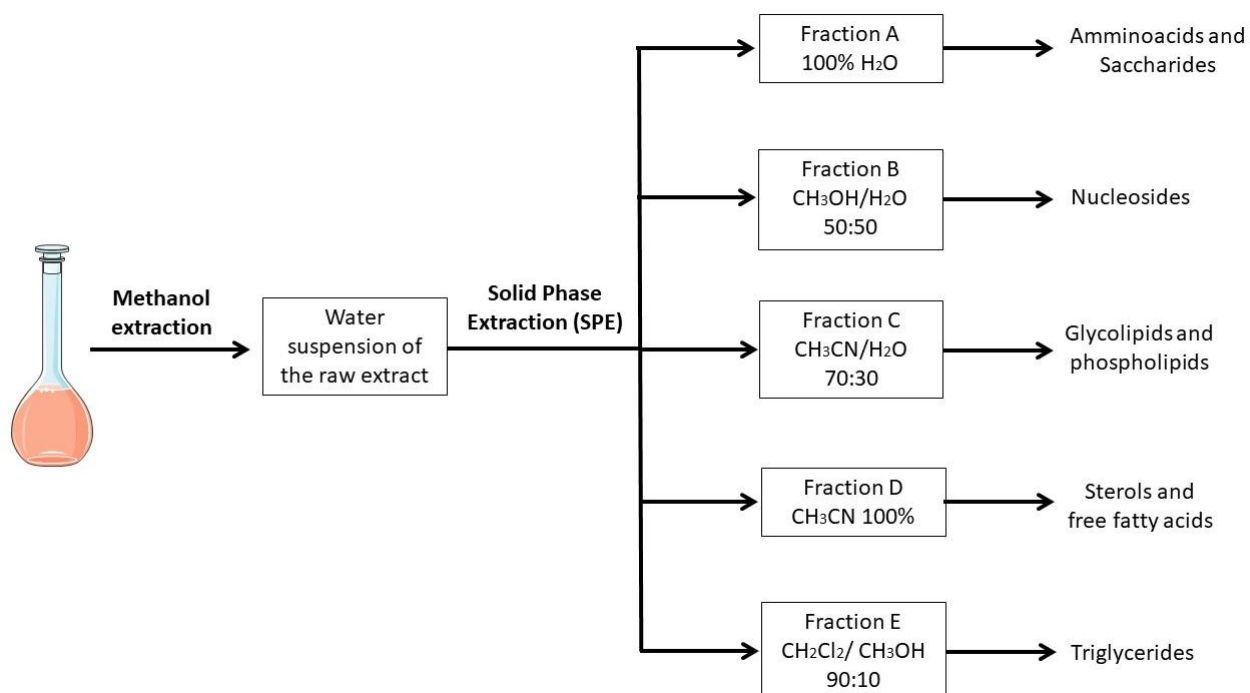
Supplementary Figure S5. Post-fertilization experiments with the fractions NSHII EXT, NSHII 2B, NSHII 2C, NSHII 2D, NSHII 2E from *Nanofrustulum shiloi* at the three concentrations: C1=0,125 mg/L; C2=0,25 mg/L; C3=0,500 mg/L.



Supplementary Figure S6. Post-fertilization experiments with the fractions CCLO EXT, CCLO 2B, CCLO 2C, CCLO 2D, CCLO 2E from *Cylindrotheca closterium* at the three concentrations: C1=0,125 mg/L; C2=0,25 mg/L; C3=0,500 mg/L.



Supplementary Figure S7. General scheme of the method for total extract and fractionation (modified from Cutignano et al.^[21]).



Supplementary Table S1. Embryos classes in the sample: all results are reported in percentage. N.P.= Normal Plutei; M.P.= Malformed Plutei; A.G. = Apoptotic Gastrulae; N.D.= Fertilized but not divided eggs. These results refer to *G. cydonium* after fertilization treatment.

Extract name		C1	C2	C3
GCYD EXT	N.P.	57.9	49.5	47.0
	M.P.	8.9	22.6	24.2
	A.G.	8	6.3	6.1
	N.D.	25.2	21.6	22.7
GCYD 2B	N.P.	59.5	35.6	34.8
	M.P.	10.1	36.3	37.6
	A.G.	6.2	5.2	5.3
	N.D.	24.2	22.9	22.3
GCYD 2C	N.P.	50.7	37.2	36.6
	M.P.	15.5	36.5	37.5
	A.G.	5.9	4.5	5.2
	N.D.	27.9	21.9	20.8
GCYD 2D	N.P.	51.5	40.7	35.4
	M.P.	24.4	36.0	38.9
	A.G.	6.2	6.6	5.4
	N.D.	17.9	16.6	20.4
GCYD 2E	N.P.	50.7	37.9	38.5
	M.P.	23.6	39.7	37.5
	A.G.	6.8	6.7	6.4
	N.D.	18.9	15.7	17.6

Supplementary Table S2. Embryos classes in the sample: all results are reported in percentage. N.P.= Normal Plutei; M.P.= Malformed Plutei; A.G. = Apoptotic Gastrulae; N.D.= Fertilized but not divided eggs. These results refer to *H. (Halichoclona) vansoesti* after fertilization treatment.

Extract name		C1	C2	C3
HVAN EXT	N.P.	48.2	44.8	42.3
	M.P.	19.2	26.7	23.1
	A.G.	4.6	5.0	5.5
	N.D.	28.1	23.5	29.2
HVAN 2B	N.P.	48.7	41.9	43.1
	M.P.	22.0	40.3	37.0
	A.G.	4.3	3.2	6.8
	N.D.	25.0	14.6	13.1
HVAN 2C	N.P.	49.7	40.2	38.8
	M.P.	21.2	36.6	35.4
	A.G.	6.2	5.2	5.8
	N.D.	22.9	18.0	20.1
HVAN 2D	N.P.	49.4	40.6	41.2
	M.P.	21.8	31.9	2.7
	A.G.	6.2	5.3	5.3
	N.D.	22.6	22.2	20.8
HVAN 2E	N.P.	54.3	37.6	36.2
	M.P.	16.9	34.7	36.6
	A.G.	5.3	8.1	5.0
	N.D.	23.5	16.5	22.1

Supplementary Table S3. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (GCYD EXT) and the four fractions (GCYD 2B, GCYD 2C, GCYD 2D, GCYD 2E from the sponge *G. cydonium* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected after fertilization: A) normal plutei; B) malformed plutei; C) apoptotic gastrulae; D) fertilized, not divided eggs.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	5,05	0,9232	ns	No	
Row Factor	9,827	0,234	ns	No	
Column Factor	35,21	0,0003	***	Yes	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	320	8	39,99	F (8, 30) = 0.3794	P=0.9232
Row Factor	622,6	4	155,6	F (4, 30) = 1.477	P=0.2340
Column Factor	2231	2	1115	F (2, 30) = 10.58	P=0.0003
Residual	3162	30	105,4		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
GCYD EXT vs. GCYD 2B	8,767	-5.272 to 22.81	No	ns	0,386
GCYD EXT vs. GCYD 2C	10	-4.039 to 24.04	No	ns	0,2608
GCYD EXT vs. GCYD 2D	9,033	-5.005 to 23.07	No	ns	0,3565
GCYD EXT vs. GCYD 2E	9,167	-4.872 to 23.21	No	ns	0,3422
GCYD 2B vs. GCYD 2C	1,233	-12.81 to 15.27	No	ns	0,999
GCYD 2B vs. GCYD 2D	0,2667	-13.77 to 14.31	No	ns	>0.9999
GCYD 2B vs. GCYD 2E	0,4	-13.64 to 14.44	No	ns	>0.9999
GCYD 2C vs. GCYD 2D	-0,9667	-15.01 to 13.07	No	ns	0,9996
GCYD 2C vs. GCYD 2E	-0,8333	-14.87 to 13.21	No	ns	0,9998
GCYD 2D vs. GCYD 2E	0,1333	-13.91 to 14.17	No	ns	>0.9999

B)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	3,857	0,9098	ns	No	
Row Factor	17,37	0,0158	*	Yes	
Column Factor	42,89	<0.0001	*****	Yes	

ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	297,1	8	37,14	F (8, 30) = 0.4031	P=0.9098
Row Factor	1338	4	334,5	F (4, 30) = 3.631	P=0.0158
Column Factor	3304	2	1652	F (2, 30) = 17.93	P<0.0001
Residual	2764	30	92,12		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
GCYD EXT vs. GCYD 2B	-9,467	-22.59 to 3.657	No	ns	0,2497
GCYD EXT vs. GCYD 2C	-11,27	-24.39 to 1.857	No	ns	0,1199
GCYD EXT vs. GCYD 2D	-14,6	-27.72 to -1.476	Yes	*	0,0234
GCYD EXT vs. GCYD 2E	-15,07	-28.19 to -1.943	Yes	*	0,0182
GCYD 2B vs. GCYD 2C	-1,8	-14.92 to 11.32	No	ns	0,9944
GCYD 2B vs. GCYD 2D	-5,133	-18.26 to 7.991	No	ns	0,7871
GCYD 2B vs. GCYD 2E	-5,6	-18.72 to 7.524	No	ns	0,7299
GCYD 2C vs. GCYD 2D	-3,333	-16.46 to 9.791	No	ns	0,9461
GCYD 2C vs. GCYD 2E	-3,8	-16.92 to 9.324	No	ns	0,9159
GCYD 2D vs. GCYD 2E	-0,4667	-13.59 to 12.66	No	ns	>0.9999

C)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	5,644	0,9682	ns	No	
Row Factor	12,47	0,3198	ns	No	
Column Factor	5,762	0,3347	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	7,134	8	0,8917	F (8, 30) = 0.2780	P=0.9682
Row Factor	15,76	4	3,939	F (4, 30) = 1.228	P=0.3198
Column Factor	7,283	2	3,642	F (2, 30) = 1.135	P=0.3347
Residual	96,22	30	3,207		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
GCYD EXT vs. GCYD 2B	1,003	-1.446 to 3.452	No	ns	0,7578

GCYD EXT vs. GCYD 2C	1,62	-0.8288 to 4.069	No	ns	0,3296
GCYD EXT vs. GCYD 2D	0,7367	-1.712 to 3.186	No	ns	0,9047
GCYD EXT vs. GCYD 2E	0,1333	-2.316 to 2.582	No	ns	0,9999
GCYD 2B vs. GCYD 2C	0,6167	-1.832 to 3.066	No	ns	0,9477
GCYD 2B vs. GCYD 2D	-0,2667	-2.716 to 2.182	No	ns	0,9977
GCYD 2B vs. GCYD 2E	-0,87	-3.319 to 1.579	No	ns	0,8393
GCYD 2C vs. GCYD 2D	-0,8833	-3.332 to 1.566	No	ns	0,8318
GCYD 2C vs. GCYD 2E	-1,487	-3.936 to 0.9622	No	ns	0,4141
GCYD 2D vs. GCYD 2E	-0,6033	-3.052 to 1.846	No	ns	0,9515

D)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	4,865	0,9764	ns	No	
Row Factor	18,99	0,1252	ns	No	
Column Factor	3,724	0,4714	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	85,91	8	10,74	F (8, 30) = 0.2519	P=0.9764
Row Factor	335,3	4	83,83	F (4, 30) = 1.966	P=0.1252
Column Factor	65,76	2	32,88	F (2, 30) = 0.7712	P=0.4714
Residual	1279	30	42,63		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
GCYD EXT vs. GCYD 2B	-0,27	-9.198 to 8.658	No	ns	>0.9999
GCYD EXT vs. GCYD 2C	-0,3967	-9.325 to 8.531	No	ns	>0.9999
GCYD EXT vs. GCYD 2D	4,863	-4.065 to 13.79	No	ns	0,5211
GCYD EXT vs. GCYD 2E	5,763	-3.165 to 14.69	No	ns	0,3534
GCYD 2B vs. GCYD 2C	-0,1267	-9.055 to 8.801	No	ns	>0.9999
GCYD 2B vs. GCYD 2D	5,133	-3.795 to 14.06	No	ns	0,4681
GCYD 2B vs. GCYD 2E	6,033	-2.895 to 14.96	No	ns	0,3093
GCYD 2C vs. GCYD 2D	5,26	-3.668 to 14.19	No	ns	0,4439
GCYD 2C vs. GCYD 2E	6,16	-2.768 to 15.09	No	ns	0,2898

GCYD 2D vs. GCYD 2E	0,9	-8.028 to 9.828	No	ns	0,9983
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Supplementary Table S4. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (HVAN EXT) and the four fractions (HVAN 2B, HVAN 2C, HVAN 2D, HVAN 2E (from the sponge *H. (Halichoclona) vansoesti* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected after fertilization treatment: A) normal plutei; B) malformed plutei; C) apoptotic gastrulae; D) fertilized, not divided eggs.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	1,154	>0.9999	ns	No	
Row Factor	0,2252	0,9993	ns	No	
Column Factor	5,611	0,4153	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	204	8	25,51	F (8, 30) = 0.04653	P>0.9999
Row Factor	39,81	4	9,952	F (4, 30) = 0.01816	P=0.9993
Column Factor	992	2	496	F (2, 30) = 0.9049	P=0.4153
Residual	16443	30	548,1		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
HVAN EXT vs. HVAN 2B	1,067	-30.95 to 33.08	No	ns	>0.9999
HVAN EXT vs. HVAN 2C	2,48	-29.53 to 34.49	No	ns	0,9994
HVAN EXT vs. HVAN 2D	1,333	-30.68 to 33.35	No	ns	>0.9999
HVAN EXT vs. HVAN 2E	2,5	-29.51 to 34.51	No	ns	0,9994
HVAN 2B vs. HVAN 2C	1,413	-30.60 to 33.43	No	ns	>0.9999
HVAN 2B vs. HVAN 2D	0,2667	-31.75 to 32.28	No	ns	>0.9999
HVAN 2B vs. HVAN 2E	1,433	-30.58 to 33.45	No	ns	>0.9999
HVAN 2C vs. HVAN 2D	-1,147	-33.16 to 30.87	No	ns	>0.9999
HVAN 2C vs. HVAN 2E	0,02	-31.99 to 32.03	No	ns	>0.9999
HVAN 2D vs. HVAN 2E	1,167	-30.85 to 33.18	No	ns	>0.9999

B)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	1,623	0,9997	ns	No	
Row Factor	3,572	0,8581	ns	No	
Column Factor	12,69	0,1159	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	

Interaction	220,5	8	27,56	F (8, 30) = 0.07412	P=0.9997
Row Factor	485,2	4	121,3	F (4, 30) = 0.3262	P=0.8581
Column Factor	1724	2	861,8	F (2, 30) = 2.318	P=0.1159
Residual	11154	30	371,8		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
HVAN EXT vs. HVAN 2B	-9,91	-36.28 to 16.46	No	ns	0,8101
HVAN EXT vs. HVAN 2C	-7,633	-34.00 to 18.73	No	ns	0,916
HVAN EXT vs. HVAN 2D	-5,9	-32.27 to 20.47	No	ns	0,9655
HVAN EXT vs. HVAN 2E	-5,7	-32.07 to 20.67	No	ns	0,9695
HVAN 2B vs. HVAN 2C	2,277	-24.09 to 28.64	No	ns	0,9991
HVAN 2B vs. HVAN 2D	4,01	-22.36 to 30.38	No	ns	0,9917
HVAN 2B vs. HVAN 2E	4,21	-22.16 to 30.58	No	ns	0,9901
HVAN 2C vs. HVAN 2D	1,733	-24.63 to 28.10	No	ns	0,9997
HVAN 2C vs. HVAN 2E	1,933	-24.43 to 28.30	No	ns	0,9995
HVAN 2D vs. HVAN 2E	0,2	-26.17 to 26.57	No	ns	>0.9999

C)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	8,407	0,9296	ns	No	
Row Factor	4,18	0,8314	ns	No	
Column Factor	1,598	0,7582	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	41,98	8	5,248	F (8, 30) = 0.3674	P=0.9296
Row Factor	20,87	4	5,219	F (4, 30) = 0.3653	P=0.8314
Column Factor	7,981	2	3,991	F (2, 30) = 0.2793	P=0.7582
Residual	428,6	30	14,29		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
HVAN EXT vs. HVAN 2B	-0,36	-5.528 to 4.808	No	ns	0,9996
HVAN EXT vs. HVAN 2C	-1,277	-6.445 to 3.891	No	ns	0,9511
HVAN EXT vs. HVAN 2D	-1,207	-6.375 to 3.961	No	ns	0,9599
HVAN EXT vs. HVAN 2E	-1,897	-7.065 to 3.271	No	ns	0,8229

HVAN 2B vs. HVAN 2C	-0,9167	-6.085 to 4.251	No	ns	0,9852
HVAN 2B vs. HVAN 2D	-0,8467	-6.015 to 4.321	No	ns	0,989
HVAN 2B vs. HVAN 2E	-1,537	-6.705 to 3.631	No	ns	0,9082
HVAN 2C vs. HVAN 2D	0,07	-5.098 to 5.238	No	ns	>0.9999
HVAN 2C vs. HVAN 2E	-0,62	-5.788 to 4.548	No	ns	0,9967
HVAN 2D vs. HVAN 2E	-0,69	-5.858 to 4.478	No	ns	0,995

D)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	3,805	0,9936	ns	No	
Row Factor	7,243	0,6387	ns	No	
Column Factor	3,94	0,5068	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	216,2	8	27,02	F (8, 30) = 0.1678	P=0.9936
Row Factor	411,5	4	102,9	F (4, 30) = 0.6390	P=0.6387
Column Factor	223,9	2	111,9	F (2, 30) = 0.6953	P=0.5068
Residual	4830	30	161		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
HVAN EXT vs. HVAN 2B	9,233	-8.116 to 26.58	No	ns	0,5434
HVAN EXT vs. HVAN 2C	6,433	-10.92 to 23.78	No	ns	0,8175
HVAN EXT vs. HVAN 2D	5,8	-11.55 to 23.15	No	ns	0,8666
HVAN EXT vs. HVAN 2E	6,267	-11.08 to 23.62	No	ns	0,8311
HVAN 2B vs. HVAN 2C	-2,8	-20.15 to 14.55	No	ns	0,9896
HVAN 2B vs. HVAN 2D	-3,433	-20.78 to 13.92	No	ns	0,9779
HVAN 2B vs. HVAN 2E	-2,967	-20.32 to 14.38	No	ns	0,9871
HVAN 2C vs. HVAN 2D	-0,6333	-17.98 to 16.72	No	ns	>0.9999
HVAN 2C vs. HVAN 2E	-0,1667	-17.52 to 17.18	No	ns	>0.9999
HVAN 2D vs. HVAN 2E	0,4667	-16.88 to 17.82	No	ns	>0.9999

Supplementary Table S5. Embryos classes in the sample: all results are reported in percentage. N.P= Normal Plutei; M.P.= Malformed Plutei; A.G. = Apoptotic Gastrulae; N.D.= Fertilized but not divided eggs. These results refer to *Agelas oroides* after fertilization treatment.

Extract name		C1	C2	C3
AORO EXT	N.P.	56.8	62.4	52.3
	M.P.	21.2	22.9	18.6
	A.G.	4.6	5.8	8.1
	N.D.	17.4	9.0	21.0
AORO 2B	N.P.	44.8	28.8	29.8
	M.P.	19.3	42.7	42.0
	A.G.	6.0	6.0	5.7
	N.D.	29.9	22.5	22.6
AORO 2C	N.P.	42.7	24.8	18.8
	M.P.	19.6	43.7	50.9
	A.G.	5.2	7.5	7.4
	N.D.	32.5	24.0	23.0
AORO 2D	N.P.	0	0	0
	M.P.	22.1	70.7	74.6
	A.G.	5.3	15.6	15.3
	N.D.	72.6	13.7	10.1
AORO 2E	N.P.	51.3	46.7	44.3
	M.P.	19.1	28.6	28.7
	A.G.	5.3	5.5	6.1
	N.D.	24.4	19.2	21.0

Supplementary Table S6. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (AORO EXT) and the four fractions (AORO 2B, AORO 2C, AORO 2D, AORO 2E) from the sponge *A. oroides* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected after fertilization treatment: A) normal plutei; B) malformed plutei; C) apoptotic gastrulae; D) fertilized, not divided eggs.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	4,471	<0.0001	****	Yes	
Row Factor	89,9	<0.0001	****	Yes	
Column Factor	4,153	<0.0001	****	Yes	
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Interaction	848,3	8	106	F (8, 30) = 11.39	P<0.0001
Row Factor	17058	4	4264	F (4, 30) = 458.1	P<0.0001
Column Factor	787,9	2	393,9	F (2, 30) = 42.32	P<0.0001
Residual	279,3	30	9,309		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
AORO EXT vs. AORO 2B	22,73	18.56 to 26.91	Yes	****	<0.0001
AORO EXT vs. AORO 2C	28,4	24.23 to 32.57	Yes	****	<0.0001
AORO EXT vs. AORO 2D	57,1	52.93 to 61.27	Yes	****	<0.0001
AORO EXT vs. AORO 2E	9,733	5.561 to 13.91	Yes	****	<0.0001
AORO 2B vs. AORO 2C	5,667	1.495 to 9.839	Yes	**	0,0038
AORO 2B vs. AORO 2D	34,37	30.19 to 38.54	Yes	****	<0.0001
AORO 2B vs. AORO 2E	-13	-17.17 to -8.828	Yes	****	<0.0001
AORO 2C vs. AORO 2D	28,7	24.53 to 32.87	Yes	****	<0.0001
AORO 2C vs. AORO 2E	-18,67	-22.84 to -14.49	Yes	****	<0.0001
AORO 2D vs. AORO 2E	-47,37	-51.54 to -43.19	Yes	****	<0.0001

B)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	21,24	<0.0001	****	Yes	
Row Factor	44,65	<0.0001	****	Yes	
Column Factor	32,82	<0.0001	****	Yes	
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value

Interaction	3139	8	392,3	F (8, 30) = 61.83	P<0.0001
Row Factor	6599	4	1650	F (4, 30) = 260.0	P<0.0001
Column Factor	4851	2	2425	F (2, 30) = 382.3	P<0.0001
Residual	190,3	30	6,345		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
AORO EXT vs. AORO 2B	-13,8	-17.24 to -10.36	Yes	****	<0.0001
AORO EXT vs. AORO 2C	-17,17	-20.61 to -13.72	Yes	****	<0.0001
AORO EXT vs. AORO 2D	-34,93	-38.38 to -31.49	Yes	****	<0.0001
AORO EXT vs. AORO 2E	-4,567	-8.011 to -1.122	Yes	**	0,0049
AORO 2B vs. AORO 2C	-3,367	-6.811 to 0.07758	No	ns	0,0579
AORO 2B vs. AORO 2D	-21,13	-24.58 to -17.69	Yes	****	<0.0001
AORO 2B vs. AORO 2E	9,233	5.789 to 12.68	Yes	****	<0.0001
AORO 2C vs. AORO 2D	-17,77	-21.21 to -14.32	Yes	****	<0.0001
AORO 2C vs. AORO 2E	12,6	9.156 to 16.04	Yes	****	<0.0001
AORO 2D vs. AORO 2E	30,37	26.92 to 33.81	Yes	****	<0.0001

C)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	24,94	0,0001	***	Yes	
Row Factor	44,13	<0.0001	****	Yes	
Column Factor	15,48	<0.0001	****	Yes	
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Interaction	148,6	8	18,58	F (8, 30) = 6.051	P=0.0001
Row Factor	263	4	65,76	F (4, 30) = 21.42	P<0.0001
Column Factor	92,26	2	46,13	F (2, 30) = 15.03	P<0.0001
Residual	92,11	30	3,07		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
AORO EXT vs. AORO 2B	0,3	-2.096 to 2.696	No	ns	0,9961
AORO EXT vs. AORO 2C	-0,5	-2.896 to 1.896	No	ns	0,9732
AORO EXT vs. AORO 2D	-5,9	-8.296 to -3.504	Yes	****	<0.0001
AORO EXT vs. AORO 2E	0,53	-1.866 to 2.926	No	ns	0,9669

AORO 2B vs. AORO 2C	-0,8	-3.196 to 1.596	No	ns	0,867
AORO 2B vs. AORO 2D	-6,2	-8.596 to -3.804	Yes	****	<0.0001
AORO 2B vs. AORO 2E	0,23	-2.166 to 2.626	No	ns	0,9986
AORO 2C vs. AORO 2D	-5,4	-7.796 to -3.004	Yes	****	<0.0001
AORO 2C vs. AORO 2E	1,03	-1.366 to 3.426	No	ns	0,7245
AORO 2D vs. AORO 2E	6,43	4.034 to 8.826	Yes	****	<0.0001

D)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	53,53	<0.0001	****	Yes	
Row Factor	13,83	<0.0001	****	Yes	
Column Factor	29,46	<0.0001	****	Yes	
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Interaction	5121	8	640,1	F (8, 30) = 63.11	P<0.0001
Row Factor	1323	4	330,8	F (4, 30) = 32.61	P<0.0001
Column Factor	2818	2	1409	F (2, 30) = 138.9	P<0.0001
Residual	304,3	30	10,14		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
AORO EXT vs. AORO 2B	-9,223	-13.58 to -4.869	Yes	****	<0.0001
AORO EXT vs. AORO 2C	-10,69	-15.05 to -6.339	Yes	****	<0.0001
AORO EXT vs. AORO 2D	-16,36	-20.71 to -12.01	Yes	****	<0.0001
AORO EXT vs. AORO 2E	-5,727	-10.08 to -1.372	Yes	**	0,0053
AORO 2B vs. AORO 2C	-1,47	-5.825 to 2.885	No	ns	0,8625
AORO 2B vs. AORO 2D	-7,137	-11.49 to -2.782	Yes	***	0,0004
AORO 2B vs. AORO 2E	3,497	-0.8579 to 7.851	No	ns	0,1637
AORO 2C vs. AORO 2D	-5,667	-10.02 to -1.312	Yes	**	0,0059
AORO 2C vs. AORO 2E	4,967	0.6121 to 9.321	Yes	*	0,0192
AORO 2D vs. AORO 2E	10,63	6.279 to 14.99	Yes	****	<0.0001

Supplementary Table S7. Embryos classes in the sample: all results are reported in percentage. N.P.= Normal Plutei; M.P.= Malformed Plutei; A.G. = Apoptotic Gastrulae; N.D.= Fertilized but not divided eggs. These results refer to *G. cydonium* before fertilization treatment.

Extract name		C1	C2	C3
GCYD EXT	N.P.	91.4	91.4	84.6
	M.P.	8.6	8.6	15.4
GCYD 2B	N.P.	91.6	90.0	86.4
	M.P.	8.4	10.0	13.6
GCYD 2C	N.P.	90.2	89.3	85.5
	M.P.	9.8	10.7	14.5
GCYD 2D	N.P.	91.1	87.6	81.8
	M.P.	8.9	12.4	18.2
GCYD 2E	N.P.	93.1	89.5	79.0
	M.P.	6.8	10.5	21.0

Supplementary Table S8. Embryos classes in the sample: all results are reported in percentage. N.P= Normal Plutei; M.P.= Malformed Plutei; A.G. = Apoptotic Gastrulae; N.D.= Fertilized but not divided eggs. These results refer to *A. oroides* before fertilization treatment.

Extract name		C1	C2	C3
AORO EXT	N.P.	89.3	92.0	85.6
	M.P.	10.7	8.0	14.4
AORO 2B	N.P.	89.4	88.4	75.8
	M.P.	10.6	11.6	24.2
AORO 2C	N.P.	77.3	60.3	36.2
	M.P.	22.7	39.7	63.8
AORO 2D	N.P.	89.0	85.4	68.0
	M.P.	11.0	14.6	32.0
AORO 2E	N.P.	89.9	87.8	86.0
	M.P.	10.1	12.2	14.0

Supplementary Table S9. Embryos classes in the sample: all results are reported in percentage. N.P.= Normal Plutei; M.P.= Malformed Plutei; A.G. = Apoptotic Gastrulae; N.D.= Fertilized but not divided eggs. These results refer to *H. (Halichoclona) vansoesti* before fertilization treatment.

Extract name		C1	C2	C3
HVAN EXT	N.P.	92.2	90.9	85.0
	M.P.	7.8	9.1	15.0
HVAN 2B	N.P.	92.1	93.2	86.3
	M.P.	7.9	6.8	13.7
HVAN 2C	N.P.	91.9	88.0	83.9
	M.P.	8.1	12.0	16.1
HVAN 2D	N.P.	88.2	88.7	85.5
	M.P.	11.8	11.3	14.5
HVAN 2E	N.P.	92.0	91.5	85.0
	M.P.	8.0	8.1	15.0

Supplementary Table S10. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (GCYD EXT) and the four fractions (GCYD 2B, GCYD 2C, GCYD 2D, GCYD 2E from the sponge *G. cydonium* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected before fertilization: A) normal plutei; B) malformed plutei.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	18,46	0,3359	ns	No	
Row Factor	9,444	0,3228	ns	No	
Column Factor	14,08	0,0384	*	Yes	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	374,1	8	46,76	F (8, 30) = 1.193	P=0.3359
Row Factor	191,4	4	47,85	F (4, 30) = 1.221	P=0.3228
Column Factor	285,3	2	142,6	F (2, 30) = 3.640	P=0.0384
Residual	1176	30	39,19		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
GCYD EXT vs. GCYD 2B	-3,533	-12.09 to 5.027	No	ns	0,7528
GCYD EXT vs. GCYD 2C	0,7333	-7.827 to 9.293	No	ns	0,9991
GCYD EXT vs. GCYD 2D	2,233	-6.327 to 10.79	No	ns	0,9409
GCYD EXT vs. GCYD 2E	1,9	-6.660 to 10.46	No	ns	0,9665
GCYD 2B vs. GCYD 2C	4,267	-4.293 to 12.83	No	ns	0,6041
GCYD 2B vs. GCYD 2D	5,767	-2.793 to 14.33	No	ns	0,3122
GCYD 2B vs. GCYD 2E	5,433	-3.127 to 13.99	No	ns	0,3699
GCYD 2C vs. GCYD 2D	1,5	-7.060 to 10.06	No	ns	0,9859
GCYD 2C vs. GCYD 2E	1,167	-7.393 to 9.727	No	ns	0,9946
GCYD 2D vs. GCYD 2E	-0,3333	-8.893 to 8.227	No	ns	>0.9999

B)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	2,545	0,9884	ns	No	
Row Factor	2,654	0,7861	ns	No	
Column Factor	6,294	0,1411	ns	No	
ANOVA table	SS (Type III)	DF	MS	F (DFn, DFd)	

Interaction	107,6	8	13,46	F (8, 48) = 0.2063	P=0.9884
Row Factor	112,3	4	28,07	F (4, 48) = 0.4302	P=0.7861
Column Factor	266,2	2	133,1	F (2, 48) = 2.041	P=0.1411
Tukey's multiple comparisons test	Predicted (LS) mean diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
GCYD EXT vs. GCYD 2B	0,2067	-10.58 to 11.00	No	ns	>0.9999
GCYD EXT vs. GCYD 2C	-0,6933	-11.48 to 10.10	No	ns	0,9997
GCYD EXT vs. GCYD 2D	-2,227	-12.22 to 7.764	No	ns	0,9692
GCYD EXT vs. GCYD 2E	2,307	-8.484 to 13.10	No	ns	0,9735
GCYD 2B vs. GCYD 2C	-0,9	-11.69 to 9.891	No	ns	0,9993
GCYD 2B vs. GCYD 2D	-2,433	-12.42 to 7.557	No	ns	0,9576
GCYD 2B vs. GCYD 2E	2,1	-8.691 to 12.89	No	ns	0,9812
GCYD 2C vs. GCYD 2D	-1,533	-11.52 to 8.457	No	ns	0,9923
GCYD 2C vs. GCYD 2E	3	-7.791 to 13.79	No	ns	0,9329
GCYD 2D vs. GCYD 2E	4,533	-5.457 to 14.52	No	ns	0,7009

Supplementary Table S11. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (AORO EXT) and the four fractions (AORO 2B, AORO 2C, AORO 2D, AORO 2E) from the sponge *A. oroides* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected before fertilization: A) normal plutei; B) malformed plutei.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	11,24	0,194	ns	No	
Row Factor	44,09	<0.0001	****	Yes	
Column Factor	16,83	0,0008	***	Yes	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	1493	8	186,6	F (8, 30) = 1.514	P=0.1940
Row Factor	5854	4	1463	F (4, 30) = 11.88	P<0.0001
Column Factor	2235	2	1117	F (2, 30) = 9.069	P=0.0008
Residual	3696	30	123,2		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
AORO EXT vs. AORO 2B	4,433	-10.74 to 19.61	No	ns	0,9135
AORO EXT vs. AORO 2C	31,03	15.86 to 46.21	Yes	****	<0.0001
AORO EXT vs. AORO 2D	8,167	-7.011 to 23.34	No	ns	0,5329
AORO EXT vs. AORO 2E	1,1	-14.08 to 16.28	No	ns	0,9995
AORO 2B vs. AORO 2C	26,6	11.42 to 41.78	Yes	***	0,0002
AORO 2B vs. AORO 2D	3,733	-11.44 to 18.91	No	ns	0,9518
AORO 2B vs. AORO 2E	-3,333	-18.51 to 11.84	No	ns	0,9677
AORO 2C vs. AORO 2D	-22,87	-38.04 to -7.689	Yes	**	0,0012
AORO 2C vs. AORO 2E	-29,93	-45.11 to -14.76	Yes	****	<0.0001
AORO 2D vs. AORO 2E	-7,067	-22.24 to 8.111	No	ns	0,6627

B)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	4,639	0,8999	ns	No	
Row Factor	17,72	0,0194	*	Yes	
Column Factor	7,648	0,0703	ns	No	
ANOVA table	SS (Type III)	DF	MS	F (DFn, DFd)	

Interaction	1529	8	191,2	F (8, 48) = 0.4256	P=0.8999
Row Factor	5840	4	1460	F (4, 48) = 3.251	P=0.0194
Column Factor	2521	2	1261	F (2, 48) = 2.807	P=0.0703
Residual	21557	48	449,1		
Tukey's multiple comparisons test	Predicted (LS) mean diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
AORO EXT vs. AORO 2B	-4,467	-32.78 to 23.85	No	ns	0,9915
AORO EXT vs. AORO 2C	-31	-59.31 to -2.686	Yes	*	0,0254
AORO EXT vs. AORO 2D	-8,133	-34.35 to 18.08	No	ns	0,9031
AORO EXT vs. AORO 2E	-1,1	-29.41 to 27.21	No	ns	>0.9999
AORO 2B vs. AORO 2C	-26,53	-54.85 to 1.780	No	ns	0,0761
AORO 2B vs. AORO 2D	-3,667	-29.88 to 22.55	No	ns	0,9946
AORO 2B vs. AORO 2E	3,367	-24.95 to 31.68	No	ns	0,9971
AORO 2C vs. AORO 2D	22,87	-3.347 to 49.08	No	ns	0,1142
AORO 2C vs. AORO 2E	29,9	1.586 to 58.21	Yes	*	0,0337
AORO 2D vs. AORO 2E	7,033	-19.18 to 33.25	No	ns	0,9406

Supplementary Table S12. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (HVAN EXT) and the four fractions (HVAN 2B, HAVN 2C, HVAN 2D, HVAN 2E (from the sponge *H. (Halichoclona) vansoesti* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected before fertilization: A) normal plutei; B) malformed plutei.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	
Interaction	5,128	0,9726	ns	No	
Row Factor	10,96	0,3607	ns	No	
Column Factor	11,24	0,1155	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Interaction	90,01	8	11,25	F (8, 30) = 0.2646	P=0.9726
Row Factor	192,3	4	48,08	F (4, 30) = 1.131	P=0.3607
Column Factor	197,4	2	98,7	F (2, 30) = 2.321	P=0.1155
Residual	1276	30	42,52		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
CTRL:0.125 mg/L vs. CTRL:0.25 mg/L	0	-19.62 to 19.62	No	ns	>0.9999
CTRL:0.125 mg/L vs. CTRL:0.500 mg/L	0	-19.62 to 19.62	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2B:0.125 mg/L	1,2	-18.42 to 20.82	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2B:0.25 mg/L	0,1	-19.52 to 19.72	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2B:0.500 mg/L	7	-12.62 to 26.62	No	ns	0,9889
CTRL:0.125 mg/L vs. HVAN 2C:0.125 mg/L	1,4	-18.22 to 21.02	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2C:0.25 mg/L	5,2	-14.42 to 24.82	No	ns	0,9994
CTRL:0.125 mg/L vs. HVAN 2C:0.500 mg/L	9,4	-10.22 to 29.02	No	ns	0,8938
CTRL:0.125 mg/L vs. HVAN 2D:0.125 mg/L	5,1	-14.52 to 24.72	No	ns	0,9995
CTRL:0.125 mg/L vs. HVAN 2D:0.25 mg/L	4,5	-15.12 to 24.12	No	ns	0,9999
CTRL:0.125 mg/L vs. HVAN 2D:0.500 mg/L	7,7	-11.92 to 27.32	No	ns	0,9751
CTRL:0.125 mg/L vs. HVAN 2E:0.125 mg/L	1,3	-18.32 to 20.92	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2E:0.25 mg/L	1,8	-17.82 to 21.42	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2E:0.500 mg/L	8,3	-11.32 to 27.92	No	ns	0,9551
CTRL:0.25 mg/L vs. CTRL:0.500 mg/L	0	-19.62 to 19.62	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2B:0.125 mg/L	1,2	-18.42 to 20.82	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2B:0.25 mg/L	0,1	-19.52 to 19.72	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2B:0.500 mg/L	7	-12.62 to 26.62	No	ns	0,9889
CTRL:0.25 mg/L vs. HVAN 2C:0.125 mg/L	1,4	-18.22 to 21.02	No	ns	>0.9999

CTRL:0.25 mg/L vs. HVAN 2C:0.25 mg/L	5,2	-14.42 to 24.82	No	ns	0,9994
CTRL:0.25 mg/L vs. HVAN 2C:0.500 mg/L	9,4	-10.22 to 29.02	No	ns	0,8938
CTRL:0.25 mg/L vs. HVAN 2D:0.125 mg/L	5,1	-14.52 to 24.72	No	ns	0,9995
CTRL:0.25 mg/L vs. HVAN 2D:0.25 mg/L	4,5	-15.12 to 24.12	No	ns	0,9999
CTRL:0.25 mg/L vs. HVAN 2D:0.500 mg/L	7,7	-11.92 to 27.32	No	ns	0,9751
CTRL:0.25 mg/L vs. HVAN 2E:0.125 mg/L	1,3	-18.32 to 20.92	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2E:0.25 mg/L	1,8	-17.82 to 21.42	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2E:0.500 mg/L	8,3	-11.32 to 27.92	No	ns	0,9551
CTRL:0.500 mg/L vs. HVAN 2B:0.125 mg/L	1,2	-18.42 to 20.82	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2B:0.25 mg/L	0,1	-19.52 to 19.72	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2B:0.500 mg/L	7	-12.62 to 26.62	No	ns	0,9889
CTRL:0.500 mg/L vs. HVAN 2C:0.125 mg/L	1,4	-18.22 to 21.02	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2C:0.25 mg/L	5,2	-14.42 to 24.82	No	ns	0,9994
CTRL:0.500 mg/L vs. HVAN 2C:0.500 mg/L	9,4	-10.22 to 29.02	No	ns	0,8938
CTRL:0.500 mg/L vs. HVAN 2D:0.125 mg/L	5,1	-14.52 to 24.72	No	ns	0,9995
CTRL:0.500 mg/L vs. HVAN 2D:0.25 mg/L	4,5	-15.12 to 24.12	No	ns	0,9999
CTRL:0.500 mg/L vs. HVAN 2D:0.500 mg/L	7,7	-11.92 to 27.32	No	ns	0,9751
CTRL:0.500 mg/L vs. HVAN 2E:0.125 mg/L	1,3	-18.32 to 20.92	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2E:0.25 mg/L	1,8	-17.82 to 21.42	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2E:0.500 mg/L	8,3	-11.32 to 27.92	No	ns	0,9551
HVAN 2B:0.125 mg/L vs. HVAN 2B:0.25 mg/L	-1,1	-20.72 to 18.52	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2B:0.500 mg/L	5,8	-13.82 to 25.42	No	ns	0,9982
HVAN 2B:0.125 mg/L vs. HVAN 2C:0.125 mg/L	0,2	-19.42 to 19.82	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2C:0.25 mg/L	4	-15.62 to 23.62	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2C:0.500 mg/L	8,2	-11.42 to 27.82	No	ns	0,9591
HVAN 2B:0.125 mg/L vs. HVAN 2D:0.125 mg/L	3,9	-15.72 to 23.52	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2D:0.25 mg/L	3,3	-16.32 to 22.92	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2D:0.500 mg/L	6,5	-13.12 to 26.12	No	ns	0,9944
HVAN 2B:0.125 mg/L vs. HVAN 2E:0.125 mg/L	0,1	-19.52 to 19.72	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2E:0.25 mg/L	0,6	-19.02 to 20.22	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2E:0.500 mg/L	7,1	-12.52 to 26.72	No	ns	0,9875
HVAN 2B:0.25 mg/L vs. HVAN 2B:0.500 mg/L	6,9	-12.72 to 26.52	No	ns	0,9903
HVAN 2B:0.25 mg/L vs. HVAN 2C:0.125 mg/L	1,3	-18.32 to 20.92	No	ns	>0.9999
HVAN 2B:0.25 mg/L vs. HVAN 2C:0.25 mg/L	5,1	-14.52 to 24.72	No	ns	0,9995

HVAN 2B:0.25 mg/L vs. HVAN 2C:0.500 mg/L	9,3	-10.32 to 28.92	No	ns	0,9008
HVAN 2B:0.25 mg/L vs. HVAN 2D:0.125 mg/L	5	-14.62 to 24.62	No	ns	0,9996
HVAN 2B:0.25 mg/L vs. HVAN 2D:0.25 mg/L	4,4	-15.22 to 24.02	No	ns	>0.9999
HVAN 2B:0.25 mg/L vs. HVAN 2D:0.500 mg/L	7,6	-12.02 to 27.22	No	ns	0,9776
HVAN 2B:0.25 mg/L vs. HVAN 2E:0.125 mg/L	1,2	-18.42 to 20.82	No	ns	>0.9999
HVAN 2B:0.25 mg/L vs. HVAN 2E:0.25 mg/L	1,7	-17.92 to 21.32	No	ns	>0.9999
HVAN 2B:0.25 mg/L vs. HVAN 2E:0.500 mg/L	8,2	-11.42 to 27.82	No	ns	0,9591
HVAN 2B:0.500 mg/L vs. HVAN 2C:0.125 mg/L	-5,6	-25.22 to 14.02	No	ns	0,9987
HVAN 2B:0.500 mg/L vs. HVAN 2C:0.25 mg/L	-1,8	-21.42 to 17.82	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2C:0.500 mg/L	2,4	-17.22 to 22.02	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2D:0.125 mg/L	-1,9	-21.52 to 17.72	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2D:0.25 mg/L	-2,5	-22.12 to 17.12	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2D:0.500 mg/L	0,7	-18.92 to 20.32	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2E:0.125 mg/L	-5,7	-25.32 to 13.92	No	ns	0,9985
HVAN 2B:0.500 mg/L vs. HVAN 2E:0.25 mg/L	-5,2	-24.82 to 14.42	No	ns	0,9994
HVAN 2B:0.500 mg/L vs. HVAN 2E:0.500 mg/L	1,3	-18.32 to 20.92	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2C:0.25 mg/L	3,8	-15.82 to 23.42	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2C:0.500 mg/L	8	-11.62 to 27.62	No	ns	0,9662
HVAN 2C:0.125 mg/L vs. HVAN 2D:0.125 mg/L	3,7	-15.92 to 23.32	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2D:0.25 mg/L	3,1	-16.52 to 22.72	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2D:0.500 mg/L	6,3	-13.32 to 25.92	No	ns	0,9959
HVAN 2C:0.125 mg/L vs. HVAN 2E:0.125 mg/L	-0,1	-19.72 to 19.52	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2E:0.25 mg/L	0,4	-19.22 to 20.02	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2E:0.500 mg/L	6,9	-12.72 to 26.52	No	ns	0,9903
HVAN 2C:0.25 mg/L vs. HVAN 2C:0.500 mg/L	4,2	-15.42 to 23.82	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2D:0.125 mg/L	-0,1	-19.72 to 19.52	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2D:0.25 mg/L	-0,7	-20.32 to 18.92	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2D:0.500 mg/L	2,5	-17.12 to 22.12	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2E:0.125 mg/L	-3,9	-23.52 to 15.72	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2E:0.25 mg/L	-3,4	-23.02 to 16.22	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2E:0.500 mg/L	3,1	-16.52 to 22.72	No	ns	>0.9999
HVAN 2C:0.500 mg/L vs. HVAN 2D:0.125 mg/L	-4,3	-23.92 to 15.32	No	ns	>0.9999
HVAN 2C:0.500 mg/L vs. HVAN 2D:0.25 mg/L	-4,9	-24.52 to 14.72	No	ns	0,9997

HVAN 2C:0.500 mg/L vs. HVAN 2D:0.500 mg/L	-1,7	-21.32 to 17.92	No	ns	>0.9999
HVAN 2C:0.500 mg/L vs. HVAN 2E:0.125 mg/L	-8,1	-27.72 to 11.52	No	ns	0,9627
HVAN 2C:0.500 mg/L vs. HVAN 2E:0.25 mg/L	-7,6	-27.22 to 12.02	No	ns	0,9776
HVAN 2C:0.500 mg/L vs. HVAN 2E:0.500 mg/L	-1,1	-20.72 to 18.52	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2D:0.25 mg/L	-0,6	-20.22 to 19.02	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2D:0.500 mg/L	2,6	-17.02 to 22.22	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2E:0.125 mg/L	-3,8	-23.42 to 15.82	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2E:0.25 mg/L	-3,3	-22.92 to 16.32	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2E:0.500 mg/L	3,2	-16.42 to 22.82	No	ns	>0.9999
HVAN 2D:0.25 mg/L vs. HVAN 2D:0.500 mg/L	3,2	-16.42 to 22.82	No	ns	>0.9999
HVAN 2D:0.25 mg/L vs. HVAN 2E:0.125 mg/L	-3,2	-22.82 to 16.42	No	ns	>0.9999
HVAN 2D:0.25 mg/L vs. HVAN 2E:0.25 mg/L	-2,7	-22.32 to 16.92	No	ns	>0.9999
HVAN 2D:0.25 mg/L vs. HVAN 2E:0.500 mg/L	3,8	-15.82 to 23.42	No	ns	>0.9999
HVAN 2D:0.500 mg/L vs. HVAN 2E:0.125 mg/L	-6,4	-26.02 to 13.22	No	ns	0,9952
HVAN 2D:0.500 mg/L vs. HVAN 2E:0.25 mg/L	-5,9	-25.52 to 13.72	No	ns	0,9978
HVAN 2D:0.500 mg/L vs. HVAN 2E:0.500 mg/L	0,6	-19.02 to 20.22	No	ns	>0.9999
HVAN 2E:0.125 mg/L vs. HVAN 2E:0.25 mg/L	0,5	-19.12 to 20.12	No	ns	>0.9999
HVAN 2E:0.125 mg/L vs. HVAN 2E:0.500 mg/L	7	-12.62 to 26.62	No	ns	0,9889
HVAN 2E:0.25 mg/L vs. HVAN 2E:0.500 mg/L	6,5	-13.12 to 26.12	No	ns	0,9944

B)

Source of Variation	% of total variation	P value	P value summary	Significant	
Interaction	5,226	0,9712	ns	No	
Row Factor	10,6	0,3787	ns	No	
Column Factor	11,32	0,1146	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Interaction	92,17	8	11,52	F (8, 30) = 0.2690	P=0.9712
Row Factor	186,9	4	46,74	F (4, 30) = 1.091	P=0.3787
Column Factor	199,6	2	99,81	F (2, 30) = 2.330	P=0.1146
Residual	1285	30	42,83		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
CTRL:0.125 mg/L vs. CTRL:0.25 mg/L	0	-19.69 to 19.69	No	ns	>0.9999
CTRL:0.125 mg/L vs. CTRL:0.500 mg/L	0	-19.69 to 19.69	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2B:0.125 mg/L	-1,1	-20.79 to 18.59	No	ns	>0.9999

CTRL:0.125 mg/L vs. HVAN 2B:0.25 mg/L	0	-19.69 to 19.69	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2B:0.500 mg/L	-6,9	-26.59 to 12.79	No	ns	0,9906
CTRL:0.125 mg/L vs. HVAN 2C:0.125 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2C:0.25 mg/L	-5,1	-24.79 to 14.59	No	ns	0,9996
CTRL:0.125 mg/L vs. HVAN 2C:0.500 mg/L	-9,3	-28.99 to 10.39	No	ns	0,9032
CTRL:0.125 mg/L vs. HVAN 2D:0.125 mg/L	-5	-24.69 to 14.69	No	ns	0,9996
CTRL:0.125 mg/L vs. HVAN 2D:0.25 mg/L	-4,5	-24.19 to 15.19	No	ns	0,9999
CTRL:0.125 mg/L vs. HVAN 2D:0.500 mg/L	-7,6	-27.29 to 12.09	No	ns	0,9783
CTRL:0.125 mg/L vs. HVAN 2E:0.125 mg/L	-1,2	-20.89 to 18.49	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2E:0.25 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
CTRL:0.125 mg/L vs. HVAN 2E:0.500 mg/L	-8,2	-27.89 to 11.49	No	ns	0,9602
CTRL:0.25 mg/L vs. CTRL:0.500 mg/L	0	-19.69 to 19.69	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2B:0.125 mg/L	-1,1	-20.79 to 18.59	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2B:0.25 mg/L	0	-19.69 to 19.69	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2B:0.500 mg/L	-6,9	-26.59 to 12.79	No	ns	0,9906
CTRL:0.25 mg/L vs. HVAN 2C:0.125 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2C:0.25 mg/L	-5,1	-24.79 to 14.59	No	ns	0,9996
CTRL:0.25 mg/L vs. HVAN 2C:0.500 mg/L	-9,3	-28.99 to 10.39	No	ns	0,9032
CTRL:0.25 mg/L vs. HVAN 2D:0.125 mg/L	-5	-24.69 to 14.69	No	ns	0,9996
CTRL:0.25 mg/L vs. HVAN 2D:0.25 mg/L	-4,5	-24.19 to 15.19	No	ns	0,9999
CTRL:0.25 mg/L vs. HVAN 2D:0.500 mg/L	-7,6	-27.29 to 12.09	No	ns	0,9783
CTRL:0.25 mg/L vs. HVAN 2E:0.125 mg/L	-1,2	-20.89 to 18.49	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2E:0.25 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
CTRL:0.25 mg/L vs. HVAN 2E:0.500 mg/L	-8,2	-27.89 to 11.49	No	ns	0,9602
CTRL:0.500 mg/L vs. HVAN 2B:0.125 mg/L	-1,1	-20.79 to 18.59	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2B:0.25 mg/L	0	-19.69 to 19.69	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2B:0.500 mg/L	-6,9	-26.59 to 12.79	No	ns	0,9906
CTRL:0.500 mg/L vs. HVAN 2C:0.125 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2C:0.25 mg/L	-5,1	-24.79 to 14.59	No	ns	0,9996
CTRL:0.500 mg/L vs. HVAN 2C:0.500 mg/L	-9,3	-28.99 to 10.39	No	ns	0,9032
CTRL:0.500 mg/L vs. HVAN 2D:0.125 mg/L	-5	-24.69 to 14.69	No	ns	0,9996
CTRL:0.500 mg/L vs. HVAN 2D:0.25 mg/L	-4,5	-24.19 to 15.19	No	ns	0,9999
CTRL:0.500 mg/L vs. HVAN 2D:0.500 mg/L	-7,6	-27.29 to 12.09	No	ns	0,9783
CTRL:0.500 mg/L vs. HVAN 2E:0.125 mg/L	-1,2	-20.89 to 18.49	No	ns	>0.9999

CTRL:0.500 mg/L vs. HVAN 2E:0.25 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
CTRL:0.500 mg/L vs. HVAN 2E:0.500 mg/L	-8,2	-27.89 to 11.49	No	ns	0,9602
HVAN 2B:0.125 mg/L vs. HVAN 2B:0.25 mg/L	1,1	-18.59 to 20.79	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2B:0.500 mg/L	-5,8	-25.49 to 13.89	No	ns	0,9982
HVAN 2B:0.125 mg/L vs. HVAN 2C:0.125 mg/L	-0,2	-19.89 to 19.49	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2C:0.25 mg/L	-4	-23.69 to 15.69	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2C:0.500 mg/L	-8,2	-27.89 to 11.49	No	ns	0,9602
HVAN 2B:0.125 mg/L vs. HVAN 2D:0.125 mg/L	-3,9	-23.59 to 15.79	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2D:0.25 mg/L	-3,4	-23.09 to 16.29	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2D:0.500 mg/L	-6,5	-26.19 to 13.19	No	ns	0,9946
HVAN 2B:0.125 mg/L vs. HVAN 2E:0.125 mg/L	-0,1	-19.79 to 19.59	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2E:0.25 mg/L	-0,2	-19.89 to 19.49	No	ns	>0.9999
HVAN 2B:0.125 mg/L vs. HVAN 2E:0.500 mg/L	-7,1	-26.79 to 12.59	No	ns	0,9879
HVAN 2B:0.25 mg/L vs. HVAN 2B:0.500 mg/L	-6,9	-26.59 to 12.79	No	ns	0,9906
HVAN 2B:0.25 mg/L vs. HVAN 2C:0.125 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
HVAN 2B:0.25 mg/L vs. HVAN 2C:0.25 mg/L	-5,1	-24.79 to 14.59	No	ns	0,9996
HVAN 2B:0.25 mg/L vs. HVAN 2C:0.500 mg/L	-9,3	-28.99 to 10.39	No	ns	0,9032
HVAN 2B:0.25 mg/L vs. HVAN 2D:0.125 mg/L	-5	-24.69 to 14.69	No	ns	0,9996
HVAN 2B:0.25 mg/L vs. HVAN 2D:0.25 mg/L	-4,5	-24.19 to 15.19	No	ns	0,9999
HVAN 2B:0.25 mg/L vs. HVAN 2D:0.500 mg/L	-7,6	-27.29 to 12.09	No	ns	0,9783
HVAN 2B:0.25 mg/L vs. HVAN 2E:0.125 mg/L	-1,2	-20.89 to 18.49	No	ns	>0.9999
HVAN 2B:0.25 mg/L vs. HVAN 2E:0.25 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
HVAN 2B:0.25 mg/L vs. HVAN 2E:0.500 mg/L	-8,2	-27.89 to 11.49	No	ns	0,9602
HVAN 2B:0.500 mg/L vs. HVAN 2C:0.125 mg/L	5,6	-14.09 to 25.29	No	ns	0,9988
HVAN 2B:0.500 mg/L vs. HVAN 2C:0.25 mg/L	1,8	-17.89 to 21.49	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2C:0.500 mg/L	-2,4	-22.09 to 17.29	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2D:0.125 mg/L	1,9	-17.79 to 21.59	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2D:0.25 mg/L	2,4	-17.29 to 22.09	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2D:0.500 mg/L	-0,7	-20.39 to 18.99	No	ns	>0.9999
HVAN 2B:0.500 mg/L vs. HVAN 2E:0.125 mg/L	5,7	-13.99 to 25.39	No	ns	0,9985
HVAN 2B:0.500 mg/L vs. HVAN 2E:0.25 mg/L	5,6	-14.09 to 25.29	No	ns	0,9988
HVAN 2B:0.500 mg/L vs. HVAN 2E:0.500 mg/L	-1,3	-20.99 to 18.39	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2C:0.25 mg/L	-3,8	-23.49 to 15.89	No	ns	>0.9999

HVAN 2C:0.125 mg/L vs. HVAN 2C:0.500 mg/L	-8	-27.69 to 11.69	No	ns	0,9671
HVAN 2C:0.125 mg/L vs. HVAN 2D:0.125 mg/L	-3,7	-23.39 to 15.99	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2D:0.25 mg/L	-3,2	-22.89 to 16.49	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2D:0.500 mg/L	-6,3	-25.99 to 13.39	No	ns	0,996
HVAN 2C:0.125 mg/L vs. HVAN 2E:0.125 mg/L	0,1	-19.59 to 19.79	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2E:0.25 mg/L	0	-19.69 to 19.69	No	ns	>0.9999
HVAN 2C:0.125 mg/L vs. HVAN 2E:0.500 mg/L	-6,9	-26.59 to 12.79	No	ns	0,9906
HVAN 2C:0.25 mg/L vs. HVAN 2C:0.500 mg/L	-4,2	-23.89 to 15.49	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2D:0.125 mg/L	0,1	-19.59 to 19.79	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2D:0.25 mg/L	0,6	-19.09 to 20.29	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2D:0.500 mg/L	-2,5	-22.19 to 17.19	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2E:0.125 mg/L	3,9	-15.79 to 23.59	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2E:0.25 mg/L	3,8	-15.89 to 23.49	No	ns	>0.9999
HVAN 2C:0.25 mg/L vs. HVAN 2E:0.500 mg/L	-3,1	-22.79 to 16.59	No	ns	>0.9999
HVAN 2C:0.500 mg/L vs. HVAN 2D:0.125 mg/L	4,3	-15.39 to 23.99	No	ns	>0.9999
HVAN 2C:0.500 mg/L vs. HVAN 2D:0.25 mg/L	4,8	-14.89 to 24.49	No	ns	0,9998
HVAN 2C:0.500 mg/L vs. HVAN 2D:0.500 mg/L	1,7	-17.99 to 21.39	No	ns	>0.9999
HVAN 2C:0.500 mg/L vs. HVAN 2E:0.125 mg/L	8,1	-11.59 to 27.79	No	ns	0,9638
HVAN 2C:0.500 mg/L vs. HVAN 2E:0.25 mg/L	8	-11.69 to 27.69	No	ns	0,9671
HVAN 2C:0.500 mg/L vs. HVAN 2E:0.500 mg/L	1,1	-18.59 to 20.79	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2D:0.25 mg/L	0,5	-19.19 to 20.19	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2D:0.500 mg/L	-2,6	-22.29 to 17.09	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2E:0.125 mg/L	3,8	-15.89 to 23.49	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2E:0.25 mg/L	3,7	-15.99 to 23.39	No	ns	>0.9999
HVAN 2D:0.125 mg/L vs. HVAN 2E:0.500 mg/L	-3,2	-22.89 to 16.49	No	ns	>0.9999
HVAN 2D:0.25 mg/L vs. HVAN 2D:0.500 mg/L	-3,1	-22.79 to 16.59	No	ns	>0.9999
HVAN 2D:0.25 mg/L vs. HVAN 2E:0.125 mg/L	3,3	-16.39 to 22.99	No	ns	>0.9999
HVAN 2D:0.25 mg/L vs. HVAN 2E:0.25 mg/L	3,2	-16.49 to 22.89	No	ns	>0.9999
HVAN 2D:0.25 mg/L vs. HVAN 2E:0.500 mg/L	-3,7	-23.39 to 15.99	No	ns	>0.9999
HVAN 2D:0.500 mg/L vs. HVAN 2E:0.125 mg/L	6,4	-13.29 to 26.09	No	ns	0,9953
HVAN 2D:0.500 mg/L vs. HVAN 2E:0.25 mg/L	6,3	-13.39 to 25.99	No	ns	0,996
HVAN 2D:0.500 mg/L vs. HVAN 2E:0.500 mg/L	-0,6	-20.29 to 19.09	No	ns	>0.9999
HVAN 2E:0.125 mg/L vs. HVAN 2E:0.25 mg/L	-0,1	-19.79 to 19.59	No	ns	>0.9999

HVAN 2E:0.125 mg/L vs. HVAN 2E:0.500 mg/L	-7	-26.69 to 12.69	No	ns	0,9893
HVAN 2E:0.25 mg/L vs. HVAN 2E:0.500 mg/L	-6,9	-26.59 to 12.79	No	ns	0,9906

Supplementary Table S13. Embryos classes in the sample: all results are reported in percentage. N.P= Normal Plutei; M.P.= Malformed Plutei; These results refer to *N. shiloi* pre- fertilization treatment.

Extract name		C1	C2	C3
NSHI EXT	N.P.	57.5	57.1	59.2
	M.P.	42.5	42.9	40.8
NSHI 2B	N.P.	86.3	86.0	88.6
	M.P.	13.7	14.0	11.4
NSHI 2C	N.P.	89.1	88.0	84.5
	M.P.	10.9	12.0	15.5
NSHI 2D	N.P.	56.5	57.0	48.8
	M.P.	43.5	43.0	51.2
NSHI 2E	N.P.	87.5	78.9	84.6
	M.P.	12.5	21.1	15.4

Supplementary Table S14. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (NSHI EXT) and the four fractions (NSHI 2B, NSHI 2C, NSHI 2D, NSHI 2E) from the diatom *Nanofrustulum shiloi* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected: A) normal plutei; B) malformed plutei in pre-fertilization treatment.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	2,284	0,5342	ns	No	
Row Factor	87,72	<0.0001	****	Yes	
Column Factor	0,4059	0,537	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	255,3	8	31,92	F (8, 30) = 0.8931	P=0.5342
Row Factor	9808	4	2452	F (4, 30) = 68.61	P<0.0001
Column Factor	45,38	2	22,69	F (2, 30) = 0.6348	P=0.5370
Residual	1072	30	35,74		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
NSHI EXT vs. NSHI 2B	-29,03	-37.21 to -20.86	Yes	****	<0.0001
NSHI EXT vs. NSHI 2C	-29,23	-37.41 to -21.06	Yes	****	<0.0001
NSHI EXT vs. NSHI 2D	3,833	-4.341 to 12.01	No	ns	0,6568
NSHI EXT vs. NSHI 2E	-25,77	-33.94 to -17.59	Yes	****	<0.0001
NSHI 2B vs. NSHI 2C	-0,2	-8.374 to 7.974	No	ns	>0.9999
NSHI 2B vs. NSHI 2D	32,87	24.69 to 41.04	Yes	****	<0.0001
NSHI 2B vs. NSHI 2E	3,267	-4.908 to 11.44	No	ns	0,7739
NSHI 2C vs. NSHI 2D	33,07	24.89 to 41.24	Yes	****	<0.0001
NSHI 2C vs. NSHI 2E	3,467	-4.708 to 11.64	No	ns	0,7342
NSHI 2D vs. NSHI 2E	-29,6	-37.77 to -21.43	Yes	****	<0.0001

B)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	2,284	0,5349	ns	No	
Row Factor	87,71	<0.0001	****	Yes	
Column Factor	0,4058	0,5373	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	

Interaction	255,3	8	31,92	F (8, 30) = 0.8922	P=0.5349
Row Factor	9808	4	2452	F (4, 30) = 68.54	P<0.0001
Column Factor	45,38	2	22,69	F (2, 30) = 0.6342	P=0.5373
Residual	1073	30	35,77		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
NSHI EXT vs. NSHI 2B	29,03	20.86 to 37.21	Yes	****	<0.0001
NSHI EXT vs. NSHI 2C	29,23	21.06 to 37.41	Yes	****	<0.0001
NSHI EXT vs. NSHI 2D	-3,833	-12.01 to 4.345	No	ns	0,6572
NSHI EXT vs. NSHI 2E	25,77	17.59 to 33.94	Yes	****	<0.0001
NSHI 2B vs. NSHI 2C	0,2	-7.978 to 8.378	No	ns	>0.9999
NSHI 2B vs. NSHI 2D	-32,87	-41.04 to -24.69	Yes	****	<0.0001
NSHI 2B vs. NSHI 2E	-3,267	-11.44 to 4.912	No	ns	0,7742
NSHI 2C vs. NSHI 2D	-33,07	-41.24 to -24.89	Yes	****	<0.0001
NSHI 2C vs. NSHI 2E	-3,467	-11.64 to 4.712	No	ns	0,7345
NSHI 2D vs. NSHI 2E	29,6	21.42 to 37.78	Yes	****	<0.0001

Supplementary Table S15. Embryos classes in the sample: all results are reported in percentage: N.P= Normal Plutei; M.P.= Malformed Plutei; These results refer to *Nanofrustulum shiloi* post-fertilization treatment.

Extract name		C1	C2	C3
NSHI EXT	N.P.	86.5	88.0	88.0
	M.P.	13.5	12.0	11.0
NSHI 2B	N.P.	85.0	86.2	74.2
	M.P.	15.0	13.8	25.8
NSHI 2C	N.P.	83.0	84.1	84.9
	M.P.	17.0	15.9	15.1
NSHI 2D	N.P.	58.6	59.7	56.0
	M.P.	41.4	40.3	44.0
NSHI 2E	N.P.	81.6	84.4	86.2
	M.P.	18.4	15.6	13.8

Supplementary Table S16. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (NSHI EXT) and the four fractions (NSHI 2B, NSHI 2C, NSHI 2D, NSHI 2E) from the diatom *Nanofrustulum shiloi* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected: A) normal plutei; B) malformed plutei in post-fertilization treatment.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	3,999	0,6453	ns	No	
Row Factor	75,32	<0.0001	****	Yes	
Column Factor	0,7666	0,5674	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	272,3	8	34,04	F (8, 30) = 0.7531	P=0.6453
Row Factor	5130	4	1283	F (4, 30) = 28.37	P<0.0001
Column Factor	52,21	2	26,11	F (2, 30) = 0.5775	P=0.5674
Residual	1356	30	45,21		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
NSHI EXT vs. NSHI 2B	5,7	-3.493 to 14.89	No	ns	0,3931
NSHI EXT vs. NSHI 2C	3,533	-5.660 to 12.73	No	ns	0,7975
NSHI EXT vs. NSHI 2D	29,47	20.27 to 38.66	Yes	****	<0.0001
NSHI EXT vs. NSHI 2E	3,433	-5.760 to 12.63	No	ns	0,8136
NSHI 2B vs. NSHI 2C	-2,167	-11.36 to 7.027	No	ns	0,9585
NSHI 2B vs. NSHI 2D	23,77	14.57 to 32.96	Yes	****	<0.0001
NSHI 2B vs. NSHI 2E	-2,267	-11.46 to 6.927	No	ns	0,9514
NSHI 2C vs. NSHI 2D	25,93	16.74 to 35.13	Yes	****	<0.0001
NSHI 2C vs. NSHI 2E	-0,1	-9.293 to 9.093	No	ns	>0.9999
NSHI 2D vs. NSHI 2E	-26,03	-35.23 to -16.84	Yes	****	<0.0001

B)

Source of Variation	% of total variation	P value	P value summary	Significant?	P value
Interaction	4,246	0,434	ns	No	
Row Factor	79,53	<0.0001	****	Yes	
Column Factor	0,8116	0,4632	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	273,7	8	34,21	F (8, 30) = 1.033	P=0.4340

Row Factor	5127	4	1282	F (4, 30) = 38.69	P<0.0001
Column Factor	52,32	2	26,16	F (2, 30) = 0.7897	P=0.4632
Residual	993,8	30	33,13		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold?	Summary	Adjusted P Value
NSHI EXT vs. NSHI 2B	-5,7	-13.57 to 2.170	No	ns	0,2461
NSHI EXT vs. NSHI 2C	-3,533	-11.40 to 4.337	No	ns	0,6919
NSHI EXT vs. NSHI 2D	-29,47	-37.34 to -21.60	Yes	****	<0.0001
NSHI EXT vs. NSHI 2E	-3,467	-11.34 to 4.403	No	ns	0,7065
NSHI 2B vs. NSHI 2C	2,167	-5.703 to 10.04	No	ns	0,929
NSHI 2B vs. NSHI 2D	-23,77	-31.64 to -15.90	Yes	****	<0.0001
NSHI 2B vs. NSHI 2E	2,233	-5.637 to 10.10	No	ns	0,9214
NSHI 2C vs. NSHI 2D	-25,93	-33.80 to -18.06	Yes	****	<0.0001
NSHI 2C vs. NSHI 2E	0,06667	-7.803 to 7.937	No	ns	>0.9999
NSHI 2D vs. NSHI 2E	26	18.13 to 33.87	Yes	****	<0.0001

Supplementary Table S17. Embryos classes in the sample: all results are reported in percentage. N.P= Normal Plutei; M.P.= Malformed Plutei. These results refer to *C. closterium* before fertilization treatment.

Extract name		C1	C2	C3
CCLO EXT	N.P.	88.9	84.4	83.5
	M.P.	11.1	15.6	16.5
CCLO 2B	N.P.	91.5	84.6	82.9
	M.P.	8.5	15.4	17.1
CCLO 2C	N.P.	87.2	87.7	88.6
	M.P.	12.8	12.3	11.4
CCLO 2D	N.P.	76.9	76.3	77.5
	M.P.	23.1	23.7	22.5
CCLO 2E	N.P.	88.9	89.1	86.0
	M.P.	11.1	10.9	14.0

Supplementary Table S18. Embryos classes in the sample: all results are reported in percentage. N.P= Normal Plutei; M.P.= Malformed Plutei; A.G. = Apoptotic Gastrulae; N.D.= Fertilized but not divided eggs. These results refer to *Cylindrotheca closterium* after fertilization treatment.

Extract name		C1	C2	C3
CCLO EXT	N.P.	91.2	83.4	85.8
	M.P.	8.8	16.6	14.2
CCLO 2B	N.P.	88.5	83.3	82.9
	M.P.	11.5	16.7	17.1
CCLO 2C	N.P.	88.3	86.4	84.2
	M.P.	11.7	13.6	15.8
CCLO 2D	N.P.	76.5	79.8	74.5
	M.P.	23.5	24.2	25.5
CCLO 2E	N.P.	86.5	82.0	86.3
	M.P.	13.5	18.0	13.7

Supplementary Table S19. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (CCLO EXT) and the four fractions (CCLO 2B, CCLO 2C, CCLO 2D, CCLO 2E) from the diatom *C. closterium* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected: A) normal plutei; B) malformed plutei in pre-fertilization treatment.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	
Interaction	8,435	0,4097	ns	No	
Row Factor	59,92	<0.0001	****	Yes	
Column Factor	2,075	0,3616	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Interaction	119,6	8	14,95	F (8, 30) = 1.070	P=0.4097
Row Factor	849,4	4	212,3	F (4, 30) = 15.20	P<0.0001
Column Factor	29,41	2	14,71	F (2, 30) = 1.053	P=0.3616
Residual	419,2	30	13,97		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
CTRL:0.125 mg/L vs. CTRL:0.25 mg/L	0	-11.25 to 11.25	No	ns	>0.9999
CTRL:0.125 mg/L vs. CTRL:0.500 mg/L	0	-11.25 to 11.25	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2B:0.125 mg/L	-3,3	-14.55 to 7.947	No	ns	0,9983
CTRL:0.125 mg/L vs. CCLO 2B:0.25 mg/L	3,7	-7.547 to 14.95	No	ns	0,9948
CTRL:0.125 mg/L vs. CCLO 2B:0.500 mg/L	5,3	-5.947 to 16.55	No	ns	0,9045
CTRL:0.125 mg/L vs. CCLO 2C:0.125 mg/L	1	-10.25 to 12.25	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2C:0.25 mg/L	0,5	-10.75 to 11.75	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2C:0.500 mg/L	-0,4	-11.65 to 10.85	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2D:0.125 mg/L	11,4	0.1535 to 22.65	Yes	*	0,0445
CTRL:0.125 mg/L vs. CCLO 2D:0.25 mg/L	11,9	0.6535 to 23.15	Yes	*	0,0302
CTRL:0.125 mg/L vs. CCLO 2D:0.500 mg/L	10,8	-0.4465 to 22.05	No	ns	0,0697
CTRL:0.125 mg/L vs. CCLO 2E:0.125 mg/L	-0,7	-11.95 to 10.55	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2E:0.25 mg/L	-0,8	-12.05 to 10.45	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2E:0.500 mg/L	2,3	-8.947 to 13.55	No	ns	>0.9999
CTRL:0.25 mg/L vs. CTRL:0.500 mg/L	0	-11.25 to 11.25	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2B:0.125 mg/L	-3,3	-14.55 to 7.947	No	ns	0,9983
CTRL:0.25 mg/L vs. CCLO 2B:0.25 mg/L	3,7	-7.547 to 14.95	No	ns	0,9948
CTRL:0.25 mg/L vs. CCLO 2B:0.500 mg/L	5,3	-5.947 to 16.55	No	ns	0,9045
CTRL:0.25 mg/L vs. CCLO 2C:0.125 mg/L	1	-10.25 to 12.25	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2C:0.25 mg/L	0,5	-10.75 to 11.75	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2C:0.500 mg/L	-0,4	-11.65 to 10.85	No	ns	>0.9999

CTRL:0.25 mg/L vs. CCLO 2D:0.125 mg/L	11,4	0.1535 to 22.65	Yes	*	0,0445
CTRL:0.25 mg/L vs. CCLO 2D:0.25 mg/L	11,9	0.6535 to 23.15	Yes	*	0,0302
CTRL:0.25 mg/L vs. CCLO 2D:0.500 mg/L	10,8	-0.4465 to 22.05	No	ns	0,0697
CTRL:0.25 mg/L vs. CCLO 2E:0.125 mg/L	-0,7	-11.95 to 10.55	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2E:0.25 mg/L	-0,8	-12.05 to 10.45	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2E:0.500 mg/L	2,3	-8.947 to 13.55	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2B:0.125 mg/L	-3,3	-14.55 to 7.947	No	ns	0,9983
CTRL:0.500 mg/L vs. CCLO 2B:0.25 mg/L	3,7	-7.547 to 14.95	No	ns	0,9948
CTRL:0.500 mg/L vs. CCLO 2B:0.500 mg/L	5,3	-5.947 to 16.55	No	ns	0,9045
CTRL:0.500 mg/L vs. CCLO 2C:0.125 mg/L	1	-10.25 to 12.25	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2C:0.25 mg/L	0,5	-10.75 to 11.75	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2C:0.500 mg/L	-0,4	-11.65 to 10.85	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2D:0.125 mg/L	11,4	0.1535 to 22.65	Yes	*	0,0445
CTRL:0.500 mg/L vs. CCLO 2D:0.25 mg/L	11,9	0.6535 to 23.15	Yes	*	0,0302
CTRL:0.500 mg/L vs. CCLO 2D:0.500 mg/L	10,8	-0.4465 to 22.05	No	ns	0,0697
CTRL:0.500 mg/L vs. CCLO 2E:0.125 mg/L	-0,7	-11.95 to 10.55	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2E:0.25 mg/L	-0,8	-12.05 to 10.45	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2E:0.500 mg/L	2,3	-8.947 to 13.55	No	ns	>0.9999
CCLO 2B:0.125 mg/L vs. CCLO 2B:0.25 mg/L	7	-4.247 to 18.25	No	ns	0,6021
CCLO 2B:0.125 mg/L vs. CCLO 2B:0.500 mg/L	8,6	-2.647 to 19.85	No	ns	0,2901
CCLO 2B:0.125 mg/L vs. CCLO 2C:0.125 mg/L	4,3	-6.947 to 15.55	No	ns	0,9799
CCLO 2B:0.125 mg/L vs. CCLO 2C:0.25 mg/L	3,8	-7.447 to 15.05	No	ns	0,9933
CCLO 2B:0.125 mg/L vs. CCLO 2C:0.500 mg/L	2,9	-8.347 to 14.15	No	ns	0,9996
CCLO 2B:0.125 mg/L vs. CCLO 2D:0.125 mg/L	14,7	3.453 to 25.95	Yes	**	0,0029
CCLO 2B:0.125 mg/L vs. CCLO 2D:0.25 mg/L	15,2	3.953 to 26.45	Yes	**	0,0019
CCLO 2B:0.125 mg/L vs. CCLO 2D:0.500 mg/L	14,1	2.853 to 25.35	Yes	**	0,0049
CCLO 2B:0.125 mg/L vs. CCLO 2E:0.125 mg/L	2,6	-8.647 to 13.85	No	ns	0,9999
CCLO 2B:0.125 mg/L vs. CCLO 2E:0.25 mg/L	2,5	-8.747 to 13.75	No	ns	>0.9999
CCLO 2B:0.125 mg/L vs. CCLO 2E:0.500 mg/L	5,6	-5.647 to 16.85	No	ns	0,8654
CCLO 2B:0.25 mg/L vs. CCLO 2B:0.500 mg/L	1,6	-9.647 to 12.85	No	ns	>0.9999
CCLO 2B:0.25 mg/L vs. CCLO 2C:0.125 mg/L	-2,7	-13.95 to 8.547	No	ns	0,9998
CCLO 2B:0.25 mg/L vs. CCLO 2C:0.25 mg/L	-3,2	-14.45 to 8.047	No	ns	0,9988
CCLO 2B:0.25 mg/L vs. CCLO 2C:0.500 mg/L	-4,1	-15.35 to 7.147	No	ns	0,9866
CCLO 2B:0.25 mg/L vs. CCLO 2D:0.125 mg/L	7,7	-3.547 to 18.95	No	ns	0,4547
CCLO 2B:0.25 mg/L vs. CCLO 2D:0.25 mg/L	8,2	-3.047 to 19.45	No	ns	0,3583

CCLO 2B:0.25 mg/L vs. CCLO 2D:0.500 mg/L	7,1	-4.147 to 18.35	No	ns	0,5807
CCLO 2B:0.25 mg/L vs. CCLO 2E:0.125 mg/L	-4,4	-15.65 to 6.847	No	ns	0,9757
CCLO 2B:0.25 mg/L vs. CCLO 2E:0.25 mg/L	-4,5	-15.75 to 6.747	No	ns	0,9708
CCLO 2B:0.25 mg/L vs. CCLO 2E:0.500 mg/L	-1,4	-12.65 to 9.847	No	ns	>0.9999
CCLO 2B:0.500 mg/L vs. CCLO 2C:0.125 mg/L	-4,3	-15.55 to 6.947	No	ns	0,9799
CCLO 2B:0.500 mg/L vs. CCLO 2C:0.25 mg/L	-4,8	-16.05 to 6.447	No	ns	0,9521
CCLO 2B:0.500 mg/L vs. CCLO 2C:0.500 mg/L	-5,7	-16.95 to 5.547	No	ns	0,8507
CCLO 2B:0.500 mg/L vs. CCLO 2D:0.125 mg/L	6,1	-5.147 to 17.35	No	ns	0,7839
CCLO 2B:0.500 mg/L vs. CCLO 2D:0.25 mg/L	6,6	-4.647 to 17.85	No	ns	0,6864
CCLO 2B:0.500 mg/L vs. CCLO 2D:0.500 mg/L	5,5	-5.747 to 16.75	No	ns	0,8793
CCLO 2B:0.500 mg/L vs. CCLO 2E:0.125 mg/L	-6	-17.25 to 5.247	No	ns	0,8017
CCLO 2B:0.500 mg/L vs. CCLO 2E:0.25 mg/L	-6,1	-17.35 to 5.147	No	ns	0,7839
CCLO 2B:0.500 mg/L vs. CCLO 2E:0.500 mg/L	-3	-14.25 to 8.247	No	ns	0,9994
CCLO 2C:0.125 mg/L vs. CCLO 2C:0.25 mg/L	-0,5	-11.75 to 10.75	No	ns	>0.9999
CCLO 2C:0.125 mg/L vs. CCLO 2C:0.500 mg/L	-1,4	-12.65 to 9.847	No	ns	>0.9999
CCLO 2C:0.125 mg/L vs. CCLO 2D:0.125 mg/L	10,4	-0.8465 to 21.65	No	ns	0,0929
CCLO 2C:0.125 mg/L vs. CCLO 2D:0.25 mg/L	10,9	-0.3465 to 22.15	No	ns	0,0648
CCLO 2C:0.125 mg/L vs. CCLO 2D:0.500 mg/L	9,8	-1.447 to 21.05	No	ns	0,1399
CCLO 2C:0.125 mg/L vs. CCLO 2E:0.125 mg/L	-1,7	-12.95 to 9.547	No	ns	>0.9999
CCLO 2C:0.125 mg/L vs. CCLO 2E:0.25 mg/L	-1,8	-13.05 to 9.447	No	ns	>0.9999
CCLO 2C:0.125 mg/L vs. CCLO 2E:0.500 mg/L	1,3	-9.947 to 12.55	No	ns	>0.9999
CCLO 2C:0.25 mg/L vs. CCLO 2C:0.500 mg/L	-0,9	-12.15 to 10.35	No	ns	>0.9999
CCLO 2C:0.25 mg/L vs. CCLO 2D:0.125 mg/L	10,9	-0.3465 to 22.15	No	ns	0,0648
CCLO 2C:0.25 mg/L vs. CCLO 2D:0.25 mg/L	11,4	0.1535 to 22.65	Yes	*	0,0445
CCLO 2C:0.25 mg/L vs. CCLO 2D:0.500 mg/L	10,3	-0.9465 to 21.55	No	ns	0,0996
CCLO 2C:0.25 mg/L vs. CCLO 2E:0.125 mg/L	-1,2	-12.45 to 10.05	No	ns	>0.9999
CCLO 2C:0.25 mg/L vs. CCLO 2E:0.25 mg/L	-1,3	-12.55 to 9.947	No	ns	>0.9999
CCLO 2C:0.25 mg/L vs. CCLO 2E:0.500 mg/L	1,8	-9.447 to 13.05	No	ns	>0.9999
CCLO 2C:0.500 mg/L vs. CCLO 2D:0.125 mg/L	11,8	0.5535 to 23.05	Yes	*	0,0326
CCLO 2C:0.500 mg/L vs. CCLO 2D:0.25 mg/L	12,3	1.053 to 23.55	Yes	*	0,0219
CCLO 2C:0.500 mg/L vs. CCLO 2D:0.500 mg/L	11,2	-0.04655 to 22.45	No	ns	0,0518
CCLO 2C:0.500 mg/L vs. CCLO 2E:0.125 mg/L	-0,3	-11.55 to 10.95	No	ns	>0.9999
CCLO 2C:0.500 mg/L vs. CCLO 2E:0.25 mg/L	-0,4	-11.65 to 10.85	No	ns	>0.9999

CCLO 2C:0.500 mg/L vs. CCLO 2E:0.500 mg/L	2,7	-8.547 to 13.95	No	ns	0,9998
CCLO 2D:0.125 mg/L vs. CCLO 2D:0.25 mg/L	0,5	-10.75 to 11.75	No	ns	>0.9999
CCLO 2D:0.125 mg/L vs. CCLO 2D:0.500 mg/L	-0,6	-11.85 to 10.65	No	ns	>0.9999
CCLO 2D:0.125 mg/L vs. CCLO 2E:0.125 mg/L	-12,1	-23.35 to -0.8535	Yes	*	0,0258
CCLO 2D:0.125 mg/L vs. CCLO 2E:0.25 mg/L	-12,2	-23.45 to -0.9535	Yes	*	0,0238
CCLO 2D:0.125 mg/L vs. CCLO 2E:0.500 mg/L	-9,1	-20.35 to 2.147	No	ns	0,2176
CCLO 2D:0.25 mg/L vs. CCLO 2D:0.500 mg/L	-1,1	-12.35 to 10.15	No	ns	>0.9999
CCLO 2D:0.25 mg/L vs. CCLO 2E:0.125 mg/L	-12,6	-23.85 to -1.353	Yes	*	0,0172
CCLO 2D:0.25 mg/L vs. CCLO 2E:0.25 mg/L	-12,7	-23.95 to -1.453	Yes	*	0,0158
CCLO 2D:0.25 mg/L vs. CCLO 2E:0.500 mg/L	-9,6	-20.85 to 1.647	No	ns	0,1594
CCLO 2D:0.500 mg/L vs. CCLO 2E:0.125 mg/L	-11,5	-22.75 to -0.2535	Yes	*	0,0412
CCLO 2D:0.500 mg/L vs. CCLO 2E:0.25 mg/L	-11,6	-22.85 to -0.3535	Yes	*	0,0381
CCLO 2D:0.500 mg/L vs. CCLO 2E:0.500 mg/L	-8,5	-19.75 to 2.747	No	ns	0,3063
CCLO 2E:0.125 mg/L vs. CCLO 2E:0.25 mg/L	-0,1	-11.35 to 11.15	No	ns	>0.9999
CCLO 2E:0.125 mg/L vs. CCLO 2E:0.500 mg/L	3	-8.247 to 14.25	No	ns	0,9994
CCLO 2E:0.25 mg/L vs. CCLO 2E:0.500 mg/L	3,1	-8.147 to 14.35	No	ns	0,9991

B)

Source of Variation	% of total variation	P value	P value summary	Significant	
Interaction	8,295	0,4253	ns	No	
Row Factor	59,97	<0.0001	****	Yes	
Column Factor	1,989	0,3787	ns	No	
ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Interaction	117,2	8	14,65	F (8, 30) = 1.046	P=0.4253
Row Factor	847,3	4	211,8	F (4, 30) = 15.12	P<0.0001
Column Factor	28,11	2	14,05	F (2, 30) = 1.003	P=0.3787
Residual	420,3	30	14,01		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
CTRL:0.125 mg/L vs. CTRL:0.25 mg/L	0	-11.26 to 11.26	No	ns	>0.9999
CTRL:0.125 mg/L vs. CTRL:0.500 mg/L	0	-11.26 to 11.26	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2B:0.125 mg/L	3,2	-8.062 to 14.46	No	ns	0,9988
CTRL:0.125 mg/L vs. CCLO 2B:0.25 mg/L	-3,7	-14.96 to 7.562	No	ns	0,9948
CTRL:0.125 mg/L vs. CCLO 2B:0.500 mg/L	-5,3	-16.56 to 5.962	No	ns	0,9053
CTRL:0.125 mg/L vs. CCLO 2C:0.125 mg/L	-1	-12.26 to 10.26	No	ns	>0.9999

CTRL:0.125 mg/L vs. CCLO 2C:0.25 mg/L	-0,5	-11.76 to 10.76	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2C:0.500 mg/L	0,4	-10.86 to 11.66	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2D:0.125 mg/L	-11,4	-22.66 to -0.1382	Yes	*	0,045
CTRL:0.125 mg/L vs. CCLO 2D:0.25 mg/L	-11,9	-23.16 to -0.6382	Yes	*	0,0306
CTRL:0.125 mg/L vs. CCLO 2D:0.500 mg/L	-10,8	-22.06 to 0.4618	No	ns	0,0704
CTRL:0.125 mg/L vs. CCLO 2E:0.125 mg/L	0,6	-10.66 to 11.86	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2E:0.25 mg/L	0,8	-10.46 to 12.06	No	ns	>0.9999
CTRL:0.125 mg/L vs. CCLO 2E:0.500 mg/L	-2,3	-13.56 to 8.962	No	ns	>0.9999
CTRL:0.25 mg/L vs. CTRL:0.500 mg/L	0	-11.26 to 11.26	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2B:0.125 mg/L	3,2	-8.062 to 14.46	No	ns	0,9988
CTRL:0.25 mg/L vs. CCLO 2B:0.25 mg/L	-3,7	-14.96 to 7.562	No	ns	0,9948
CTRL:0.25 mg/L vs. CCLO 2B:0.500 mg/L	-5,3	-16.56 to 5.962	No	ns	0,9053
CTRL:0.25 mg/L vs. CCLO 2C:0.125 mg/L	-1	-12.26 to 10.26	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2C:0.25 mg/L	-0,5	-11.76 to 10.76	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2C:0.500 mg/L	0,4	-10.86 to 11.66	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2D:0.125 mg/L	-11,4	-22.66 to -0.1382	Yes	*	0,045
CTRL:0.25 mg/L vs. CCLO 2D:0.25 mg/L	-11,9	-23.16 to -0.6382	Yes	*	0,0306
CTRL:0.25 mg/L vs. CCLO 2D:0.500 mg/L	-10,8	-22.06 to 0.4618	No	ns	0,0704
CTRL:0.25 mg/L vs. CCLO 2E:0.125 mg/L	0,6	-10.66 to 11.86	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2E:0.25 mg/L	0,8	-10.46 to 12.06	No	ns	>0.9999
CTRL:0.25 mg/L vs. CCLO 2E:0.500 mg/L	-2,3	-13.56 to 8.962	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2B:0.125 mg/L	3,2	-8.062 to 14.46	No	ns	0,9988
CTRL:0.500 mg/L vs. CCLO 2B:0.25 mg/L	-3,7	-14.96 to 7.562	No	ns	0,9948
CTRL:0.500 mg/L vs. CCLO 2B:0.500 mg/L	-5,3	-16.56 to 5.962	No	ns	0,9053
CTRL:0.500 mg/L vs. CCLO 2C:0.125 mg/L	-1	-12.26 to 10.26	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2C:0.25 mg/L	-0,5	-11.76 to 10.76	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2C:0.500 mg/L	0,4	-10.86 to 11.66	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2D:0.125 mg/L	-11,4	-22.66 to -0.1382	Yes	*	0,045
CTRL:0.500 mg/L vs. CCLO 2D:0.25 mg/L	-11,9	-23.16 to -0.6382	Yes	*	0,0306
CTRL:0.500 mg/L vs. CCLO 2D:0.500 mg/L	-10,8	-22.06 to 0.4618	No	ns	0,0704
CTRL:0.500 mg/L vs. CCLO 2E:0.125 mg/L	0,6	-10.66 to 11.86	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2E:0.25 mg/L	0,8	-10.46 to 12.06	No	ns	>0.9999
CTRL:0.500 mg/L vs. CCLO 2E:0.500 mg/L	-2,3	-13.56 to 8.962	No	ns	>0.9999
CCLO 2B:0.125 mg/L vs. CCLO 2B:0.25 mg/L	-6,9	-18.16 to 4.362	No	ns	0,6254
CCLO 2B:0.125 mg/L vs. CCLO 2B:0.500 mg/L	-8,5	-19.76 to 2.762	No	ns	0,3082
CCLO 2B:0.125 mg/L vs. CCLO 2C:0.125 mg/L	-4,2	-15.46 to 7.062	No	ns	0,9837
CCLO 2B:0.125 mg/L vs. CCLO 2C:0.25 mg/L	-3,7	-14.96 to 7.562	No	ns	0,9948

CCLO 2B:0.125 mg/L vs. CCLO 2C:0.500 mg/L	-2,8	-14.06 to 8.462	No	ns	0,9997
CCLO 2B:0.125 mg/L vs. CCLO 2D:0.125 mg/L	-14,6	-25.86 to -3.338	Yes	**	0,0032
CCLO 2B:0.125 mg/L vs. CCLO 2D:0.25 mg/L	-15,1	-26.36 to -3.838	Yes	**	0,0021
CCLO 2B:0.125 mg/L vs. CCLO 2D:0.500 mg/L	-14	-25.26 to -2.738	Yes	**	0,0054
CCLO 2B:0.125 mg/L vs. CCLO 2E:0.125 mg/L	-2,6	-13.86 to 8.662	No	ns	0,9999
CCLO 2B:0.125 mg/L vs. CCLO 2E:0.25 mg/L	-2,4	-13.66 to 8.862	No	ns	>0.9999
CCLO 2B:0.125 mg/L vs. CCLO 2E:0.500 mg/L	-5,5	-16.76 to 5.762	No	ns	0,8803
CCLO 2B:0.25 mg/L vs. CCLO 2B:0.500 mg/L	-1,6	-12.86 to 9.662	No	ns	>0.9999
CCLO 2B:0.25 mg/L vs. CCLO 2C:0.125 mg/L	2,7	-8.562 to 13.96	No	ns	0,9998
CCLO 2B:0.25 mg/L vs. CCLO 2C:0.25 mg/L	3,2	-8.062 to 14.46	No	ns	0,9988
CCLO 2B:0.25 mg/L vs. CCLO 2C:0.500 mg/L	4,1	-7.162 to 15.36	No	ns	0,9868
CCLO 2B:0.25 mg/L vs. CCLO 2D:0.125 mg/L	-7,7	-18.96 to 3.562	No	ns	0,4568
CCLO 2B:0.25 mg/L vs. CCLO 2D:0.25 mg/L	-8,2	-19.46 to 3.062	No	ns	0,3603
CCLO 2B:0.25 mg/L vs. CCLO 2D:0.500 mg/L	-7,1	-18.36 to 4.162	No	ns	0,5828
CCLO 2B:0.25 mg/L vs. CCLO 2E:0.125 mg/L	4,3	-6.962 to 15.56	No	ns	0,9801
CCLO 2B:0.25 mg/L vs. CCLO 2E:0.25 mg/L	4,5	-6.762 to 15.76	No	ns	0,9712
CCLO 2B:0.25 mg/L vs. CCLO 2E:0.500 mg/L	1,4	-9.862 to 12.66	No	ns	>0.9999
CCLO 2B:0.500 mg/L vs. CCLO 2C:0.125 mg/L	4,3	-6.962 to 15.56	No	ns	0,9801
CCLO 2B:0.500 mg/L vs. CCLO 2C:0.25 mg/L	4,8	-6.462 to 16.06	No	ns	0,9526
CCLO 2B:0.500 mg/L vs. CCLO 2C:0.500 mg/L	5,7	-5.562 to 16.96	No	ns	0,8519
CCLO 2B:0.500 mg/L vs. CCLO 2D:0.125 mg/L	-6,1	-17.36 to 5.162	No	ns	0,7854
CCLO 2B:0.500 mg/L vs. CCLO 2D:0.25 mg/L	-6,6	-17.86 to 4.662	No	ns	0,6882
CCLO 2B:0.500 mg/L vs. CCLO 2D:0.500 mg/L	-5,5	-16.76 to 5.762	No	ns	0,8803
CCLO 2B:0.500 mg/L vs. CCLO 2E:0.125 mg/L	5,9	-5.362 to 17.16	No	ns	0,8201
CCLO 2B:0.500 mg/L vs. CCLO 2E:0.25 mg/L	6,1	-5.162 to 17.36	No	ns	0,7854
CCLO 2B:0.500 mg/L vs. CCLO 2E:0.500 mg/L	3	-8.262 to 14.26	No	ns	0,9994
CCLO 2C:0.125 mg/L vs. CCLO 2C:0.25 mg/L	0,5	-10.76 to 11.76	No	ns	>0.9999
CCLO 2C:0.125 mg/L vs. CCLO 2C:0.500 mg/L	1,4	-9.862 to 12.66	No	ns	>0.9999
CCLO 2C:0.125 mg/L vs. CCLO 2D:0.125 mg/L	-10,4	-21.66 to 0.8618	No	ns	0,0938
CCLO 2C:0.125 mg/L vs. CCLO 2D:0.25 mg/L	-10,9	-22.16 to 0.3618	No	ns	0,0655
CCLO 2C:0.125 mg/L vs. CCLO 2D:0.500 mg/L	-9,8	-21.06 to 1.462	No	ns	0,1412
CCLO 2C:0.125 mg/L vs. CCLO 2E:0.125 mg/L	1,6	-9.662 to 12.86	No	ns	>0.9999
CCLO 2C:0.125 mg/L vs. CCLO 2E:0.25 mg/L	1,8	-9.462 to 13.06	No	ns	>0.9999

CCLO 2C:0.125 mg/L vs. CCLO 2E:0.500 mg/L	-1,3	-12.56 to 9.962	No	ns	>0.9999
CCLO 2C:0.25 mg/L vs. CCLO 2C:0.500 mg/L	0,9	-10.36 to 12.16	No	ns	>0.9999
CCLO 2C:0.25 mg/L vs. CCLO 2D:0.125 mg/L	-10,9	-22.16 to 0.3618	No	ns	0,0655
CCLO 2C:0.25 mg/L vs. CCLO 2D:0.25 mg/L	-11,4	-22.66 to -0.1382	Yes	*	0,045
CCLO 2C:0.25 mg/L vs. CCLO 2D:0.500 mg/L	-10,3	-21.56 to 0.9618	No	ns	0,1006
CCLO 2C:0.25 mg/L vs. CCLO 2E:0.125 mg/L	1,1	-10.16 to 12.36	No	ns	>0.9999
CCLO 2C:0.25 mg/L vs. CCLO 2E:0.25 mg/L	1,3	-9.962 to 12.56	No	ns	>0.9999
CCLO 2C:0.25 mg/L vs. CCLO 2E:0.500 mg/L	-1,8	-13.06 to 9.462	No	ns	>0.9999
CCLO 2C:0.500 mg/L vs. CCLO 2D:0.125 mg/L	-11,8	-23.06 to -0.5382	Yes	*	0,0331
CCLO 2C:0.500 mg/L vs. CCLO 2D:0.25 mg/L	-12,3	-23.56 to -1.038	Yes	*	0,0222
CCLO 2C:0.500 mg/L vs. CCLO 2D:0.500 mg/L	-11,2	-22.46 to 0.06183	No	ns	0,0524
CCLO 2C:0.500 mg/L vs. CCLO 2E:0.125 mg/L	0,2	-11.06 to 11.46	No	ns	>0.9999
CCLO 2C:0.500 mg/L vs. CCLO 2E:0.25 mg/L	0,4	-10.86 to 11.66	No	ns	>0.9999
CCLO 2C:0.500 mg/L vs. CCLO 2E:0.500 mg/L	-2,7	-13.96 to 8.562	No	ns	0,9998
CCLO 2D:0.125 mg/L vs. CCLO 2D:0.25 mg/L	-0,5	-11.76 to 10.76	No	ns	>0.9999
CCLO 2D:0.125 mg/L vs. CCLO 2D:0.500 mg/L	0,6	-10.66 to 11.86	No	ns	>0.9999
CCLO 2D:0.125 mg/L vs. CCLO 2E:0.125 mg/L	12	0.7382 to 23.26	Yes	*	0,0282
CCLO 2D:0.125 mg/L vs. CCLO 2E:0.25 mg/L	12,2	0.9382 to 23.46	Yes	*	0,0241
CCLO 2D:0.125 mg/L vs. CCLO 2E:0.500 mg/L	9,1	-2.162 to 20.36	No	ns	0,2192
CCLO 2D:0.25 mg/L vs. CCLO 2D:0.500 mg/L	1,1	-10.16 to 12.36	No	ns	>0.9999
CCLO 2D:0.25 mg/L vs. CCLO 2E:0.125 mg/L	12,5	1.238 to 23.76	Yes	*	0,0189
CCLO 2D:0.25 mg/L vs. CCLO 2E:0.25 mg/L	12,7	1.438 to 23.96	Yes	*	0,0161
CCLO 2D:0.25 mg/L vs. CCLO 2E:0.500 mg/L	9,6	-1.662 to 20.86	No	ns	0,1608
CCLO 2D:0.500 mg/L vs. CCLO 2E:0.125 mg/L	11,4	0.1382 to 22.66	Yes	*	0,045
CCLO 2D:0.500 mg/L vs. CCLO 2E:0.25 mg/L	11,6	0.3382 to 22.86	Yes	*	0,0386
CCLO 2D:0.500 mg/L vs. CCLO 2E:0.500 mg/L	8,5	-2.762 to 19.76	No	ns	0,3082
CCLO 2E:0.125 mg/L vs. CCLO 2E:0.25 mg/L	0,2	-11.06 to 11.46	No	ns	>0.9999
CCLO 2E:0.125 mg/L vs. CCLO 2E:0.500 mg/L	-2,9	-14.16 to 8.362	No	ns	0,9996
CCLO 2E:0.25 mg/L vs. CCLO 2E:0.500 mg/L	-3,1	-14.36 to 8.162	No	ns	0,9991

Supplementary Table S20. The two-way analysis of variance (ANOVA) and Tukey's post hoc test to assess the differences between the effects induced from the extracts (CCLO EXT) and the four fractions (CCLO 2B, CCLO 2C, CCLO 2D, CCLO 2E) from the diatom *C. closterium* on the embryonic development of the sea urchin *P. lividus*, considering the classes of embryos detected: A) normal plutei; B) malformed plutei in post-fertilization treatment.

A)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	5,286	0,6774	ns	No	
Row Factor	56,54	<0.0001	****	Yes	
Column Factor	10,41	0,0084	**	Yes	
ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	75,05	8	9,381	F (8, 30) = 0.7139	P=0.6774
Row Factor	802,8	4	200,7	F (4, 30) = 15.27	P<0.0001
Column Factor	147,9	2	73,93	F (2, 30) = 5.626	P=0.0084
Residual	394,2	30	13,14		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
CCLO EXT vs. CCLO 2B	1,833	-3.123 to 6.790	No	ns	0,8188
CCLO EXT vs. CCLO 2C	0,4667	-4.490 to 5.423	No	ns	0,9987
CCLO EXT vs. CCLO 2D	11,43	6.477 to 16.39	Yes	****	<0.0001
CCLO EXT vs. CCLO 2E	1,833	-3.123 to 6.790	No	ns	0,8188
CCLO 2B vs. CCLO 2C	-1,367	-6.323 to 3.590	No	ns	0,9286
CCLO 2B vs. CCLO 2D	9,6	4.643 to 14.56	Yes	****	<0.0001
CCLO 2B vs. CCLO 2E	0	-4.957 to 4.957	No	ns	>0.9999
CCLO 2C vs. CCLO 2D	10,97	6.010 to 15.92	Yes	****	<0.0001
CCLO 2C vs. CCLO 2E	1,367	-3.590 to 6.323	No	ns	0,9286
CCLO 2D vs. CCLO 2E	-9,6	-14.56 to -4.643	Yes	****	<0.0001

B)

Source of Variation	% of total variation	P value	P value summary	Significant	P value
Interaction	6,581	0,3562	ns	No	
Row Factor	60,89	<0.0001	****	Yes	
Column Factor	11,2	0,0018	**	Yes	

ANOVA table	SS	DF	MS	F (DFn, DFd)	
Interaction	82,51	8	10,31	F (8, 30) = 1.157	P=0.3562
Row Factor	763,3	4	190,8	F (4, 30) = 21.41	P<0.0001
Column Factor	140,4	2	70,21	F (2, 30) = 7.877	P=0.0018
Residual	267,4	30	8,912		
Tukey's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Below threshold	Summary	Adjusted P Value
CCLO EXT vs. CCLO 2B	-1,833	-5.915 to 2.249	No	ns	0,6916
CCLO EXT vs. CCLO 2C	-0,4667	-4.549 to 3.615	No	ns	0,9972
CCLO EXT vs. CCLO 2D	-11,17	-15.25 to -7.085	Yes	****	<0.0001
CCLO EXT vs. CCLO 2E	-1,833	-5.915 to 2.249	No	ns	0,6916
CCLO 2B vs. CCLO 2C	1,367	-2.715 to 5.449	No	ns	0,8659
CCLO 2B vs. CCLO 2D	-9,333	-13.42 to -5.251	Yes	****	<0.0001
CCLO 2B vs. CCLO 2E	0	-4.082 to 4.082	No	ns	>0.9999
CCLO 2C vs. CCLO 2D	-10,7	-14.78 to -6.618	Yes	****	<0.0001
CCLO 2C vs. CCLO 2E	-1,367	-5.449 to 2.715	No	ns	0,8659
CCLO 2D vs. CCLO 2E	9,333	5.251 to 13.42	Yes	****	<0.0001