

Supplementary Information

Effects of ocean acidification on calcification of the sub-Antarctic pteropod *Limacina retroversa*

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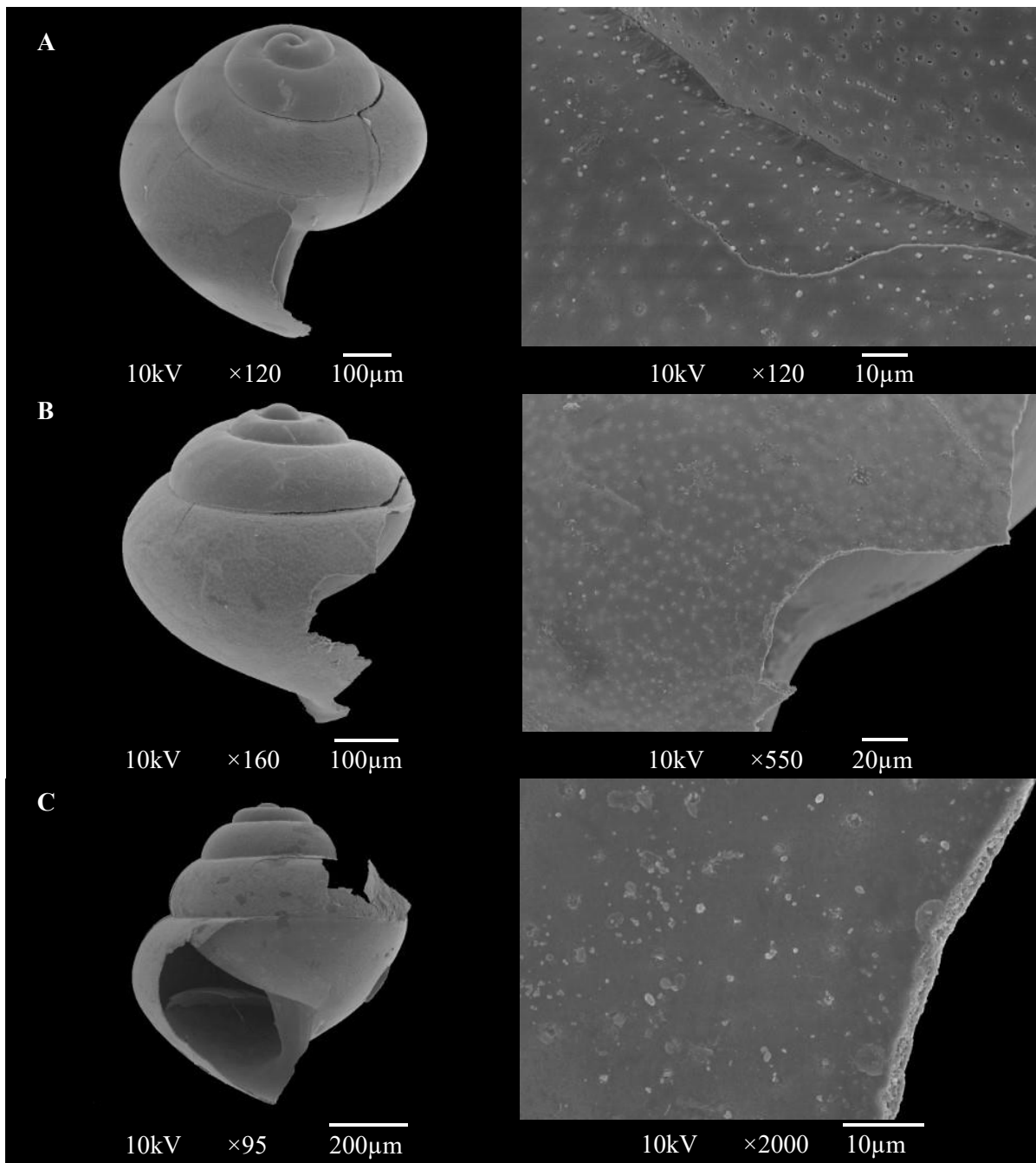
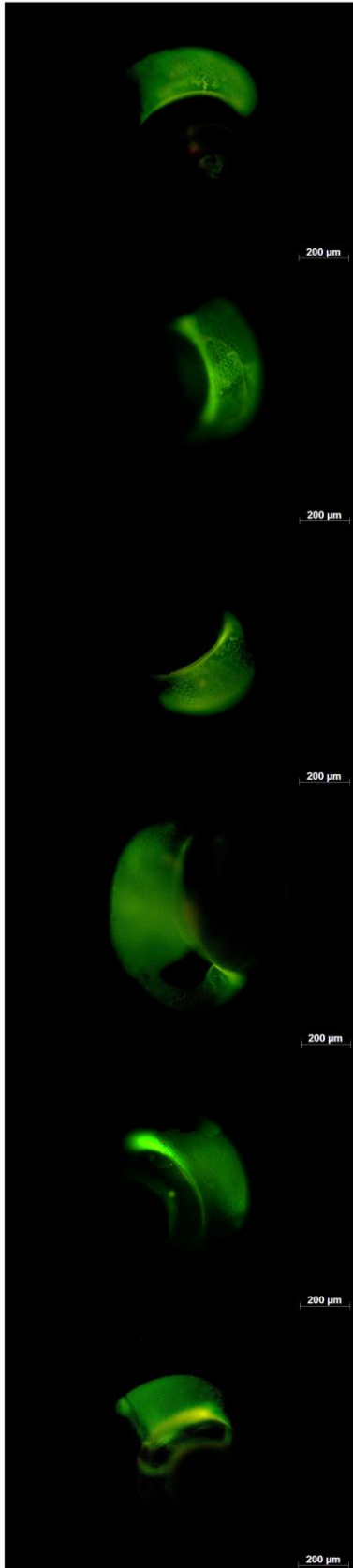
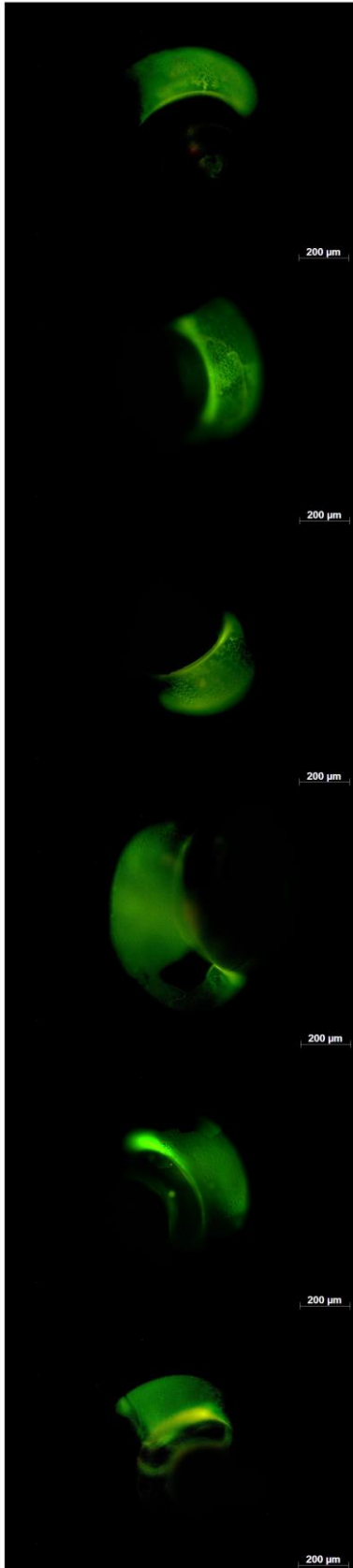


Figure S1 | SEM images of three individuals used for analyses demonstrating that organic tissue has been removed after low temperature ashing. **A)** A shell from present conditions with only apertural glow, **B)** a shell from past conditions with entire shell glow, and **C)** a shell from near-future conditions with only apertural glow.

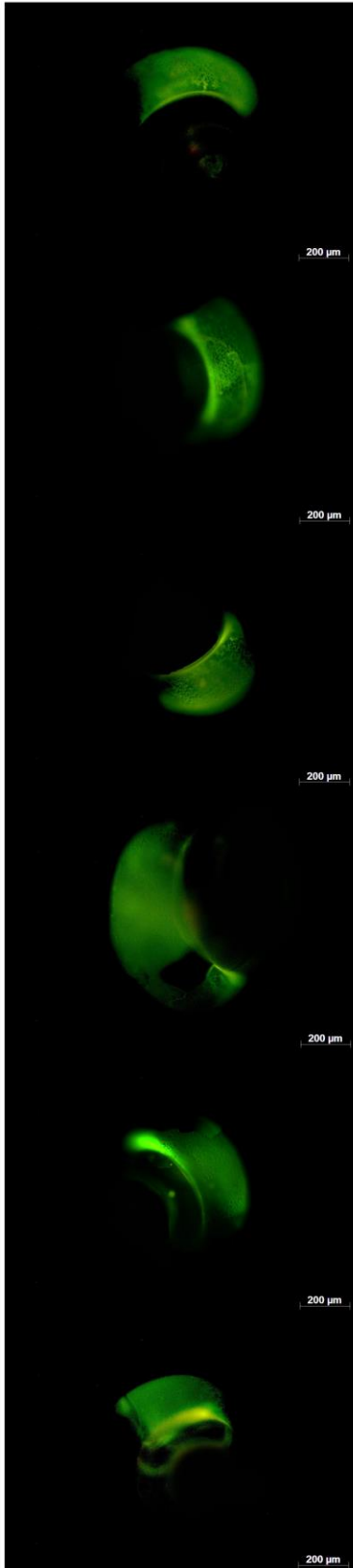
A_01_01
Apertural glow



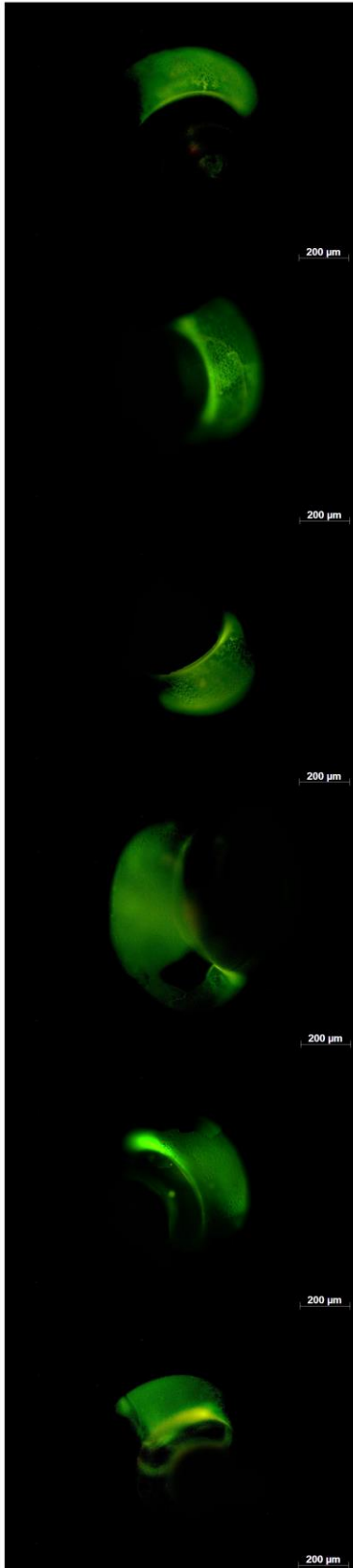
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Apertural glow



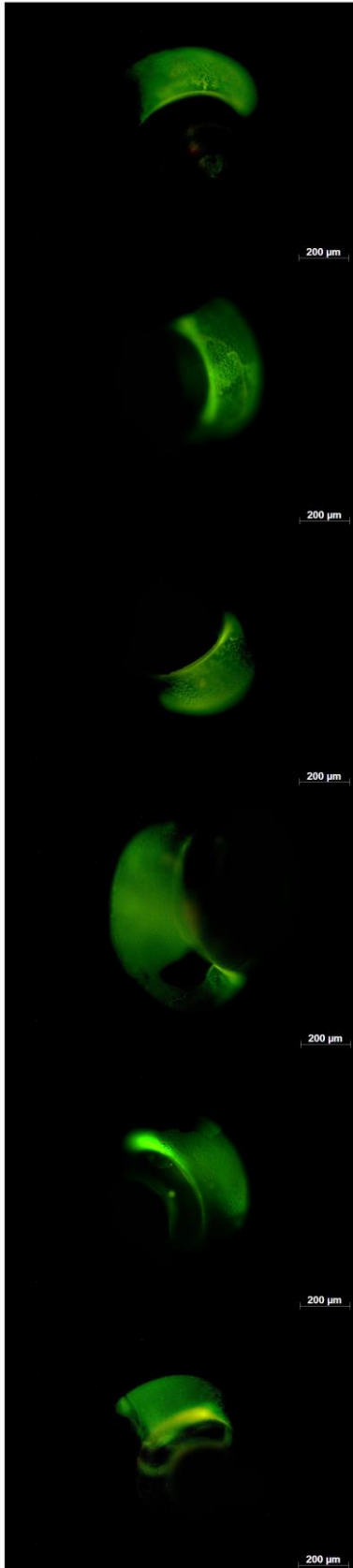
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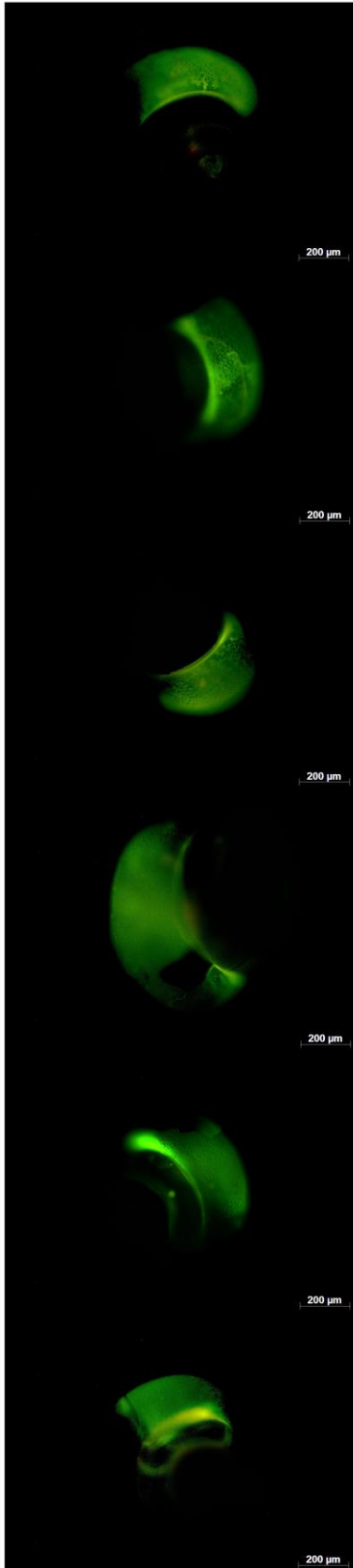
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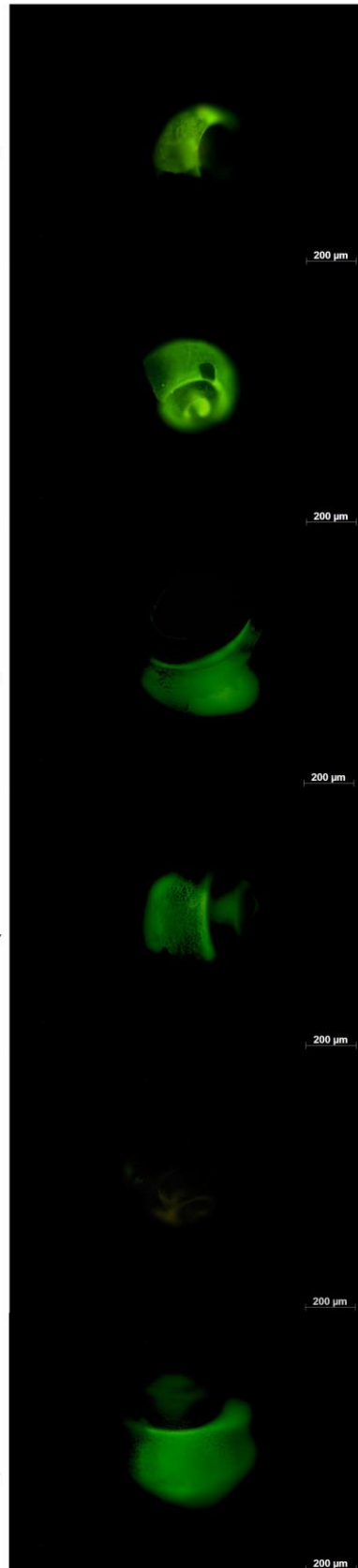
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Apertural glow



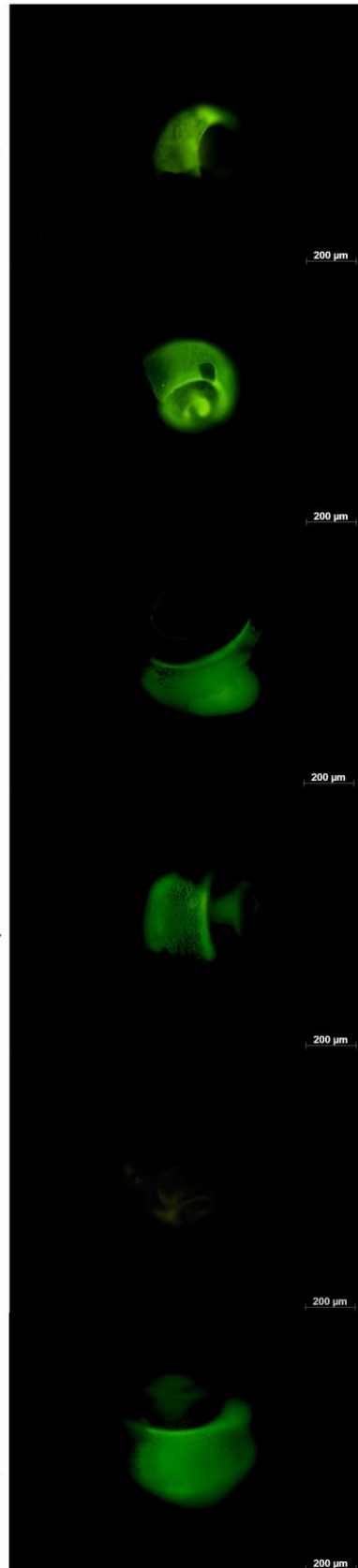
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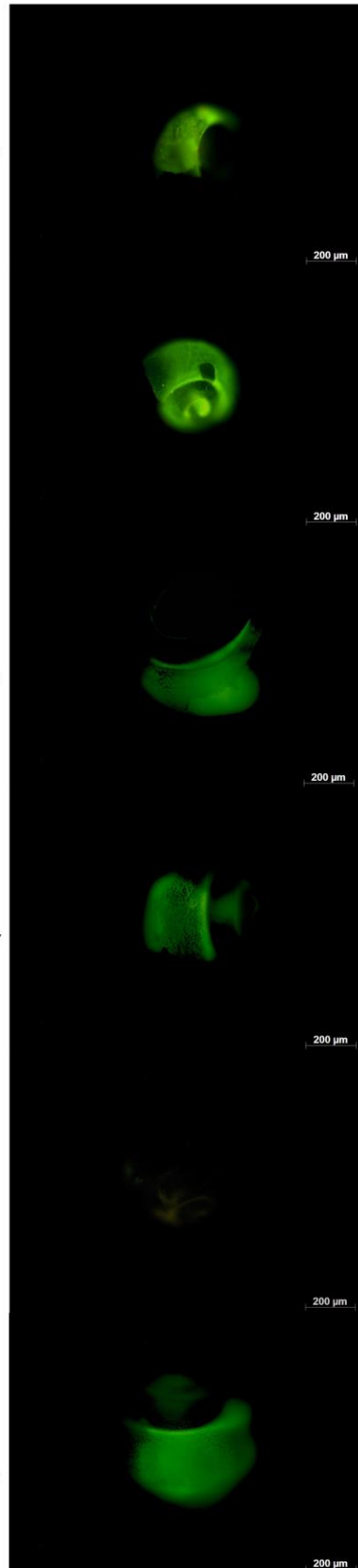
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Apertural glow



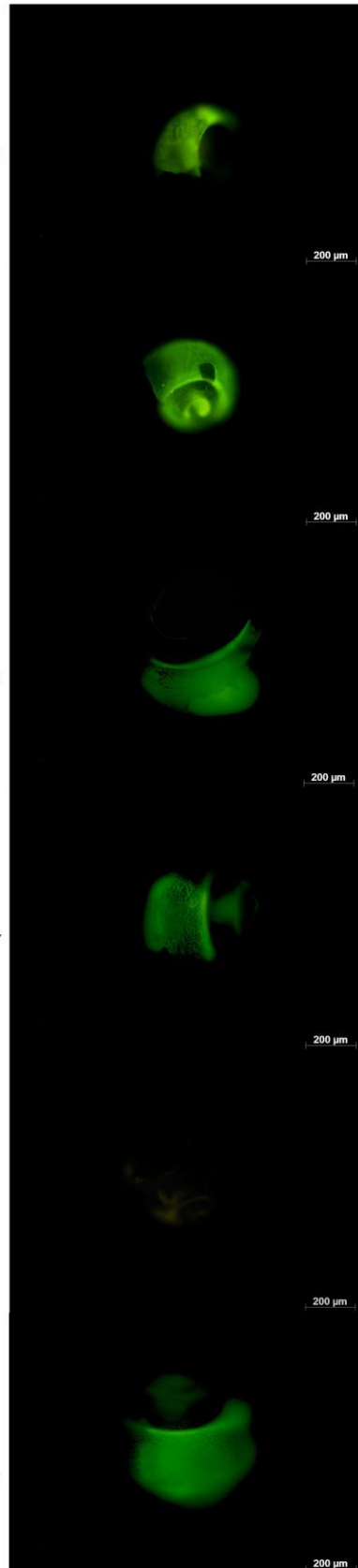
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Full glow



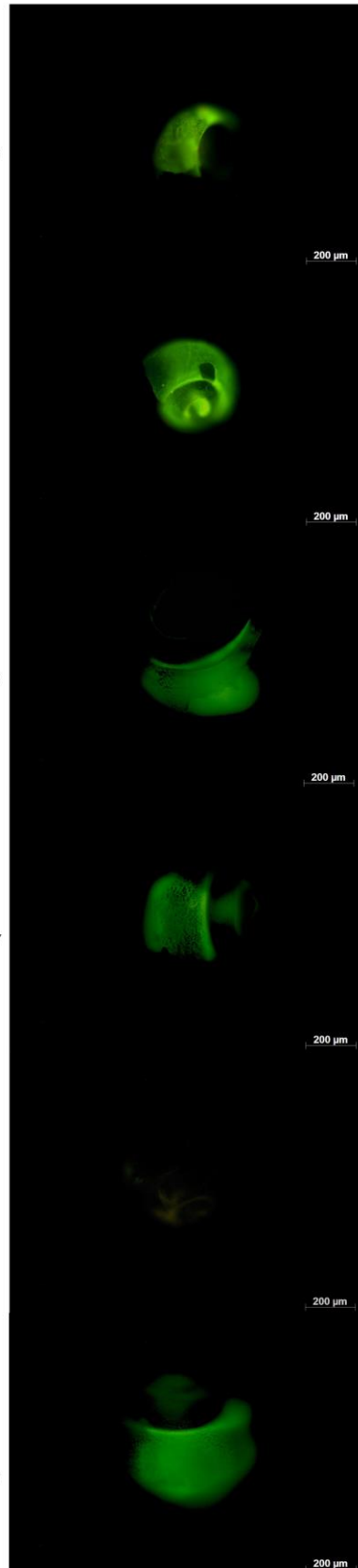
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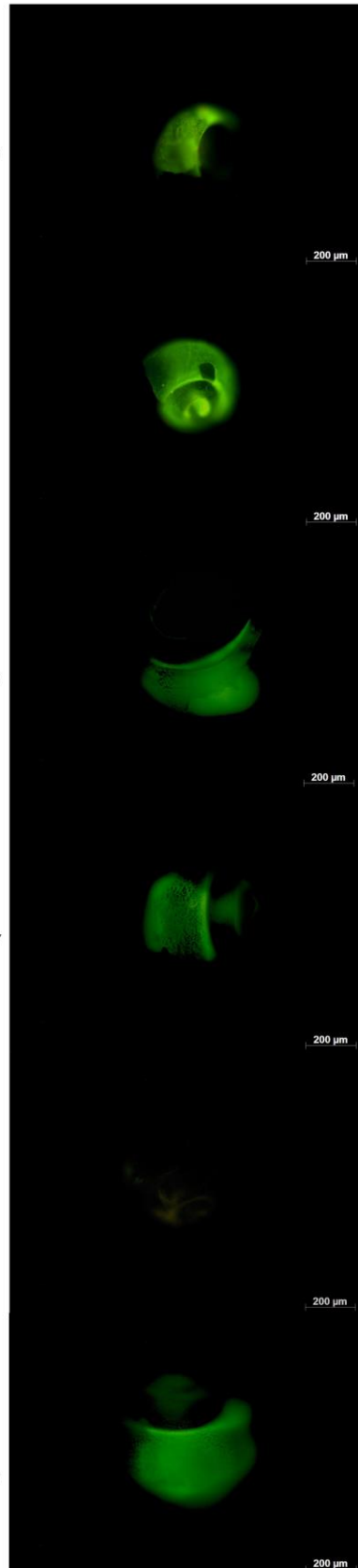
A_01_16
Apertural glow



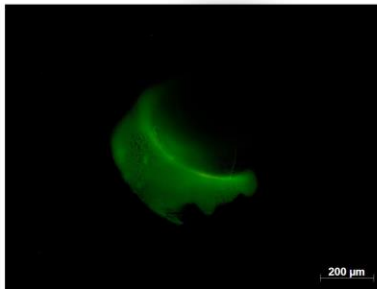
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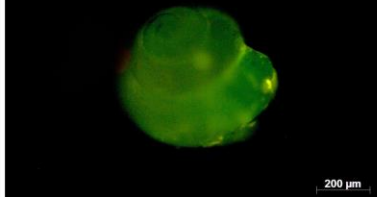
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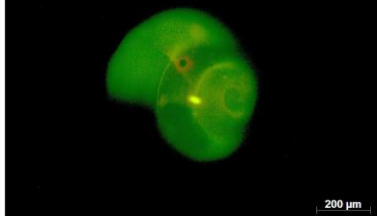
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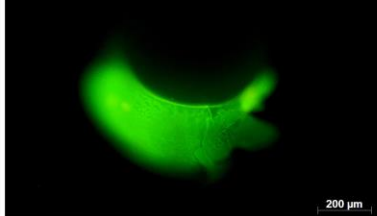
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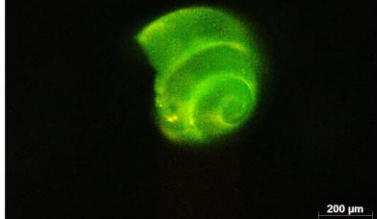
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A_02_04
Apertural glow



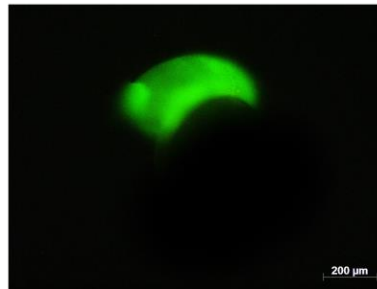
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A_02_06
Apertural glow



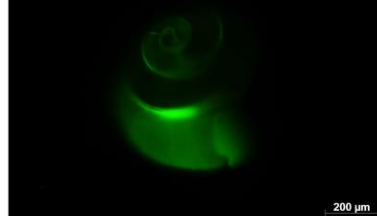
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A_02_10
No glow



A_02_11
Apertural glow



A_02_12
Apertural glow



A_02_13
No glow



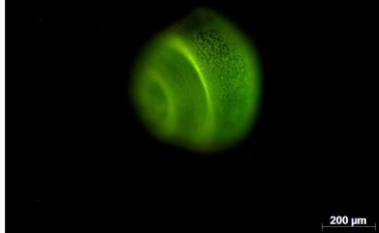
A_02_14
Apertural glow



A_02_15
No glow



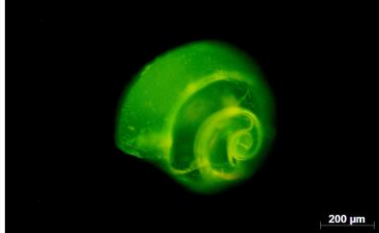
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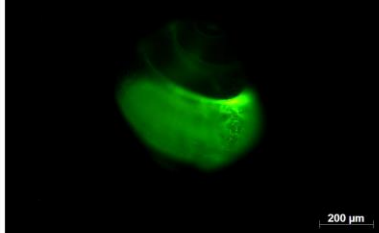
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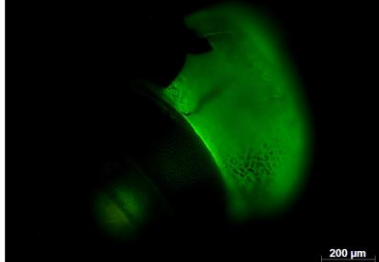
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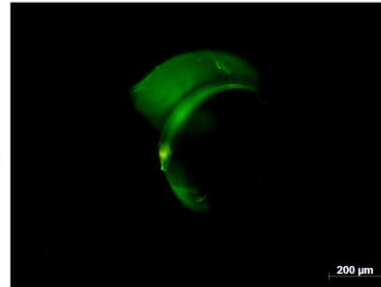
A_03_02
Apertural glow



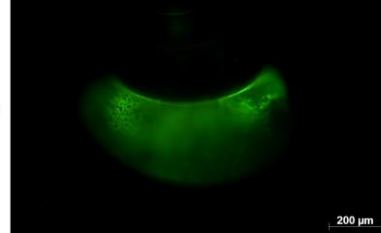
A_03_03
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A_03_05
Apertural glow



A_03_06
Apertural glow



A_03_08
Apertural glow



A_03_09
Apertural glow



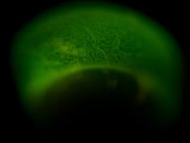
A_03_10
Apertural glow



A_03_11
Apertural glow

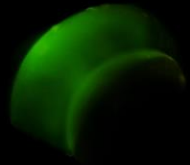


A_03_12
Apertural glow



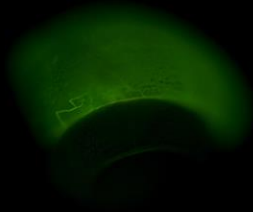
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A_03_14
Apertural glow



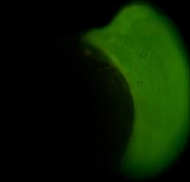
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A_03_15
Apertural glow



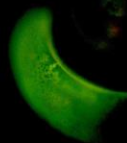
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A_03_16
Apertural glow



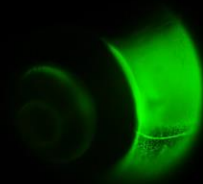
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A_03_17
Apertural glow

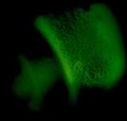


200 µm

A_03_18
Apertural glow

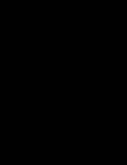


A_03_23
Apertural glow



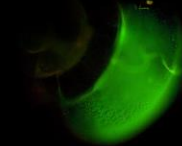
200 µm

A_03_27
Apertural glow



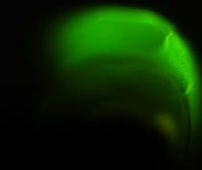
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B_01_02
Apertural glow



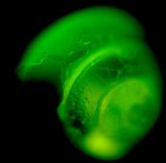
100 µm

B_01_11
Apertural glow



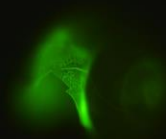
200 µm

B_01_27
Full glow



200 µm

B_02_01
Apertural glow



200 µm

B_02_02
No glow



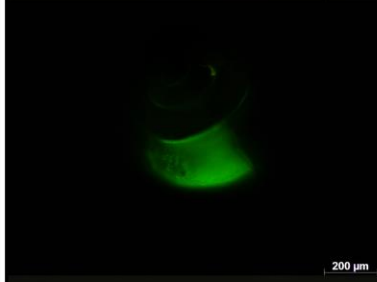
B_02_03
Apertural glow



B_02_04
Apertural glow



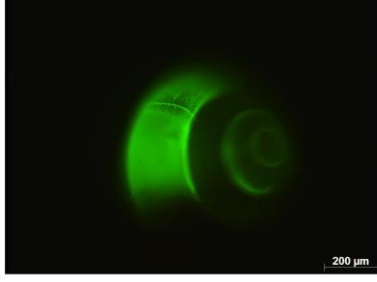
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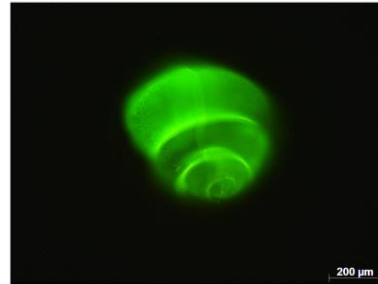
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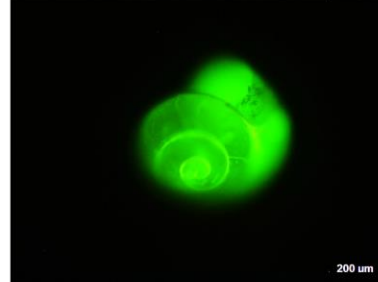
B_02_07
Apertural glow



B_02_08
Full glow



B_02_09
Full glow



B_02_10
Full glow



B_02_11
Full glow



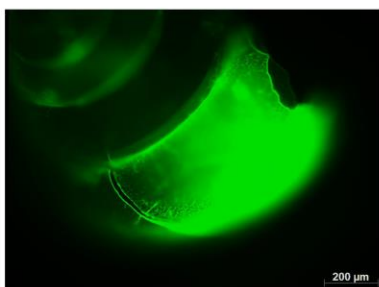
B_02_17
Full glow



B_02_24
Full glow



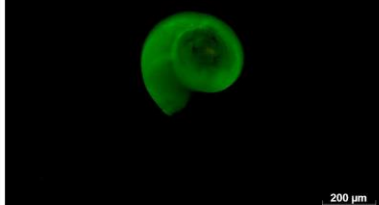
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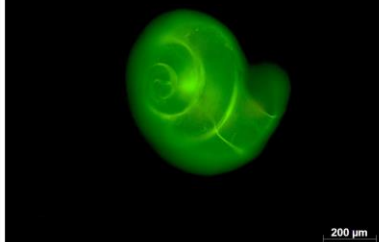
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B_03_03
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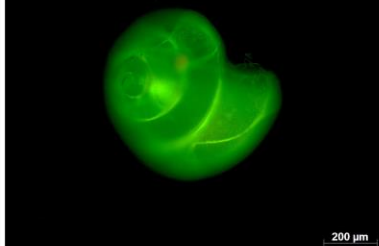
B_03_04
Full glow



B_03_05
Full glow



B_03_06
Full glow



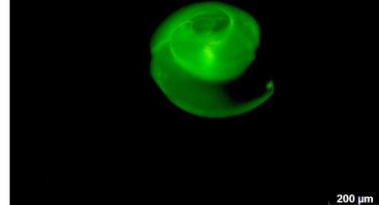
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B_03_08
Apertural glow



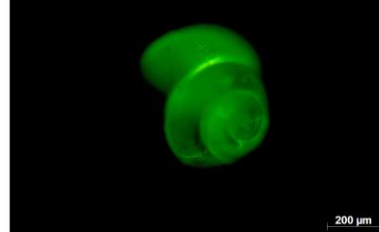
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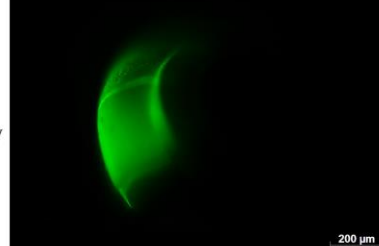
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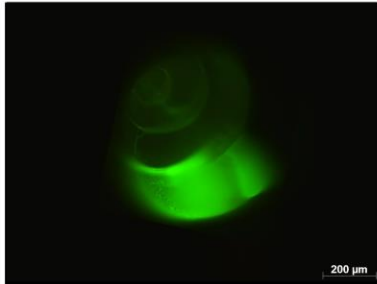
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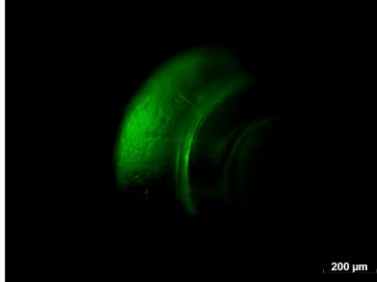
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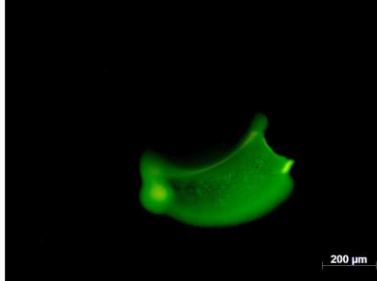
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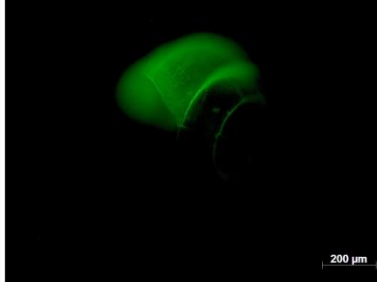
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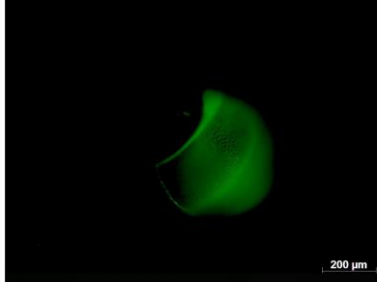
B_03_22
Apertural glow



C_01_01
Apertural glow



C_01_04
Apertural glow



C_01_06
Apertural glow



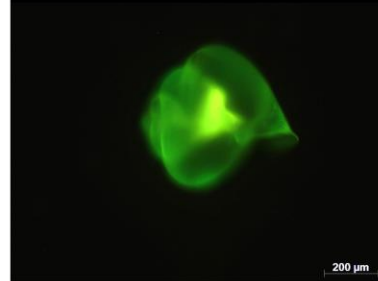
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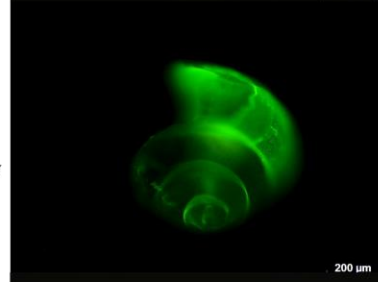
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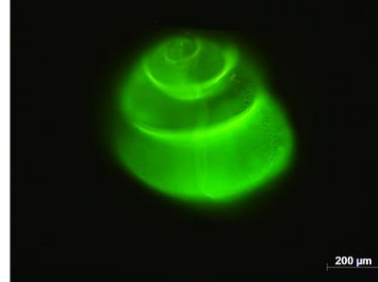
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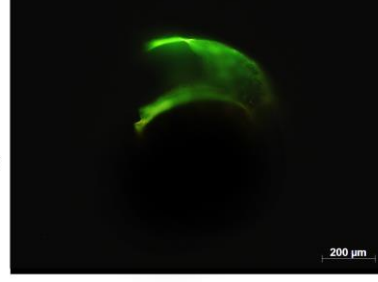
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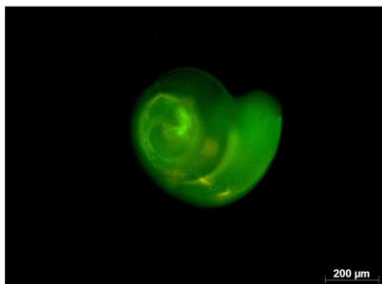
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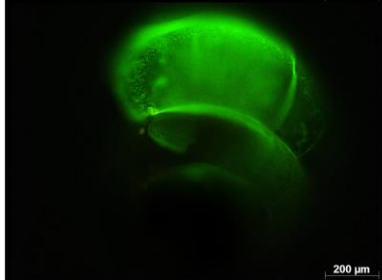
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Apertural glow



C_02_01
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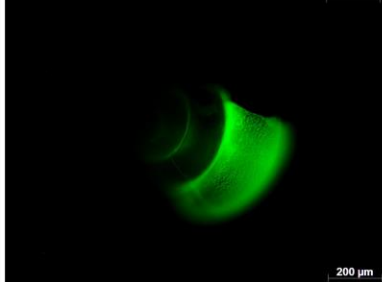
C_02_02
Apertural glow



C_02_03
No glow



C_02_04
Apertural glow



C_02_07
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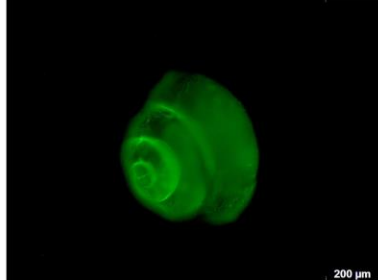
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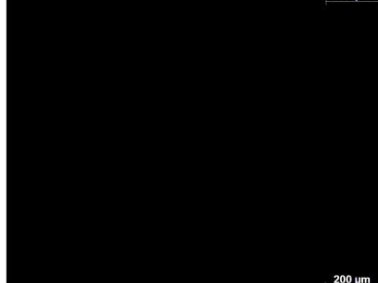
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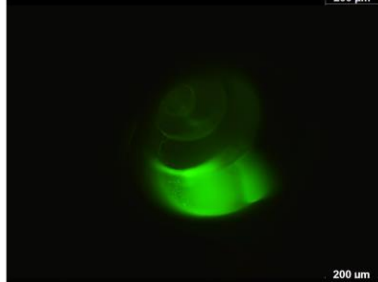
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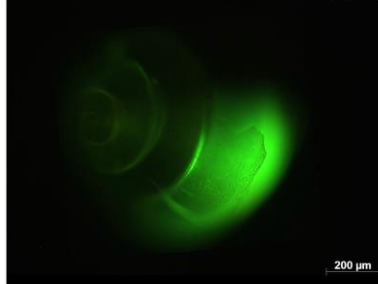
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C_02_12
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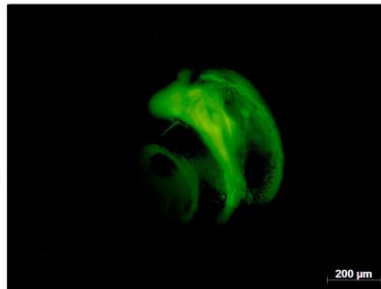
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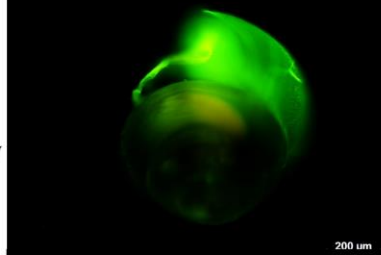
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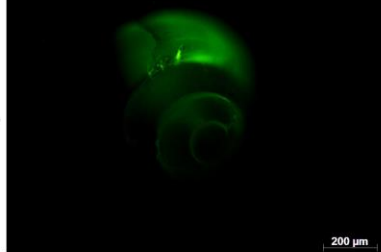
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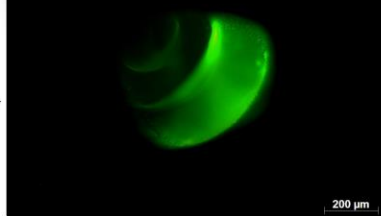
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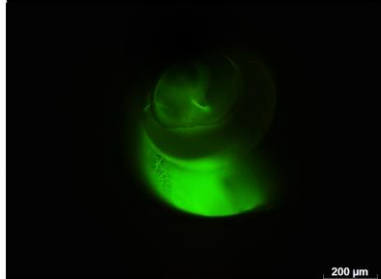
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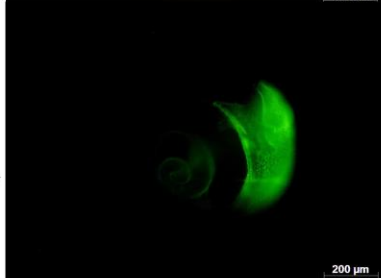
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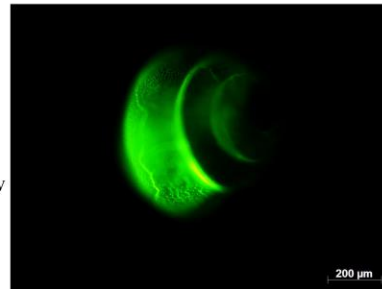
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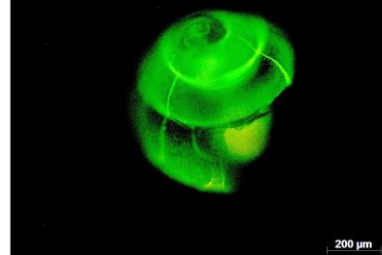
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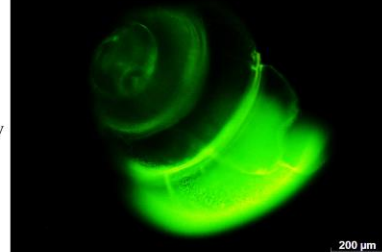
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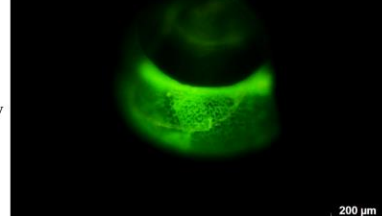
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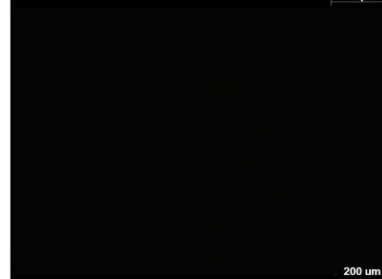
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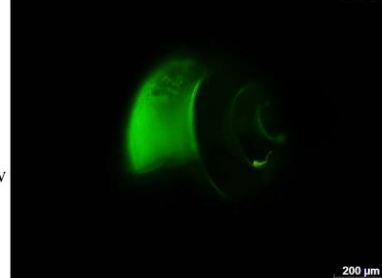
C_03_15
Apertural glow



C_03_18
No glow



C_03_20
Apertural glow



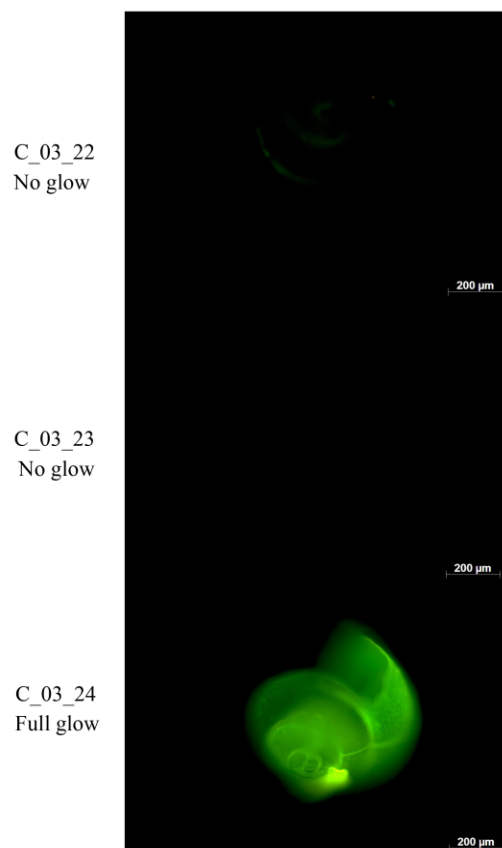


Figure S2 | An overview of all examined specimens using a fluorescence microscope (N=111). Labels “A”, “B” and “C” represent the experimental conditions that specimens were exposed to: A = near-future conditions, B = present conditions, and C = past conditions.

Table S1 | Number of specimens measured per treatment and method, after being exposed to past, present and near-future conditions.

	Calcification pattern	Shell weight	Shell thickness/ density	Thickness new-grown shell
Past	31	14	14	6
Present	36	13	13	10
Future	44	15	15	8
Total	111	42	42	24

Table S2 | Matrix of correlation coefficients (Pearson's r) among sea water variables based on $n=12$ samples (4 treatments x 3 replicates). A high correlation was found among the carbonate chemistry parameters DIC, pH, $p\text{CO}_2$ and Ω_{Ar} .

	DIC	pH	S	TA	$p\text{CO}_2$	Ω_{Ar}
DIC	1	-0.98*	0.24	-0.05	0.96*	-0.99*
pH		1	-0.15	0.24	-0.99*	0.99*
S			1	0.23	0.1	-0.21
TA				1	-0.32	0.19
$p\text{CO}_2$					1	-0.98*
Ω_{Ar}						1

*Significant after Bonferroni correction ($p < 0.003$)

Table S3 | Differences in calcification patterns of *Limacina retroversa* after being exposed to past, present and near-future conditions. The values show standardized residuals from the Pearson's Chi-square test applied to the calcification patterns in Fig. 3A. Standardized residuals were calculated as $(O-E)/\sqrt{E}$, where O and E are the observed and expected number of individuals, respectively. Positive values indicate a larger contribution of the specific glow than expected, whereas negative values indicate a smaller contribution.

	Past	Present	Future
No glow	-1.41	1.18	0.98
Apertural glow	-0.90	1.17	2.78
Full glow	2.44	-0.73	-0.73