

Fig. S1: Morphological of the second kind of primmorphs stage. (A&B) A general view of primmorphs in the culture after 2 dpd, an intact single layer of cells surrounding primmorphs and inner cell mass, the external cavity (*) resembles the extraembryonic cavity with a single layer of flat cells. (C&D). Images are taken with (A & B) bright field, (C) confocal, Anti- α -Tubulin (green) with the nuclei counterstained with DAPI (blue). P: pinacocyte; F: flagella; (*): external cavity.

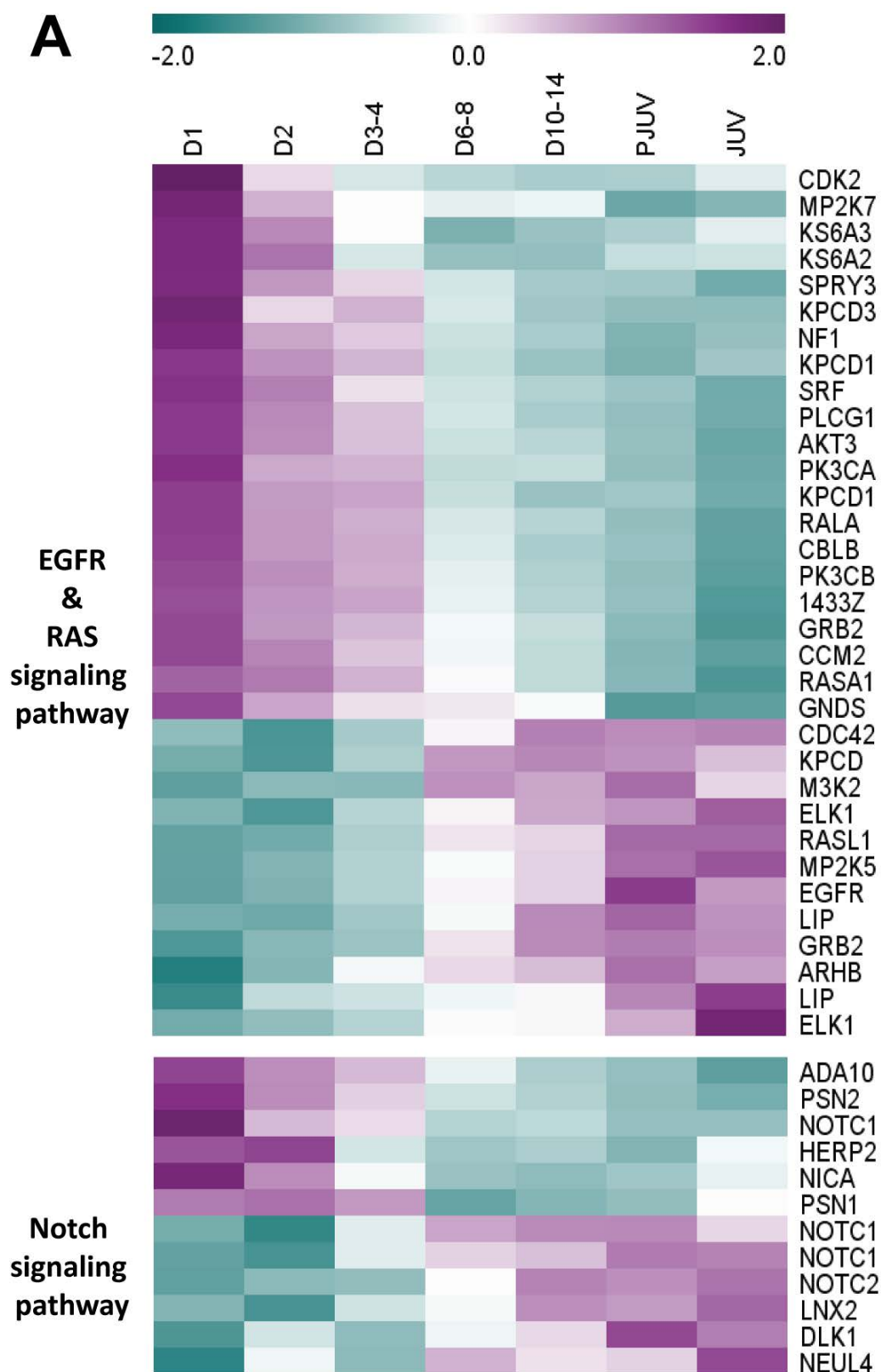


Fig. S2: Differentially expressed genes associated with developmental signaling pathways. (A) Heatmap shows the relative expression of developmental regulatory genes associated with EGF, Notch, and Ras signaling pathways. The selected list of genes is significantly DE across the course of *S. ciliatum* regeneration.

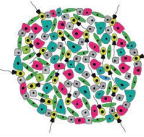
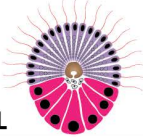
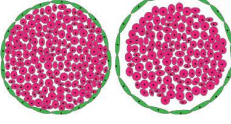
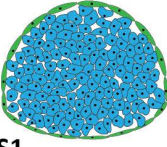
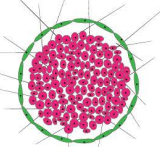
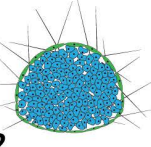
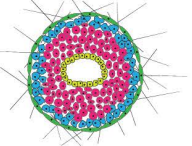
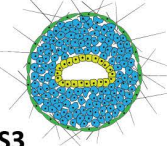
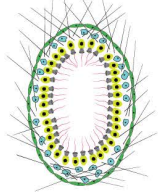
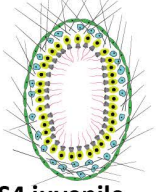
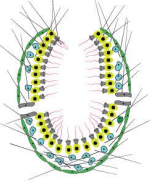
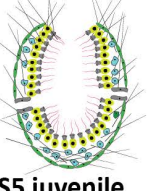
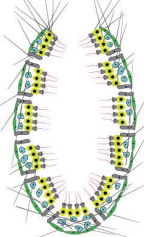
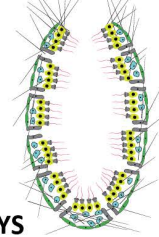
Stage	Regeneration	Morphological signatures	Postlarval development	Overlap
I) Aggregation dpd 1 $N = \sim 20, n = 6, R = 2$			SL 	—
II) Primmorphs dpd 2 $N = \sim 20, n = 6, R = 2$		<ul style="list-style-type: none"> • Epithelized surface with pinocytes and loss of granulated inner cell mass. • A continuous cavity separating external pinacocytes and inner cell mass. 	S1 	—
III) Primmorphs with spicules dpd 3-4 $N = \sim 20, n = 3, R = 6$		<ul style="list-style-type: none"> • First appearance of spicules 	S2 	*
IV) Ciliated chamber dpd 6-8 $N = \sim 20, n = 3, R = 5$		<ul style="list-style-type: none"> • Developing multiple ciliated chambers 	S3 	*
V) Choanoderm dpd 10-14 $N = \sim 20, n = 3, R = 4$		<ul style="list-style-type: none"> • Choanoderm with flagellated choanocytes • Expanding spongocoel • A continuous pinacoderm 	S4 juvenile 	*
VI) Pre-Juvenile dpd 16-18 $N = \sim 20, n = 3, R = 3$		<ul style="list-style-type: none"> • Osculum opens at the apical end • Porocytes form ostia 	S5 juvenile 	*
VII) Juvenile dpd 21-24 $N = \sim 20, n = 3, R = 2$		<ul style="list-style-type: none"> • Increase in the size of ascon • Increase in number of porocytes 	YS 	*

Table S1: Summary of the morphological and cellular events during regeneration in *S. ciliatum*.

The table details various regeneration steps and their overlaps with postlarval development. 4th column (postlarval development) depicts the morphological events at postlarval development of *S. ciliatum*. 1st column details number of samples collected for RNA-sequencing at each stage of regeneration, N=number of pooled regenerating structures per well, n=number of pooled regenerating structures per replicate, R=number of replicates per stage.

Table S2: Data relevant to figure 5 detailing the differential gene expression data

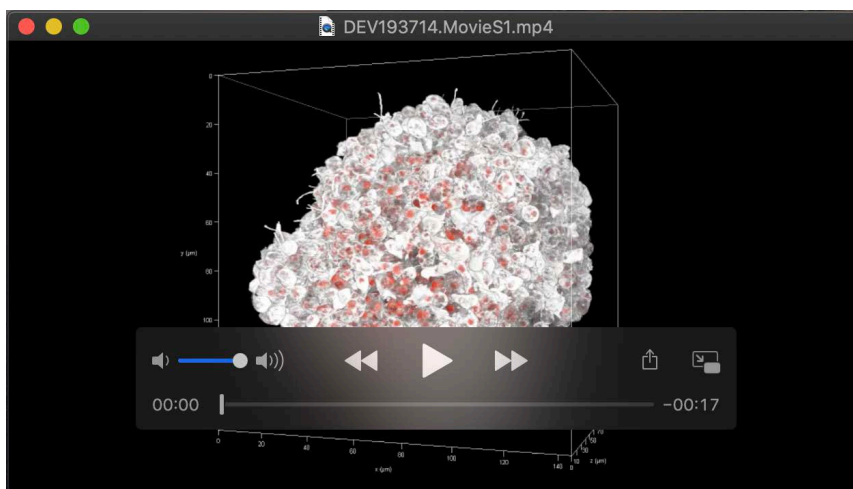
[Click here to Download Table S2](#)

Table S3: Detailed clusters of regeneration and PLD, the data is related to figure 6

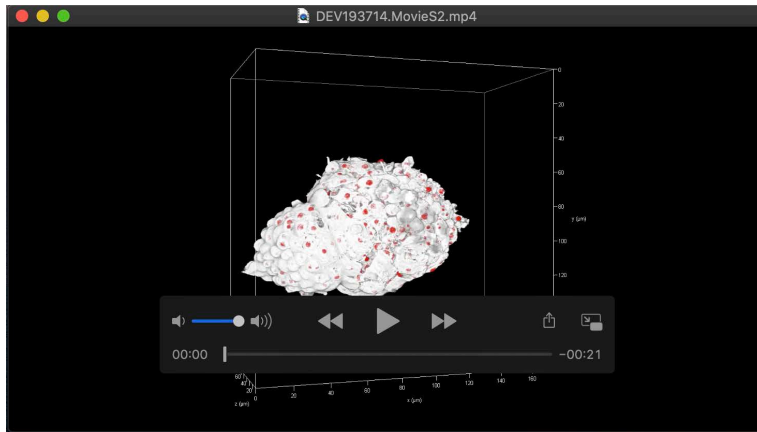
[Click here to Download Table S3](#)

Table S4: Data presented in the heatmaps

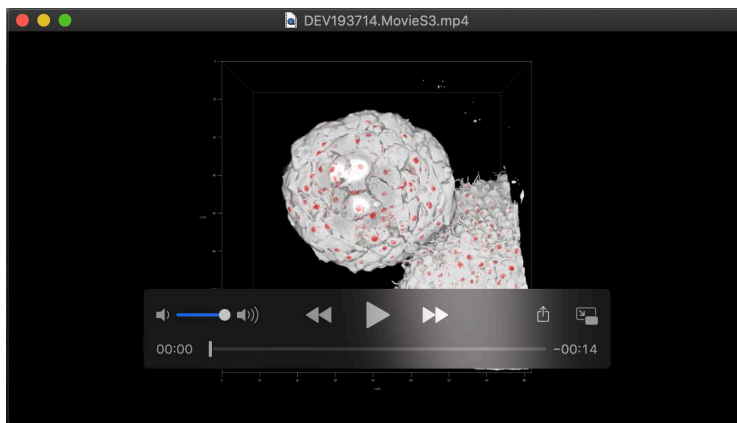
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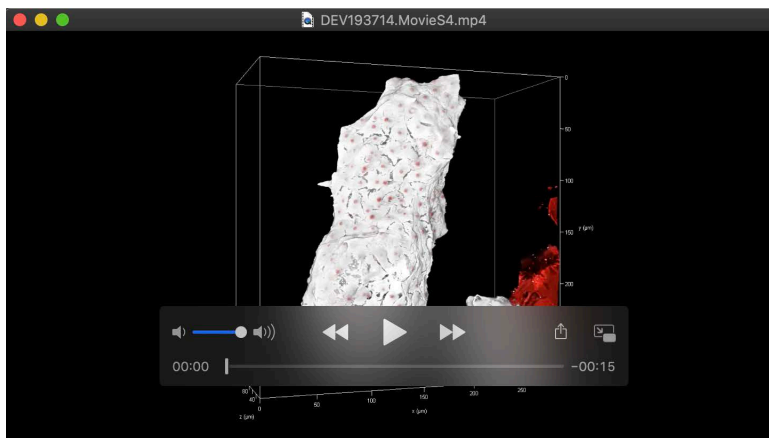
Movie 1: 3D and Z-stack of imaging of primmorphs after 24 hrs post dissociation.



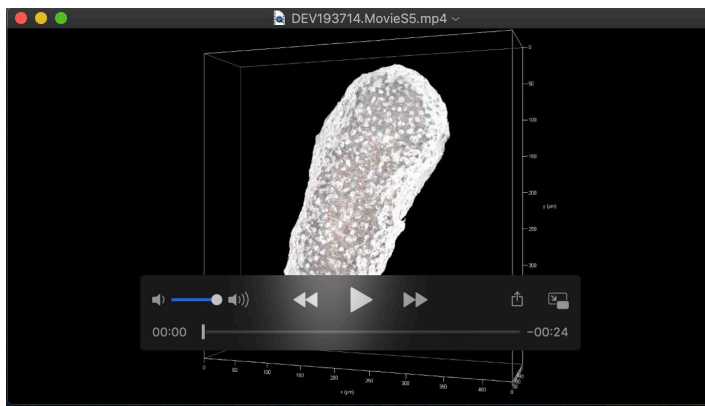
Movie 2: 3D and Z-stack of imaging of primmorphs 2 days post dissociation.



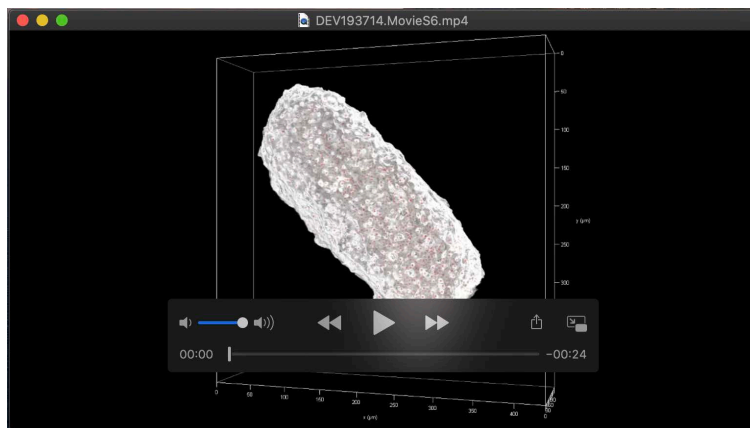
Movie 3: 3D and Z-stack of imaging of primmorphs 3 days post dissociation.



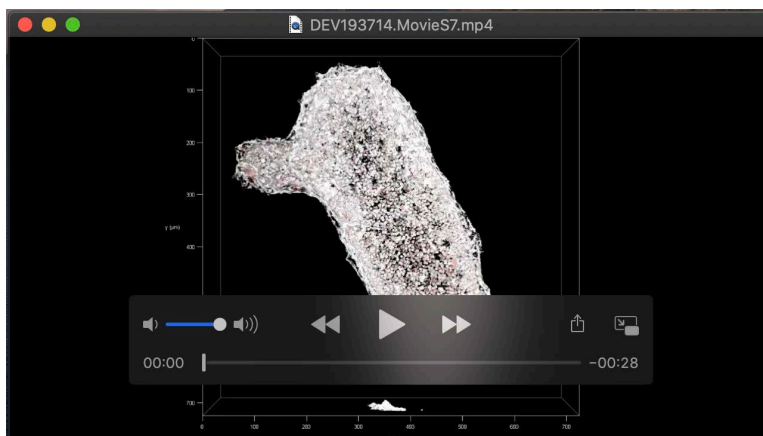
Movie 4: 3D and Z-stack of imaging of structures with ciliated chambers 8 days post dissociation.



Movie 5: 3D and Z-stack of imaging of regenerating structure at 12 days post dissociation. Defined choanoderm with a single layer of choanocytes surrounding the atrium. Note that ostium and osculum are not formed yet.



Movie 6: 3D and Z-stack of imaging of pre-juvenile 18 days post dissociation. The ostium and osculum are formed.



Movie 7: 3D and Z-stack of imaging of juvenile 24 days post dissociation.