

The shell structure and the chamber production cycle of the cephalopod *Spirula* (Coleoidea, Decapodiformes)

Antonio G. Checa^{1,2}, Christian Grenier¹, Erika Griesshaber³, Wolfgang W. Schmahl³, Julyan H.E. Cartwright^{2,6}, Carmen Salas⁵, Morgane Oudot⁴

¹Departamento de Estratigrafía y Paleontología, Universidad de Granada, Granada, Spain

²Instituto Andaluz de Ciencias de la Tierra, CSIC-Universidad de Granada, 18100 Armilla, Spain

³Department für Geo- und Umweltwissenschaften, Ludwig-Maximilians Universität München, 80333 Munich, Germany

⁴Departamento de Biología Animal, Facultad de Ciencias, Universidad de Málaga, 29071-Málaga, Spain

⁵UMR CNRS 6282 Biogeosciences, University of Burgundy-Franche-Comté, 21000 Dijon, France

⁶Instituto Carlos I de Física Teórica y Computacional, Universidad de Granada, 18071 Granada, Spain

Supplementary Figures S1 to S3

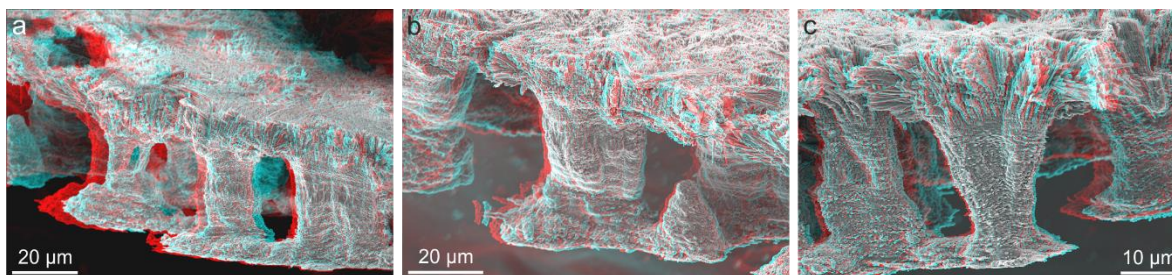


Fig. S1 Anaglyphs of three examples of pillars (**a**, **b**, **c**). Note aborted pillar in **b**. A far view of **b** and **c** is shown in Fig. 6h. The 3D effect can only be appreciated by using red-cyan glasses.

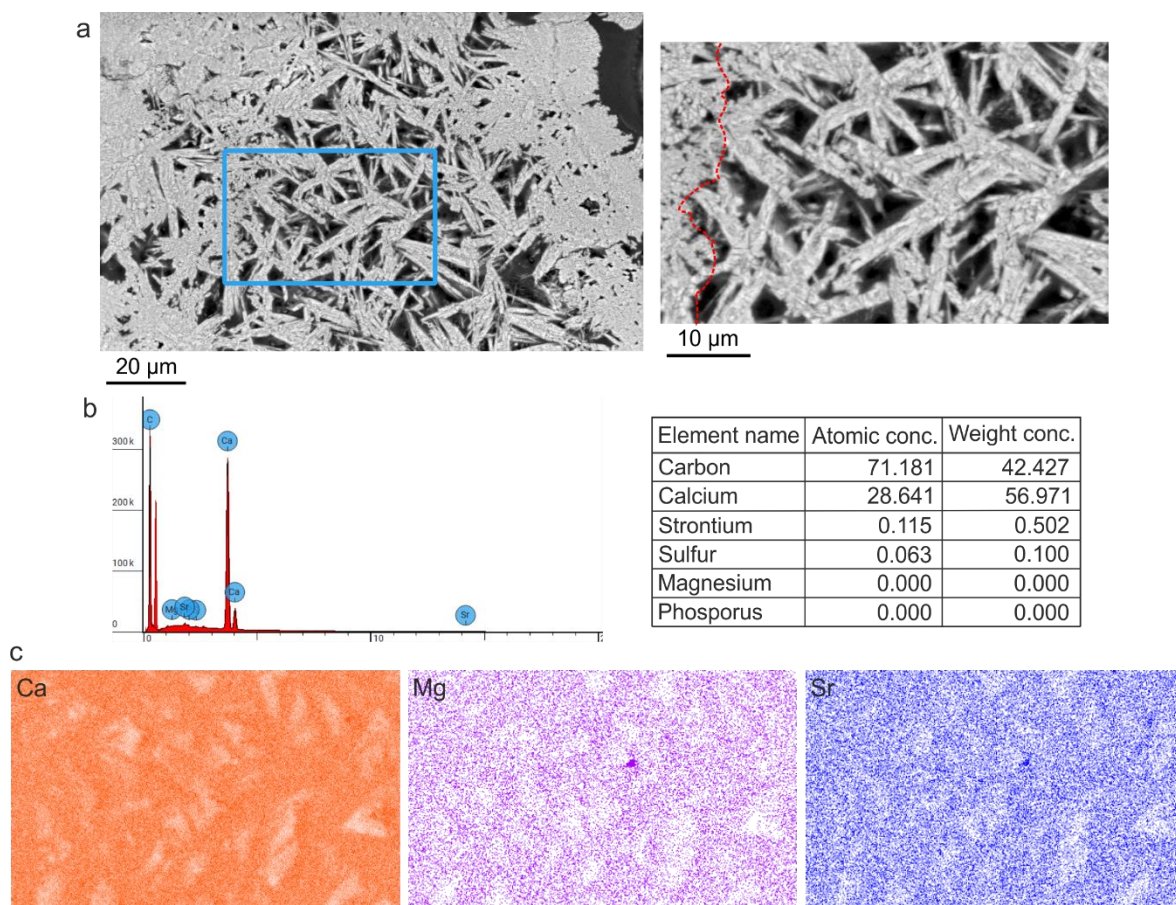


Fig. S2 Elemental EDX analysis of the pillar fibers and fibrous prismatic deposits. **a** Analyzed area, framed in the left image and cropped in the right image. The approximate boundary between pillar fibers and fibrous-prismatic deposits is indicated with the broken line in the right image. **b** Spectrum and elemental composition of the analyzed area. Note absence of Mg and presence of Sr, indicative of aragonite. **c** Elemental (Ca, Mg and Sr) maps of the analyzed area.

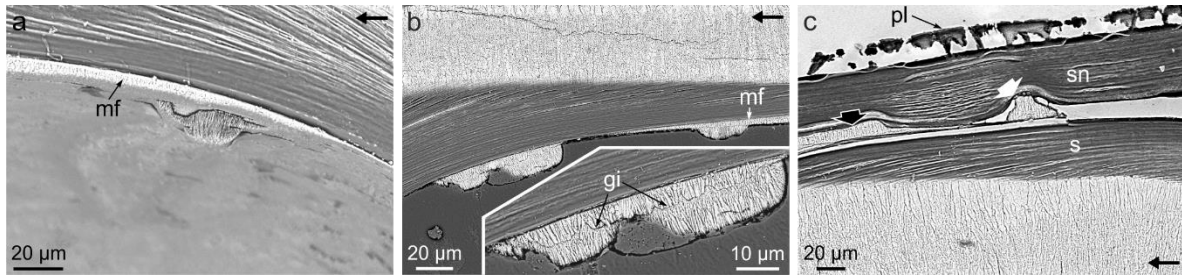


Fig. S3 Examples of secondary calcifications (fibrous aggregates) formed within the chambers of *Spirula*. **a** Aggregate formed on the internal surface of the dorsal mural flap. **b** Two aggregates formed on the adoral surface of the septum and the mural flap (dorsal area). The inset is a detailed view of the aggregate on the left showing a growth interruption. **c** Two aggregates (very thick arrows) formed on the internal surface of the ventral septal edge. Arrows indicate the growth direction. gi: growth interruption; mf: mural flap; pl: pillar layer; s: septum; sn: septal neck.