

Supplementary Figure captions

Supplementary Fig. S1. Location of the two sampling sites in the NW Pacific.

Supplementary Fig. S2. Bathymetric map of the area around the 30° N site.

Supplementary Fig. S3. Bathymetric map of the area around the 32.5° N site.

Supplementary Fig. S4. Shipboard photographs of newly collected specimens seen through sides of core tubes. A, B. *Psammmina yokosukae* sp. nov.. A. Holotype, reg. no. TNS-Pr691. B. Paratype, reg. no. TNS-Pr693. C, D. *Psammmina contorta* sp. nov.. C. Paratype, reg. no. TNS-Pr694. D. Holotype, reg. no. TNS-Pr695; the rounded object on the right-hand side is the 'Pebble-shaped, honeycombed xenophyophore' informally described below. The arrowhead indicates the chimney-like feature referred to in the text.

Supplementary Fig. S5. A, B. *Psammmina yokosukae* sp. nov.. holotype reg. no. TNS- Pr691, photographs taken through side of core tube. A. Overview of test viewed obliquely from above. B. Detail of largest plate showing vague surface zonation and radial structures and granular agglutination. C-D. *Psammmina contorta* sp. nov., paratype, reg. no. TNS- Pr694; much of the test had collapsed following collection. C. Main the remaining upstanding part of the test showing zonation and granular agglutination. D. Same part of test from the other side. E, F. *Psammmina contorta* sp. nov., holotype, reg. no. TNS-Pr695; two views from different angles.

Supplementary Fig. S6. *Laminarena variabilis* gen. & sp. nov., typical 30N form. A-E. Seafloor photographs. A. Holotype, reg. no. TNS-Pr700. B. Paratype, reg. no. TNS- Pr699. C. Additional specimen reg. no. TNS-Pr705. D. Additional specimen reg. no. TNS-Pr702. E. Additional specimen reg. no. TNS-Pr703. F. Additional specimen reg. no. TNS-Pr703, shipboard photograph taken through side of core tube of freshly collected specimen.

Supplementary Fig. S7. *Laminarena variabilis* gen. & sp. nov., typical 30N form, additional specimen reg. no. TNS-Pr705. A, B, D. Micro-CT renders showing internal features of them test. C, E, F. Light photographs. A. View from above. B-E. Micro-CT renders and corresponding light photographs showing different views of the test. F. Detail of plate-like element showing surface ornamentation. The light photographs are somewhat distorted as a result of being taken through the curved core-tube wall, whereas the μ CT renders show the true shape of the test. Scale bars = 10 mm

Supplementary Fig. S8. *Laminarena variabilis* gen. & sp. nov., typical 30N form, additional specimen reg. no. TNS-Pr702. A, B, D, F. Micro-CT renders showing internal features of them test. C, E. Light photographs. A. View from above. B-E. Micro-CT renders and corresponding light photographs showing different side views of the test. F. Micro-CT render showing different side view. The light photographs are somewhat distorted as a result of being taken through the curved core-tube wall, whereas the μ CT renders show the true shape of the test. Scale bars = 10 mm

Supplementary Fig. S9. *Laminarena variabilis* gen. & sp. nov., typical 30N form, additional specimen reg. no. TNS-Pr703. A-C. Micro-CT renders showing internal features of the test. C, E. Light photographs. A. View from above. B-E. Micro-CT renders and corresponding light photographs showing different side views of the test. Feeding marks in C are indicated

by arrows. The lighter patches in B correspond to dome-like structures, also visible in C. F. Different side view; the tubes that are particularly prominent in this photograph are probably those of a polychaete. The light photographs are somewhat distorted as a result of being taken through the curved core-tube wall, whereas the μ CT renders show the true shape of the test. Scale bars = 10 mm.

Supplementary Fig. S10. *Laminarena variabilis* gen. & sp. nov., 32.5N form. A, C, E Seafloor photographs. B, D, F. Shipboard photographs of freshly collected specimen taken through side of core tube. A, B. Specimen reg. no. TNS-Pr697. C, D. Specimen reg. no. TNS-Pr714. E, F. Additional specimen reg. no. TNS-Pr690.

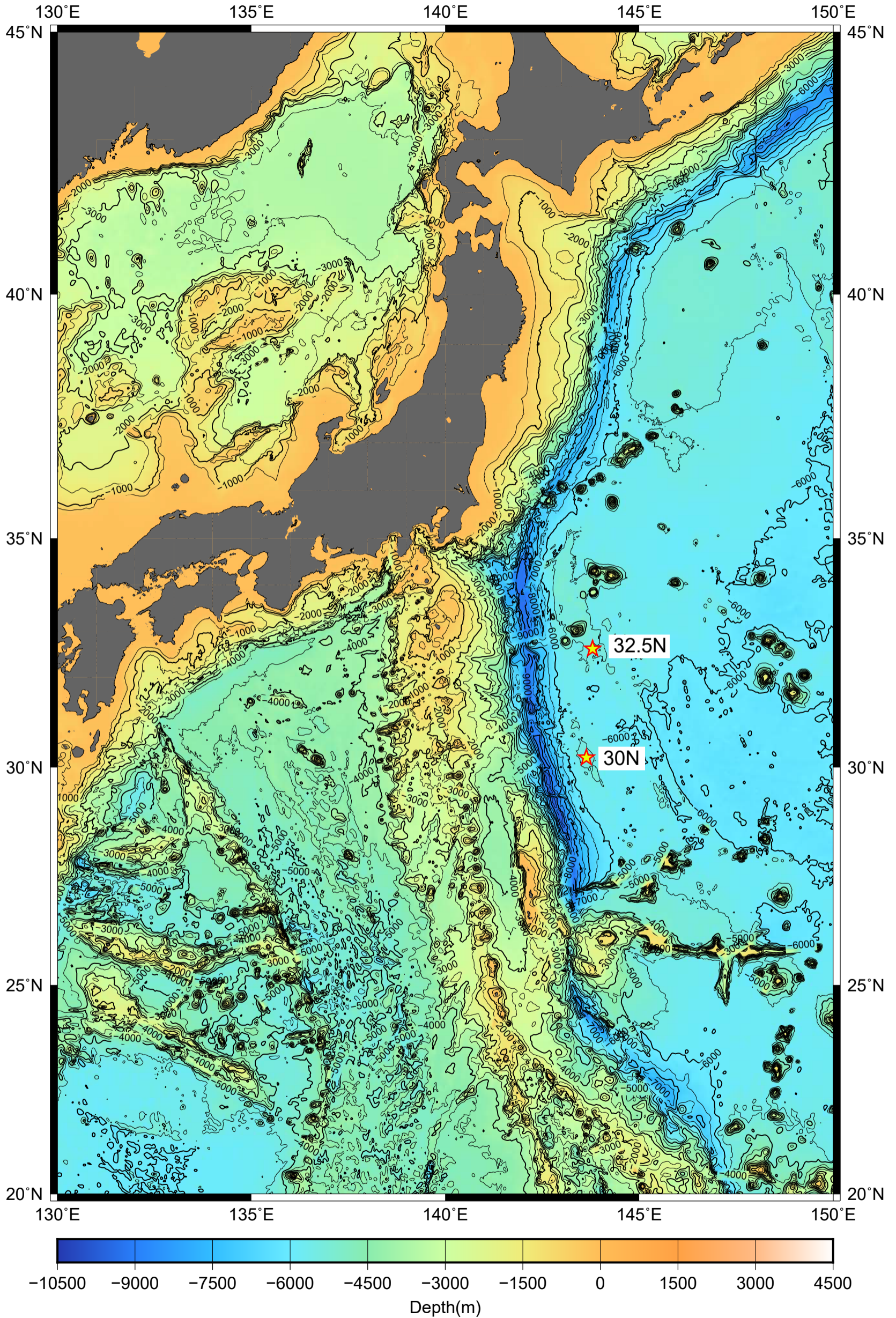
Supplementary Fig. S11. *Laminarena variabilis* gen. & sp. nov., 32.5N form, specimen reg. no. TNS-Pr714. Various views taken through the wall of the core tube. A-C. Complete specimen. D-F. Details. Some rather vague concentric zones are visible on the fan-shaped element shown in F. The large tube indicated by arrowheads is probably that of a polychaete.

Supplementary Fig. S12. *Laminarena variabilis* gen. & sp. nov., 32.5N form, specimen reg. no. TNS-Pr690; μ CT renders. A. Render showing the external surface of the test viewed from above. B-E. Renders showing internal features of the test. B, C. Views of the entire test from different sides; the prominent tube is probably that of a polychaete. D, E. Details of the most prominent fan-shaped feature; the concentric zones and radial structures are clearly shown, together with open spaces that punctuate the test and follow the same trend as the radial structures. Scale bars = 2 mm (A-C), 1 mm (D, E).

Supplementary Fig. S13. *Laminarena variabilis* sp. nov. 32.5N form, specimen reg. no. TNS-Pr714, SEM images. A. Overview of outer surface. B. Detail showing mineral grain with linear structures, possibly of volcanic origin. C. Stercomare showing stercomata. D. Detail of stercomare. Scale bars = 1 mm (A, B), 100 μ m (D), 20 μ m (C).

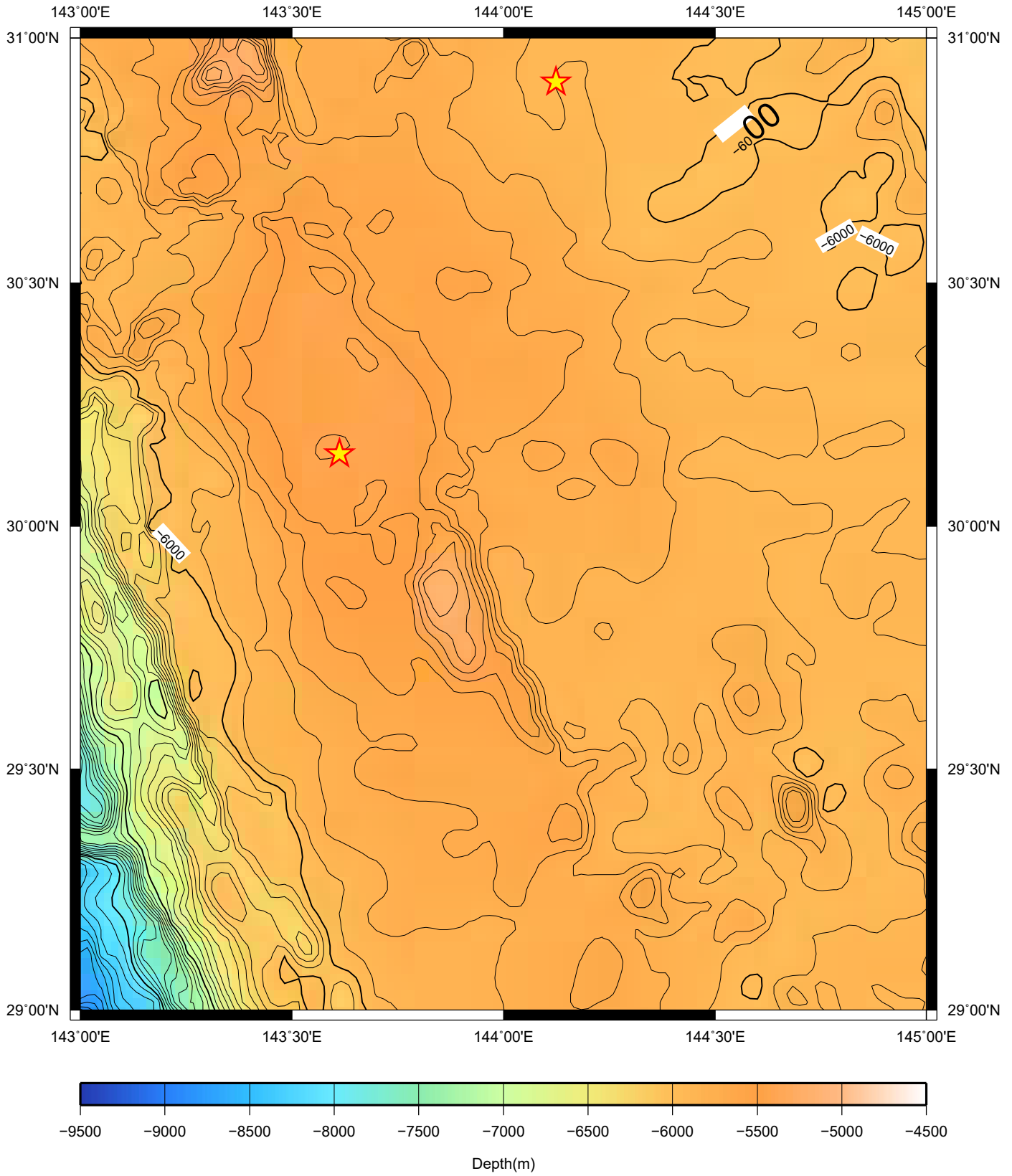
Supplementary Fig. S14. Associated organisms. A-E. *Laminarena variabilis* gen. & sp. nov., typical 30N form, specimen reg. no. TNS-Pr703. A. Large polychaete tube. B. three narrow, indeterminate tubes attached to a larger probable polychaete tube. C. Two irregularly shaped monothalamids. D. Indeterminate organism, possibly a demosponge. E. Small, dome-like monothalamid. F. *Laminarena variabilis* gen. & sp. nov., 32.5N form, specimen reg. no. TNS-Pr697#1. Very thin tubular, agglutinated foraminiferal tube, possibly *Spiculosiphon* sp.

Supplementary Fig. S1



Supplementary Fig. S2

ID[M11-193] BATHYMETRIC MAP

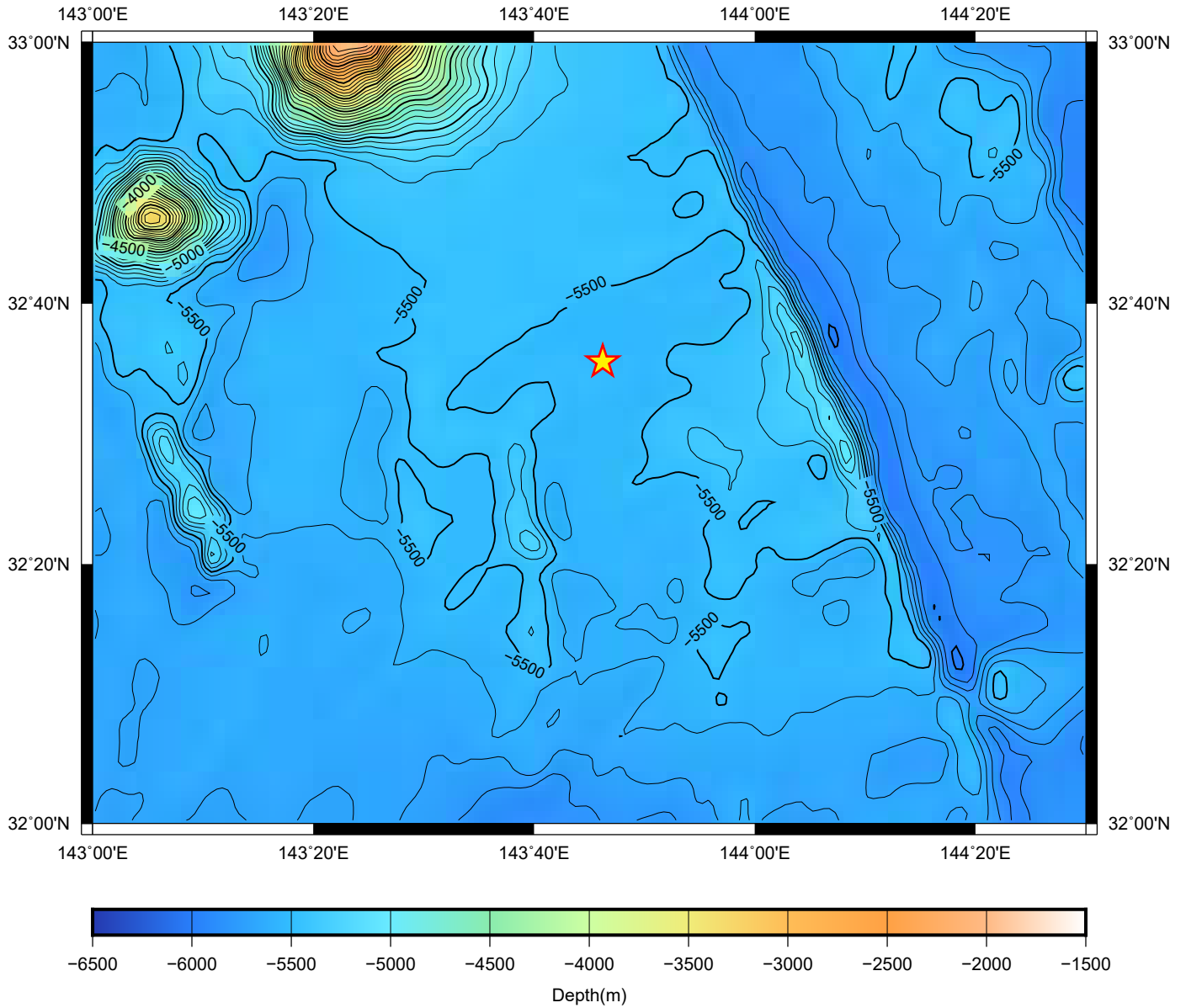


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Supplementary Fig. S3

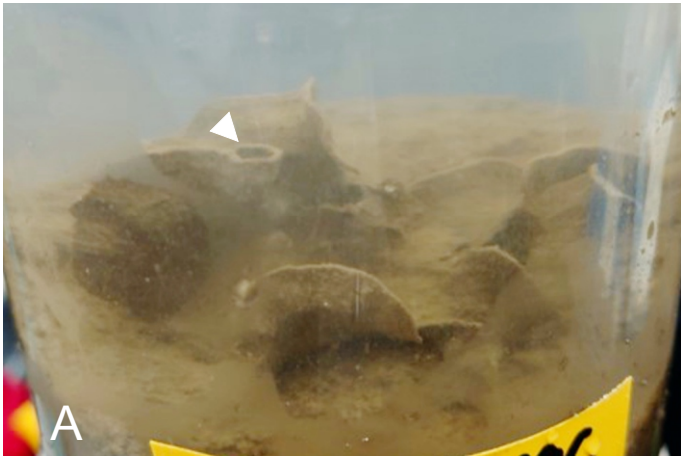
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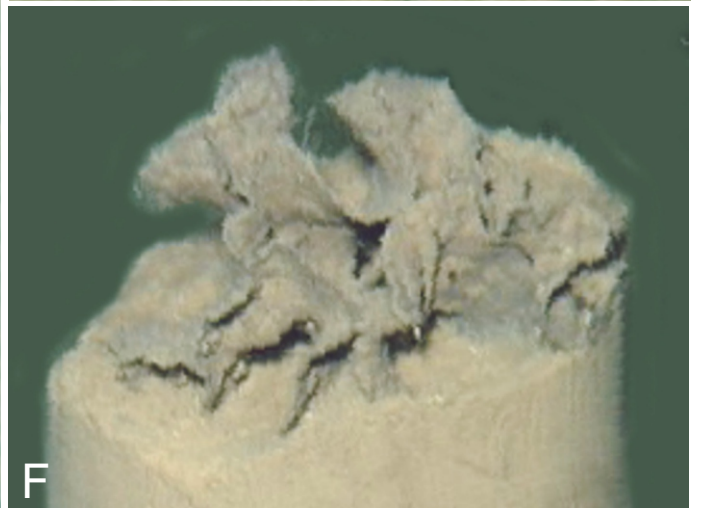
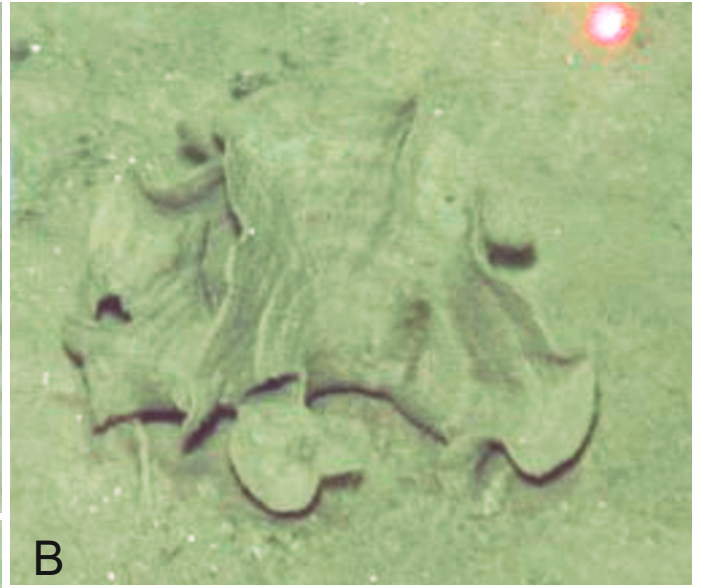
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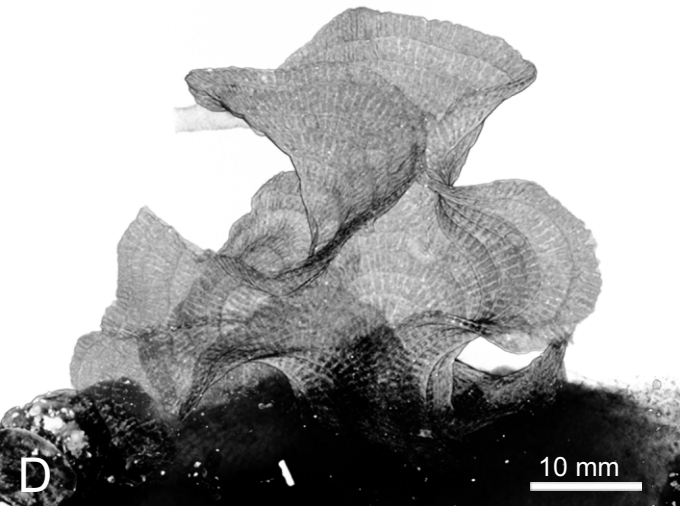
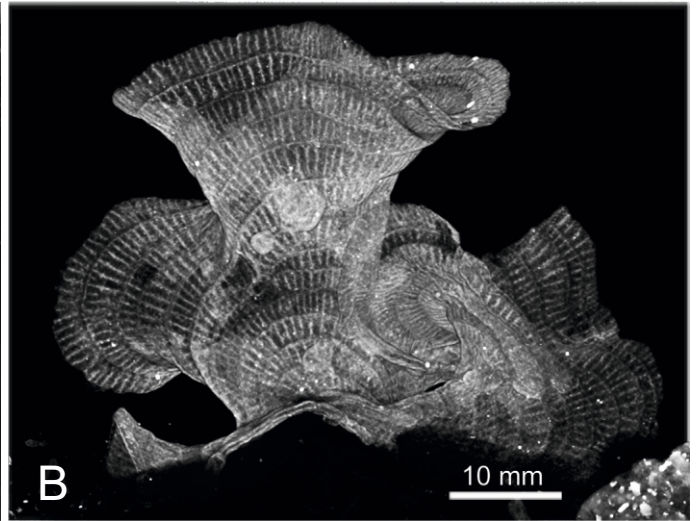
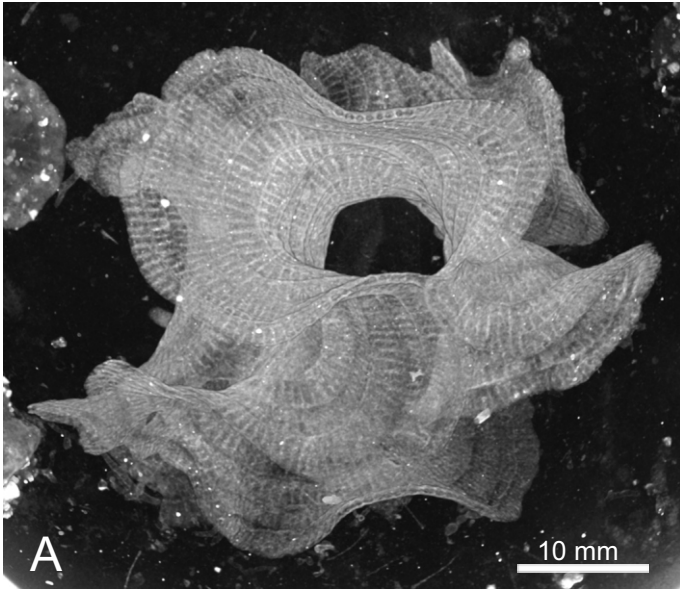
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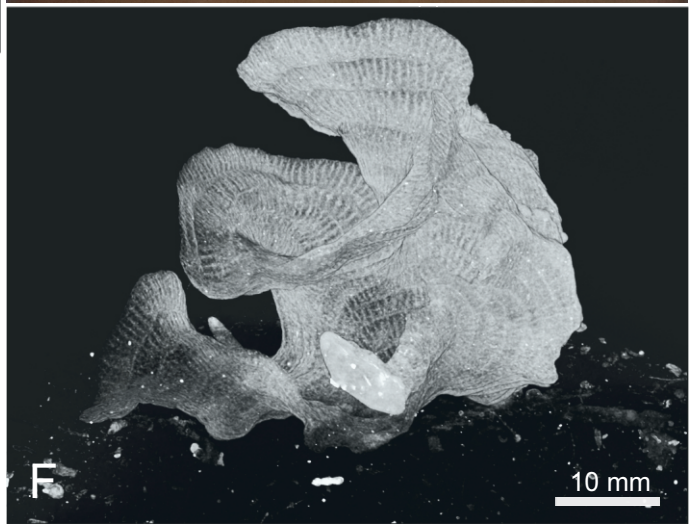
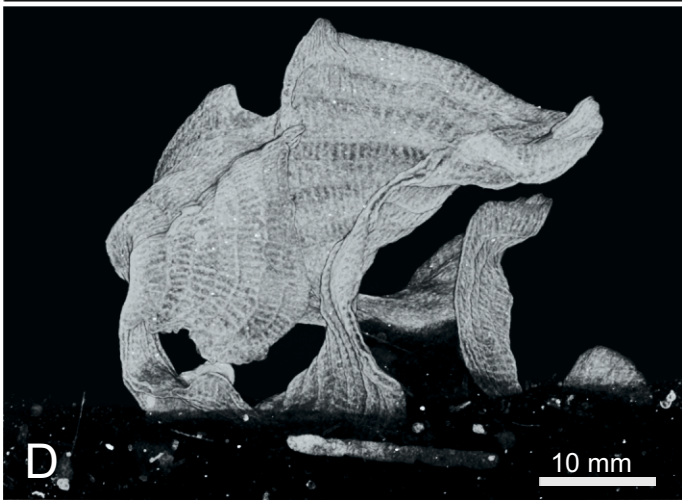
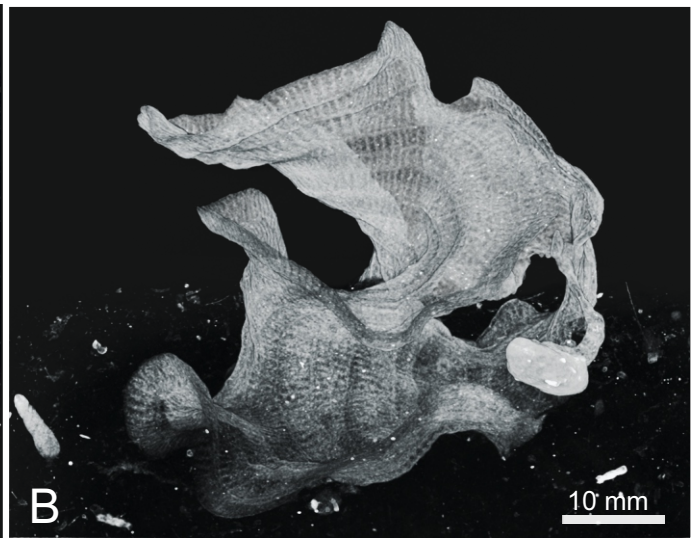
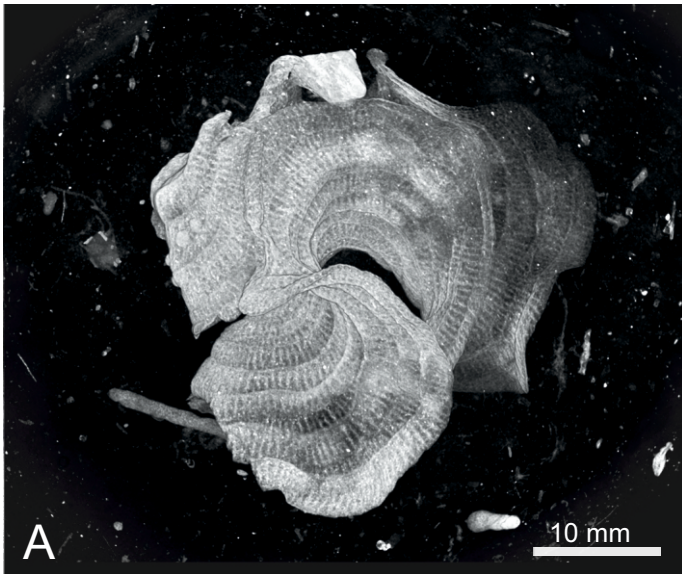
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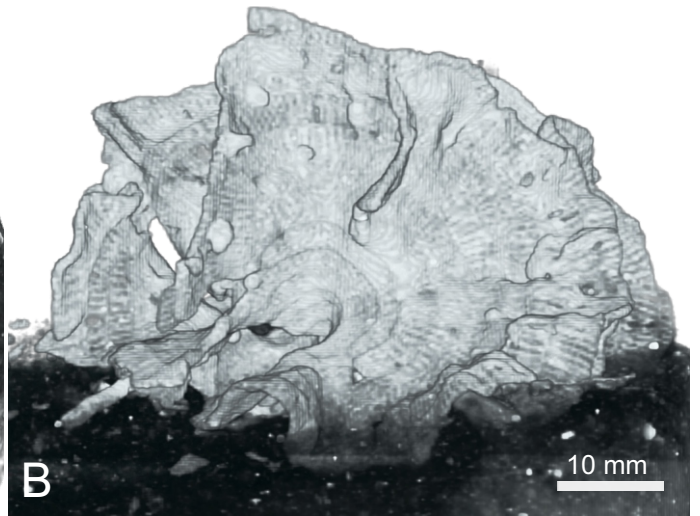
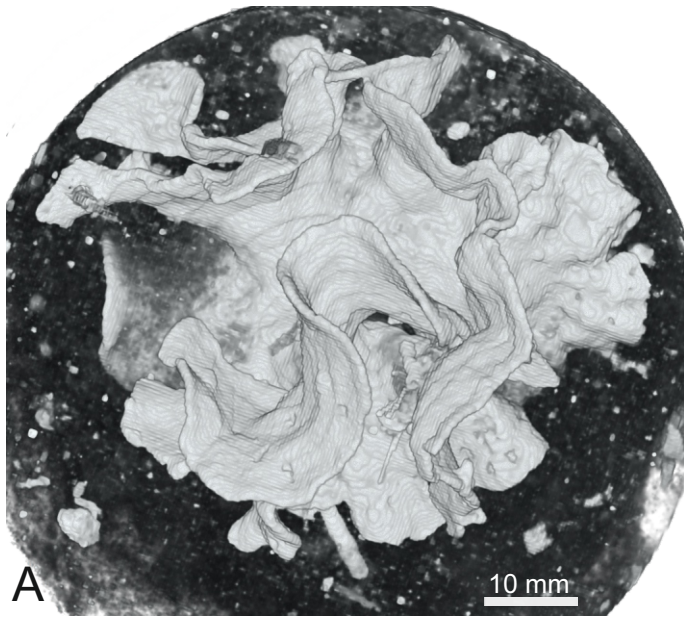
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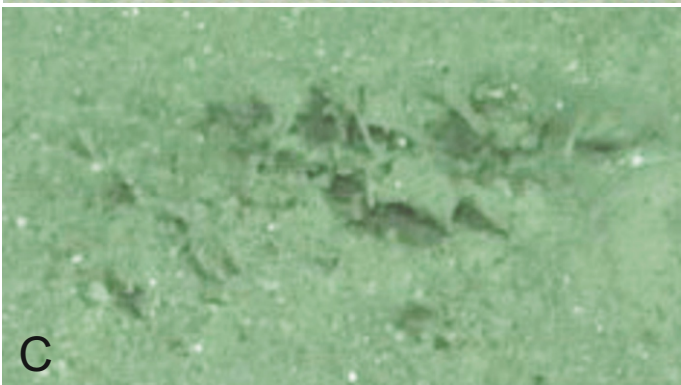
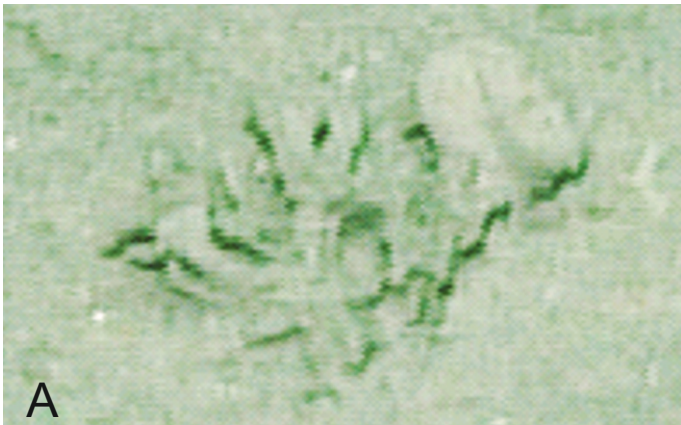
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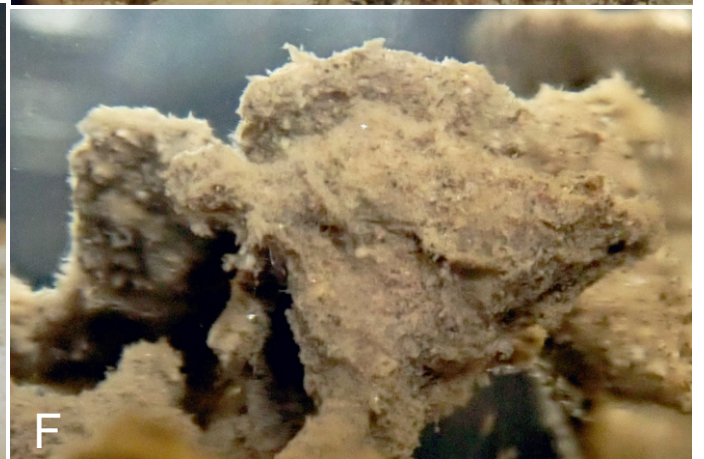
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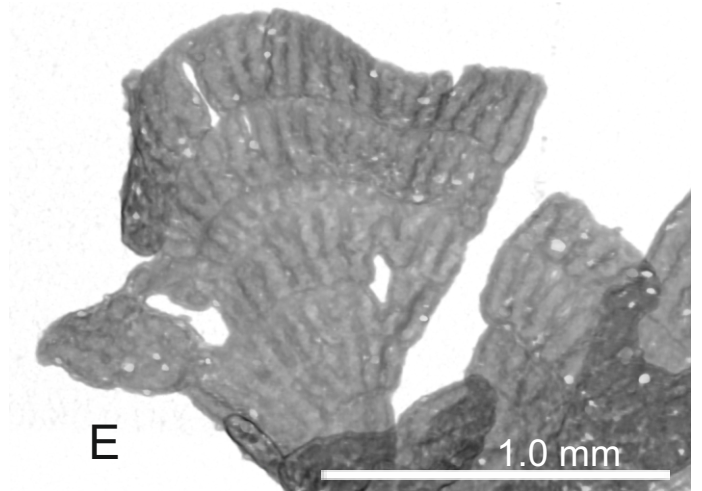
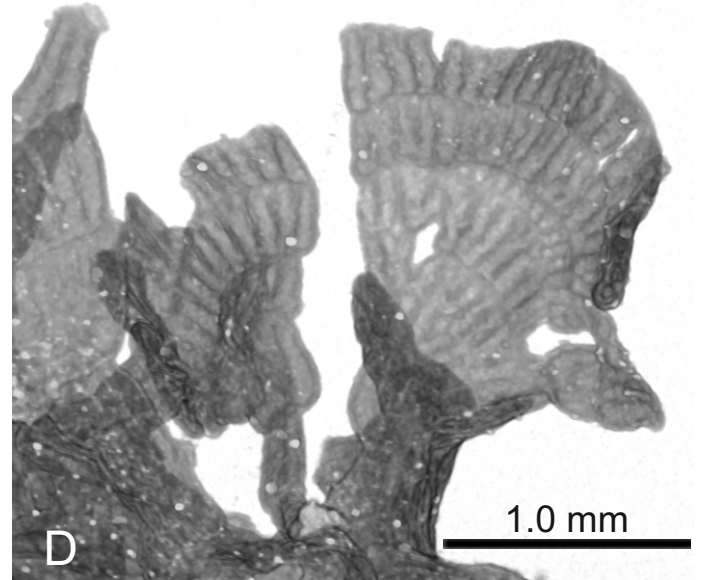
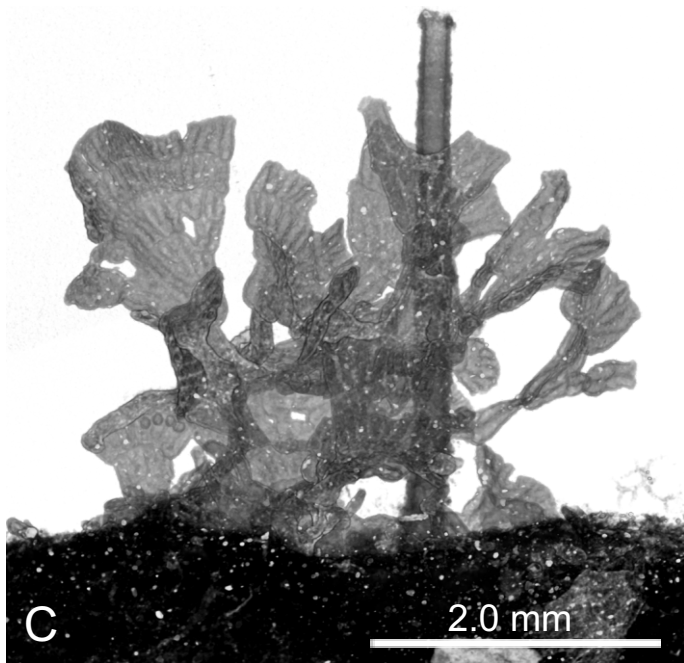
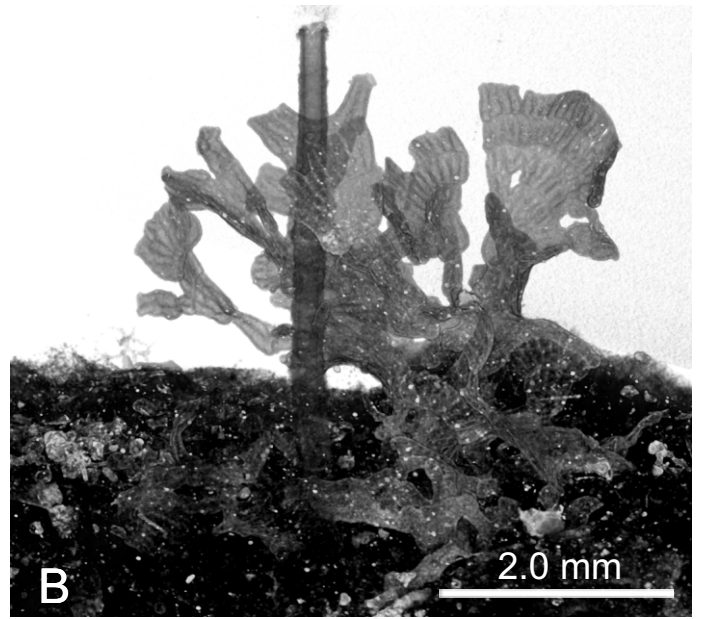
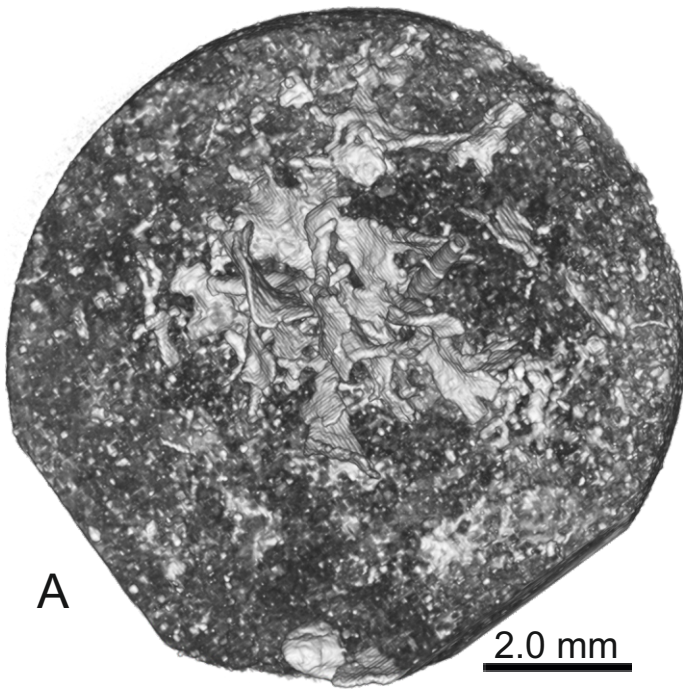
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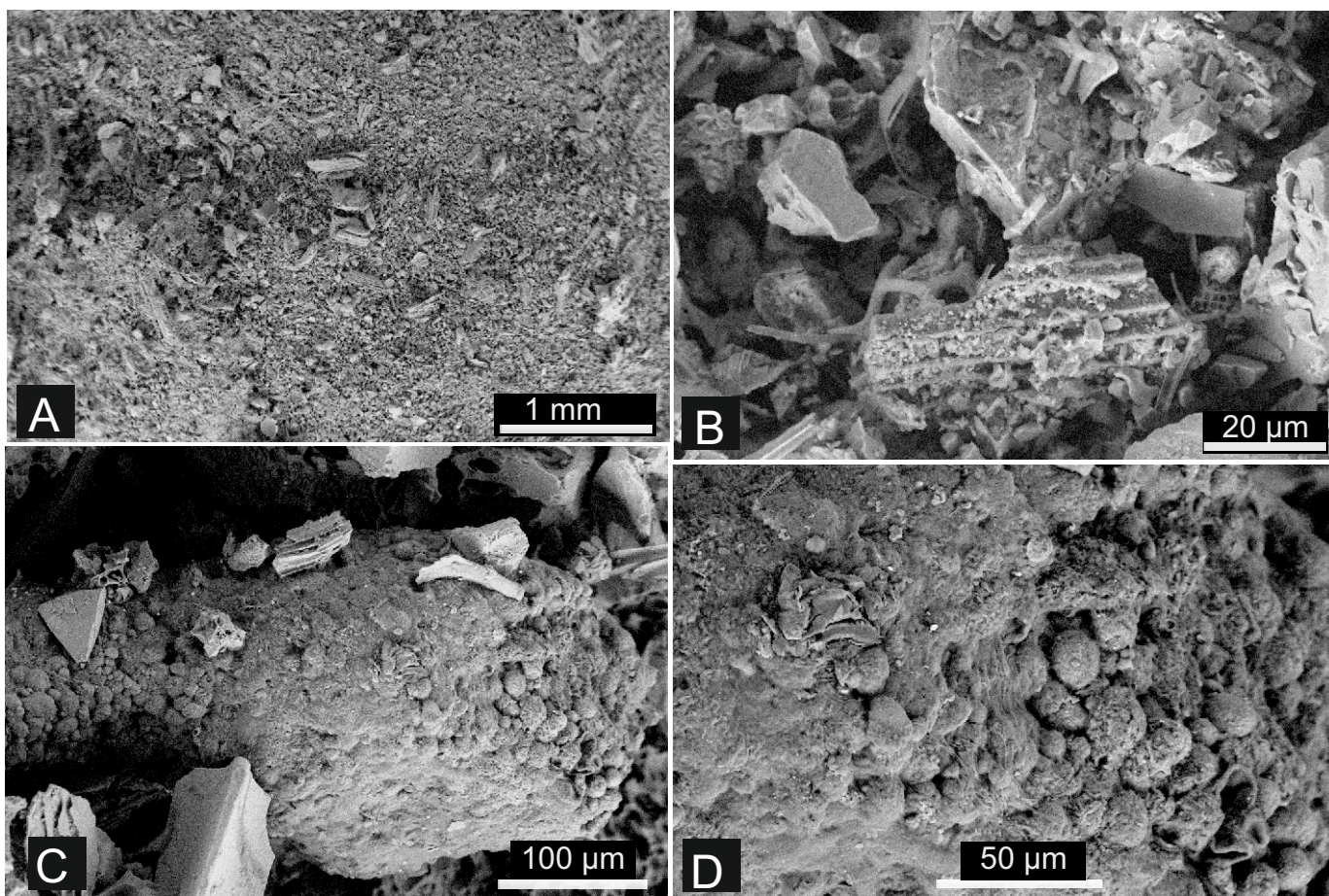
Supplementary Fig. S11



Supplementary Fig. S12



Supplementary Fig. S13



Supplementary Fig. 14

