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Supplemental Information

Filamentous Connections between Ediacaran Fronds

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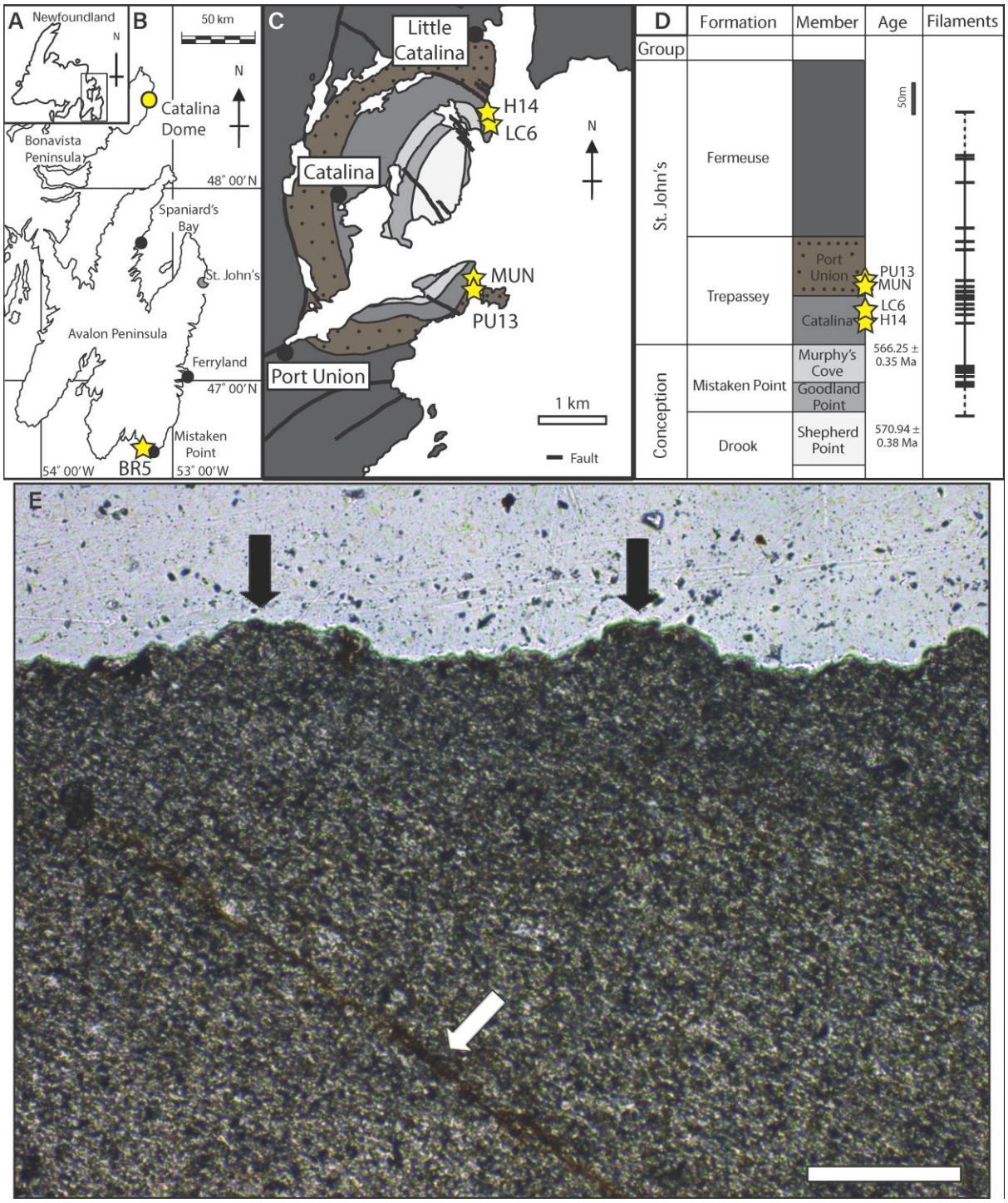

Figure S1. Map and stratigraphic column showing the location and stratigraphic position of field localities in Newfoundland, related to the Method Details section of the STAR Methods. (**A)** Newfoundland, Eastern Canada. **(B)** The Avalon and Bonavista peninsulas, showing major Ediacaran macrofossil localities, and the BR5 surface discussed in the text. **(C)** Geological map of the Catalina Dome [after S1], showing major settlements (black circles) and the location of the primary studied surfaces (yellow stars). **(D)** Stratigraphic column [following S2]. Dates [following S3] originate from stratigraphic sections on the Avalon Peninsula that

have been correlated with the Catalina Dome by regional lithostratigraphy [S1]. Plot on the right shows the stratigraphic occurrence of filamentous fossils on the Bonavista Peninsula. Locality names follow the main text, with 'H' prefixes referring to locality numbers of sites first described within [S1] **(E)** Thin section (CAMES N12-PU9-1A) perpendicular to filamentous structures collected from the MUN Surface. Filamentous impressions (black arrows) show no sub-surface expression, or association with either cleavage planes, or fractures (white arrow). Scale bar = 100 µm.

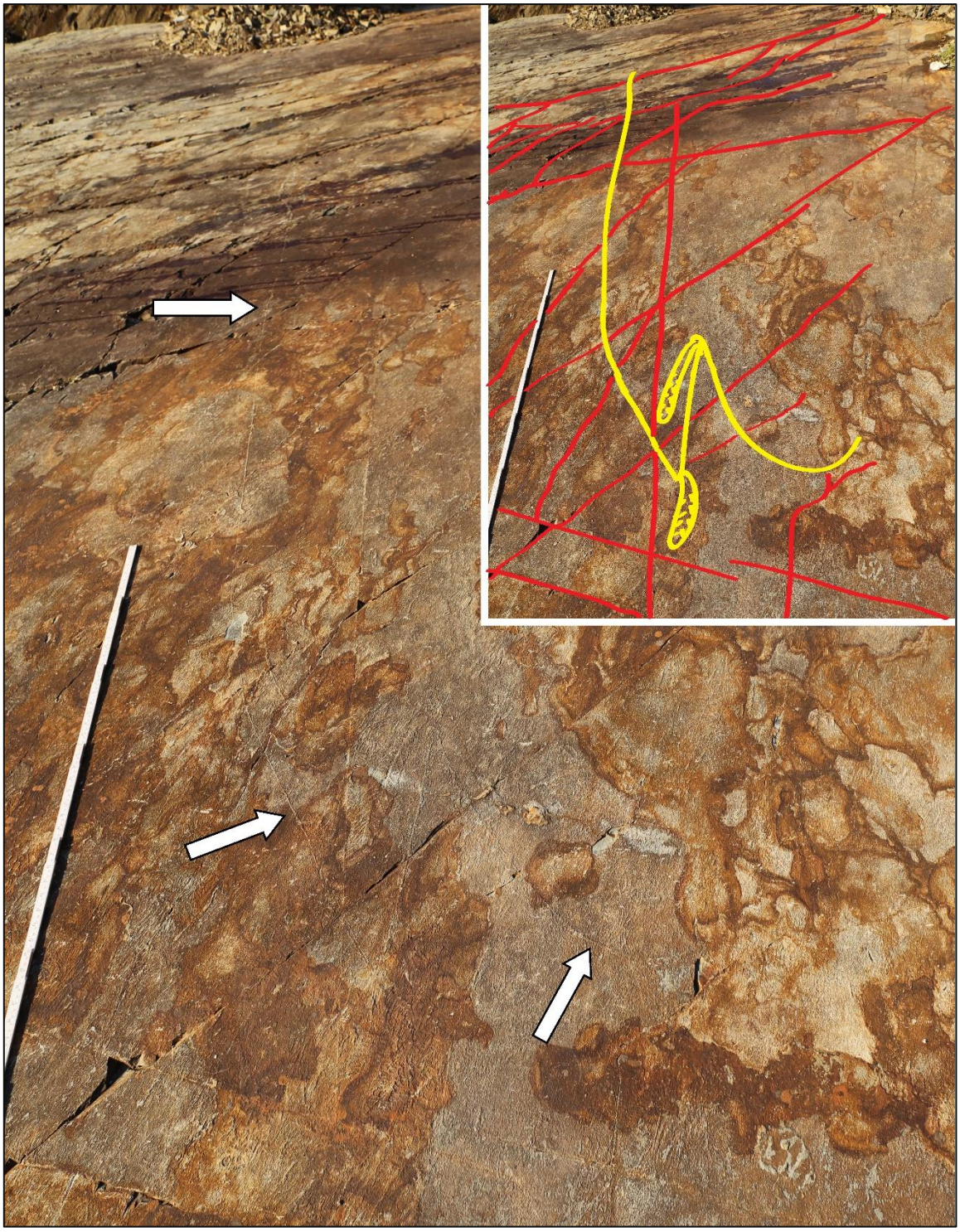

Figure S2. Field photograph of the specimens on the LC6 Surface, Bonavista Peninsula, Newfoundland, related to Figure 2A. The 'zig-zag' is in the foreground (inset shows its position in yellow, with surface fractures, which are distinguished from filaments in being negative epirelief, often jagged in appearance, straight, and aligned with other fractures on the same surface, highlighted in red). Note that the filamentous structure extends away from the 'zig-zag' towards the top left, for a distance of over four metres (arrowed).

Figure S3. Field photograph of the filament (white arrows) connecting the rangeomorph specimens in Text Figures 2D–E. LC6 Surface, Bonavista Peninsula, Newfoundland. The inset overlay shows the position of the filament (yellow), the two fronds lying along it (the specimen in Figure 2D is in the foreground), as well as an independent large rangeomorph of the same taxon seemingly attached to a separate filament on the left (black arrow). Red lines indicate the position of surface fractures, which are distinguished from filaments in being negative epirelief, often jagged in appearance, straight, and aligned with other fractures on the same surface.

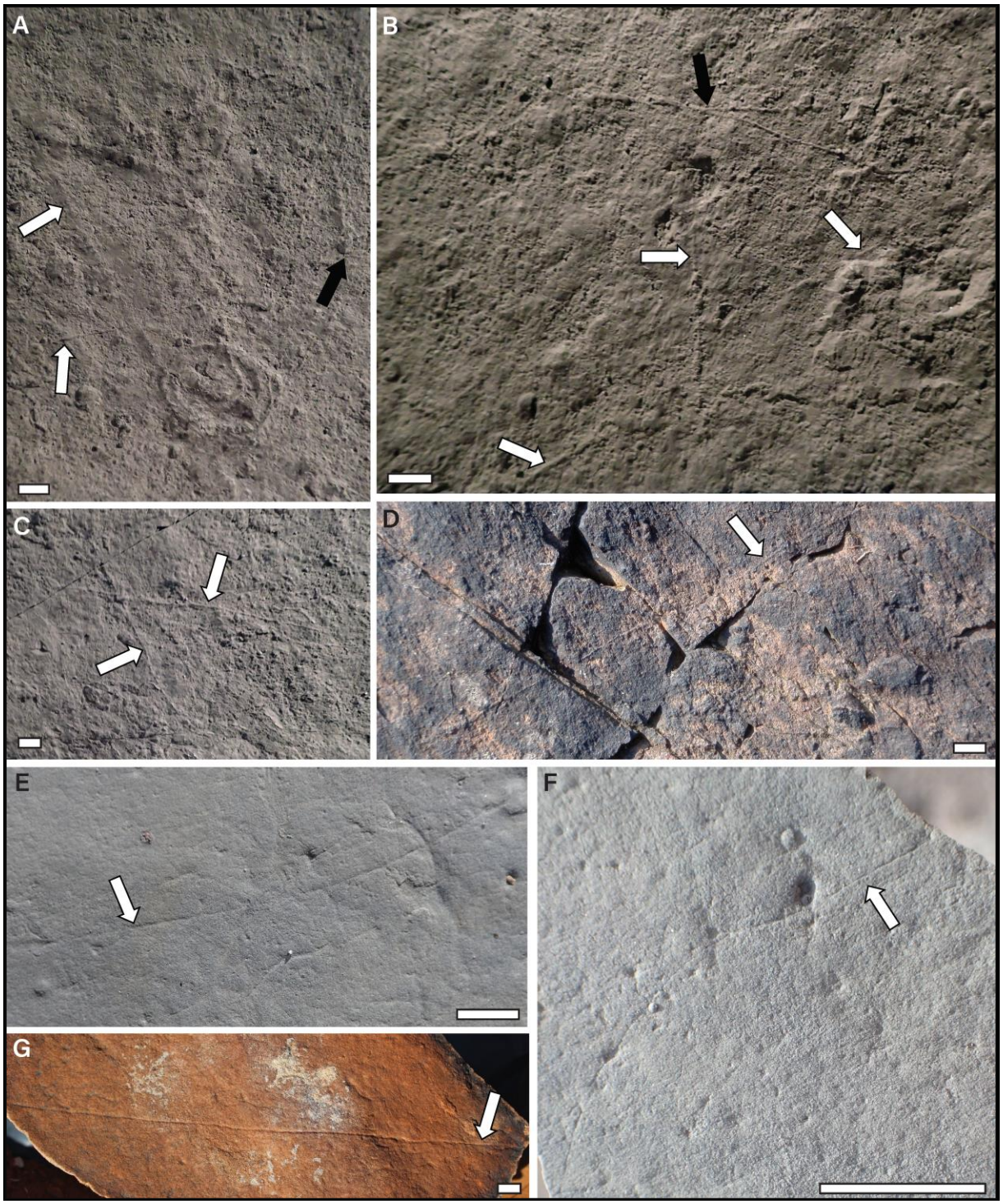

Figure S4. Filamentous macrofossils (white arrows) from Charnwood Forest, U.K.; the Lyamtsa Formation, White Sea (Russia); and the Ediacara Member, Rawnsley Quartzite, South Australia, related to the STAR Methods. (A–C) Jesmonite™ cast taken from BGS GSM 105875 ("mould 6") of the North Quarry 'Bed B' bedding plane, Leicestershire [S4], on display at Leicester New Walk Museum. **(A)** Positive epirelief filamentous structures near a *Primocandelabrum* sp. specimen, with one running directly over a small *Charniodiscus* holdfast (black arrow). **(B)** Superimposed filamentous structures (black arrow). **(C)** Additional

filaments from the ‘Bed B’ bedding plane at North Quarry. **(D)** Field photograph of a filamentous structure at Memorial Crags, Leicestershire. **(E–F)** Negative hyporelief filamentous impressions from the Lyamtsa Formation, Lyamtsa, White Sea coast. Specimen in (E) is CAMES WS17-LY2-1. **(G)** Negative hyporelief filament-like impression, Ediacara Member, Nilpena National Heritage Site, South Australia. Specimens in F and G were found as loose float, and remain in the field. Scale bars = 10 mm.

SUPPLEMENTAL REFERENCES

S1. Hofmann, H.J., O'Brien, S.J., and King, A.F. (2008). Ediacaran biota on Bonavista Peninsula, Newfoundland, Canada. J. Paleontology *82*, 1–36.

S2. O'Brien, S.J., and King, A.F. (2005). Late Neoproterozoic (Ediacaran) stratigraphy of Avalon Zone sedimentary rocks, Bonavista Peninsula, Newfoundland. Current Research, Newfoundland and Labrador Department of Natural Resources Geological Survey *5*, 101–113.

S3. Pu, J. P., Bowring, S.A., Ramezani, J., Myrow, P., Raub, T.D., Landing, E., Mills, A., Hodgin, E., and Macdonald, F. A. (2016). Dodging snowballs: Geochronology of the Gaskiers glaciation and the first appearance of the Ediacaran biota. Geology *44*, 955–958.

S4. Wilby, P.R., Carney, J.N., and Howe, M.P.A. (2011). A rich Ediacaran assemblage from eastern Avalonia: Evidence of early widespread diversity in the deep ocean. Geology *39*, 655–658.