Figures & Table:

Fig. 1A. Geological location of the Cambrian fossiliferous outcrops from the Rozel Cap, in Normandy (NW France). B. Detailed geological map of the Rozel Cape area, with the location of the earliest Cambrian formation of the Rozel Cape and the younger Cambrian formation of Carteret and Saint-Jean-de-la-Rivière (Modified after Graindor et *al*., 1976).

Fig. 2A-C. General views of the outcrops on the foreshore (Rozel Cape, Manche).

Fig. 3. Satellite view of the Rozel Cape outcrops and the locations of the measured Logs (Log Roz – 01; Log Roz – 02; Log Roz – 03; Log Roz – 04).

Fig. 4. Simplified stratigraphic sections of the Le Rozel Formation (Log Roz – 01; Log Roz – 02; Log Roz – 03; Log Roz – 04; see Fig. 3. for location) with the stratigraphic position of the three samples (Roz-01, Roz 21-2 and Roz 21-4) for the zircon dates. Location of the fossiliferous bedding planes, and BPBI indices (Bedding-Plan Bioturbation Indices). Indices: 2: >10%; 3: 10-40%; 4: 40-60%; 5:60-100% (sensu Miller & and Smail, 1997).

Fig. 5. Sedimentary structures and lithology observed from upper bedding planes in the Le Rozel Formation. A, B. Wrinkles structure interpreted as MISS showing the two different microbial mats textures: mosaic-like regular reticulate ridges texture (A) and the sub-linear and aligned patterns (B). C. Upper bedding plane with diagenetic nodules. D. Phosphate nodules in the upper siliciclastic surface (white arrows). E, F. small 2D ripples . G. Large bioturbated bedding plane. White scale bars: 5 cm; Black scale bars: 20 cm.

Fig. 6. A) outcrop of the deposits with flaser bedding where the two detailed stratigraphic logs (B - Log 1 and C- Log 2) were measured. C and D - strata surfaces with horizontally spread traces.

Fig. 7. Log 1 and 2 measured in flaser facies containing abundant MISS and horizontal trace fossils.

Fig. 8. Facies flaser bedding of the Le Rozel Formation deposits. A- Flaser facies with 2D ripple of unidirectional current, in which a decimetric cyclic pattern of the flaser facies is observed, produced by increasing/decreasing variations in lamina thickness. B- Facies flaser with 2D Ripples of unidirectional currents of small wavelength and very small amplitude. C, D, E, F- Flaser bedding at mesoscopic (C and D) and microscopic (E and F) scales. It can be seen that the sediment that makes up the different arenaceous and clayey-silty laminas is very well sorted.

Fig. 9A. Vertical cross sections (polished slab; IGR-PAL-23267) of sandstone sample showing bioturbated layers with well-defined, small, and horizontal burrows (white arrows). Scale bar: 1 cm. B. Thin section (IGR-PAL-23267.1) of a vertical cross-section showing the sedimentological relationship between the bioturbated layer (2) which includes a circular shaped burrow (yellow arrow) surrounded above and below by grained coarser layers (1, 3) rich in silicate minerals. Sub-vertical shrinkage filled by quartz across layers 2 and 3 (white arrow). Scale bar: 1 mm. C. Another thin section (IGR-PAL-23267.2) is focused on the very fine-grained and bioturbated layer enriched with clay minerals and organic matter, displaying circular burrows filled with coarse minerals (white arrows). Scale bar: 1 mm.

Fig. 10A-C. Wetherill concordia diagrams of the analyzed samples ROZ-01, ROZ 21-2, and ROZ 21-4. Numbers between brackets refer to the number of 90-110% concordant analyses versus the total number of analyses. Insets show the maximum age of deposition calculated for each sample.

Fig. 11. Field photographs of the trace fossils from the Le Rozel Formation outcrops. A, B. Simple horizontal trails with two distinct lateral levees of *Archaeonassa fossulata*. C. Simple horizontal trail of *Archaeonassa* isp. displaying one self-over-crossing pattern forming a loop. D. Horizontal trail with disconnected segments (7; numbered in white color) of *Archaeonassa* cf. *fossulata* forming a uniserial chain with lateral levees (D: IGR-PAL-23263). E. Close-up picture of *Archaeonassa* cf. *fossulata* (IGR-PAL-23263) displaying the discontinued segments with

'coffee bean shapes'. F. Another *Archaeonassa* cf. *fossulata* displaying straight and disconnected segments. G. Comparison of *Archaeonassa* cf. *fossulata* and of *Archaeonassa fossulata. Preservation type I* displays typical *Archaeonassa fossulata,* a horizontal and continuous trail flanked with two symmetrical lateral levees. *Preservation type II*, however, displays *Archaeonassa* cf. *fossulata* as a horizontal and segmented trail with slightly bilobed lobes. Modified from Uchman and Martyshyn (2020). Scale bars A-F: 20 mm

Fig. 12. Field photographs of the trace fossils from the Le Rozel Formation outcrops. A. Bedding plane with numerous plug-shape burrows *Bergaueria* isp. B. Cross section displaying one vertical specimen of *Bergaueria* isp. Black arrow: the top of the burrow. White arrow; the base of the burrow C. Bioturbated bedding plane with a group of simple grazing *Helminthoidichnites tenuis* trace fossils (e.g., white arrows). D. Single and curved *Helminthopsis tenuis*. Scale bars: 20 mm.

Fig. 13. Field photographs of upper bedding plane surface with well-preserved complex horizontal trace fossils of *Nereites* from the Le Rozel Formation. A. Winding *Nereites* trace fossils with median furrow and thin and smooth rows of lobes (white arrow). B. Sinuous *Nereites* trace fossils with median furrow flanked by lateral levees and smooth rows of lobes. C. Sinuous *Nereites* trace fossils with median furrow flanked smooth rows of lobes. D. Large siltstone upper bedding plane with meandering to winding *Nereites* trace fossils. E, F. Focus from (D) on large meandering to winding *Nereites* trace fossils. Scale bars: 20 mm.

Fig. 14. Field photographs of upper bedding plane surfaces with well-preserved large and bilobate *Psammichnites gigas circularis* trace fossils from the Le Rozel Formation A. Large and bilobate *P. gigas circularis* trace fossil with characteristic median furrow (with arrow) B. *P. gigas circularis* lassoing type with distinctive loops. C. Large and bilobate *P. gigas circularis* trace fossil with collapse burrows. D. Large sandstone slate with *P. gigas circularis* lassoing type. Scale bars: white 20 mm; grey 100 mm.

Fig. 15. Field photographs of upper bedding plane surfaces with well-preserved horizontal to vertical *Treptichnus coronatum* burrows from the Le Rozel Formation. A. Elongated to winding

Treptichnus coronatum. Slate collected under the number IGR-PAL-23265. B. Another specimen of *Treptichnus coronatum* preserved in a half-circle. C. Another specimen of elongated to winding *Treptichnus coronatum*.

Fig. 16. Field photographs of upper bedding plane surfaces with well-preserved horizontal to vertical *Treptichnus sensu lato* burrows from the Le Rozel Formation. A. Elongated to winding *Treptichnus pedum* with characteristic projections (white arrows). B. Circular *Treptichnus pedum* displaying string pits burrow with characteristic projections (white arrows). C. Another specimen of *Treptichnus pedum* displays an infill burrow with disconnected segments projected outwards (white arrows). D. Example of *Treptichnus* isp. like a string of very fine and connected beads. Slate collected under the number IGR-PAL-23266. E. Another example of *Treptichnus* isp. like a string of beads (white arrows) associated with simple horizontal grazing trails (yellow arrows). Slate collected under the number IGR-PAL-23264 F. Horizontal segmented burrow of *Treptichnus* indet. Scale bars: 20 mm.

Fig. 17. Schematic diagrams of the two Armorican ichnofaunas. A. Cambrian from Normandy. B. Brioverian from Brittany. Abbreviations: An: *Archaeonassa* cf. *fossulata*; Ar: *Archaeonassa fossulata*; Be: *Bergaueria* isp.; Go: *Gordia*; He: *Helminthoidichnites*; Hl: *Helminthopsis*; Ne: *Nereites*; Pa: *Palaeophycus*; Ps: *Psammichnites*; Sp: *Spirodesmos*; Tc: *Treptichnus coronatum*; ; Ti: ?Treptichnus isp Tr: *Treptichnus pedum*. Orange arrows: single or paired pits/knobs common in the Brioverian's slates.

Table 1. Bioturbation index from Miller and Smail (1997)

Supplementary material captions

Table S1: Operating conditions for the LA-ICP-MS equipment

Table S2: LA–ICP–MS U–Pb data for zircon extracted from the Le Rozel samples. f206c % = (207Pb/206Pbm - 207Pb/206Pb*)/(207Pb/206PbC -207Pb/206Pb*)x100. 207Pb/206Pbm is the measured ratio; 207Pb/206Pb* is the radiogenic ratio calculated for the age of the grain;

207Pb/206PbC is the common Pb ratio calculated at the age of the grain following the Pb evolution model of Stacey and Kramers (1975).