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The utility of height for the Ediacaran organisms of Mistaken Point

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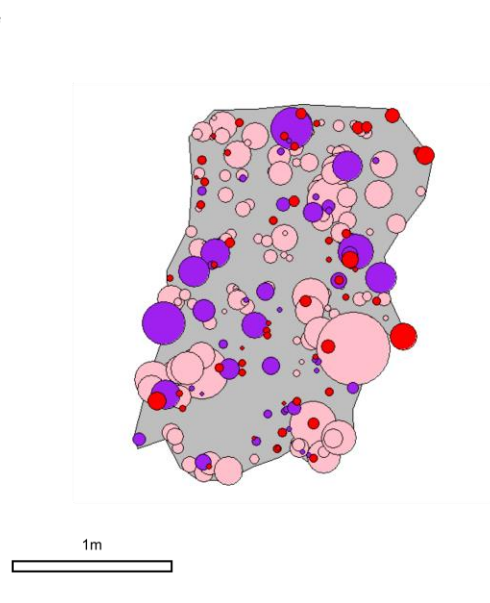
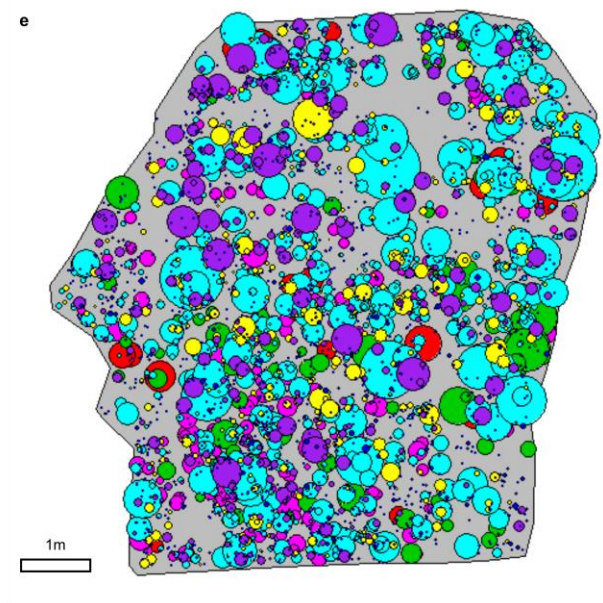
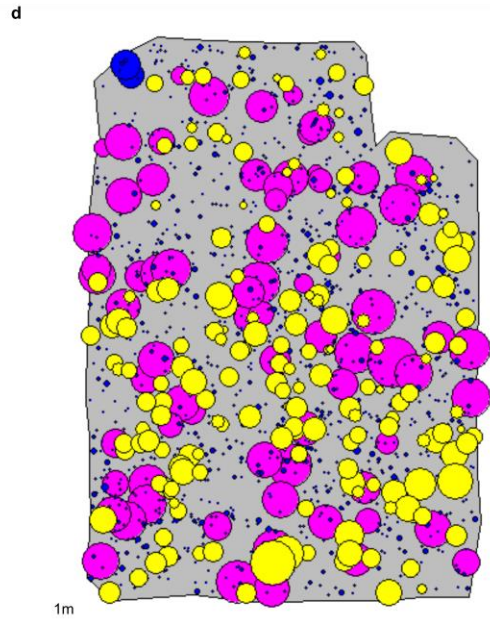
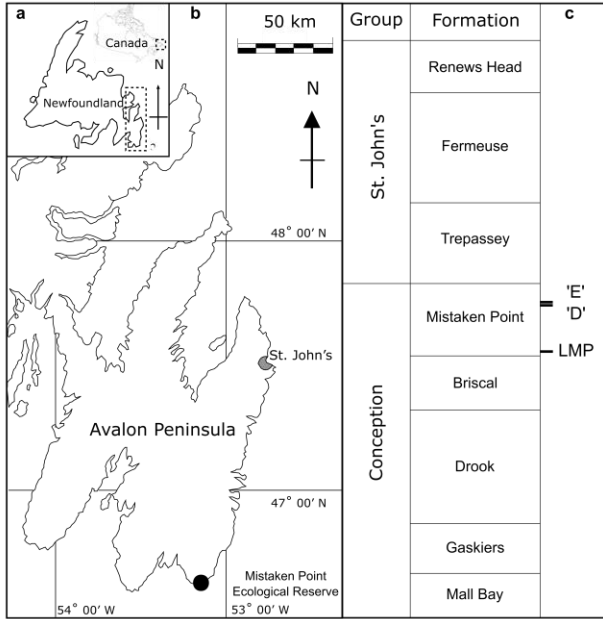
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Supplementary Figure 1.

Map and simplified stratigraphic column showing the position of studied bedding planes with bedding plane maps. a, Newfoundland, eastern Canada. Dashed area indicates

region of interest in b. **b,** The Avalon Peninsula, eastern Newfoundland. Locations of the bedding planes are indicated. **c,** Stratigraphic column (not to scale) of the Avalon Peninsulas.

The 'E' surface at Mistaken Point has been dated to $566 \pm 0.3\text{Ma}$ (ref. 1). **d-e,** Maps of the 'D',

'E' and LMP surfaces showing specimen position and height (circle diameter). **d,** 'D' surface,

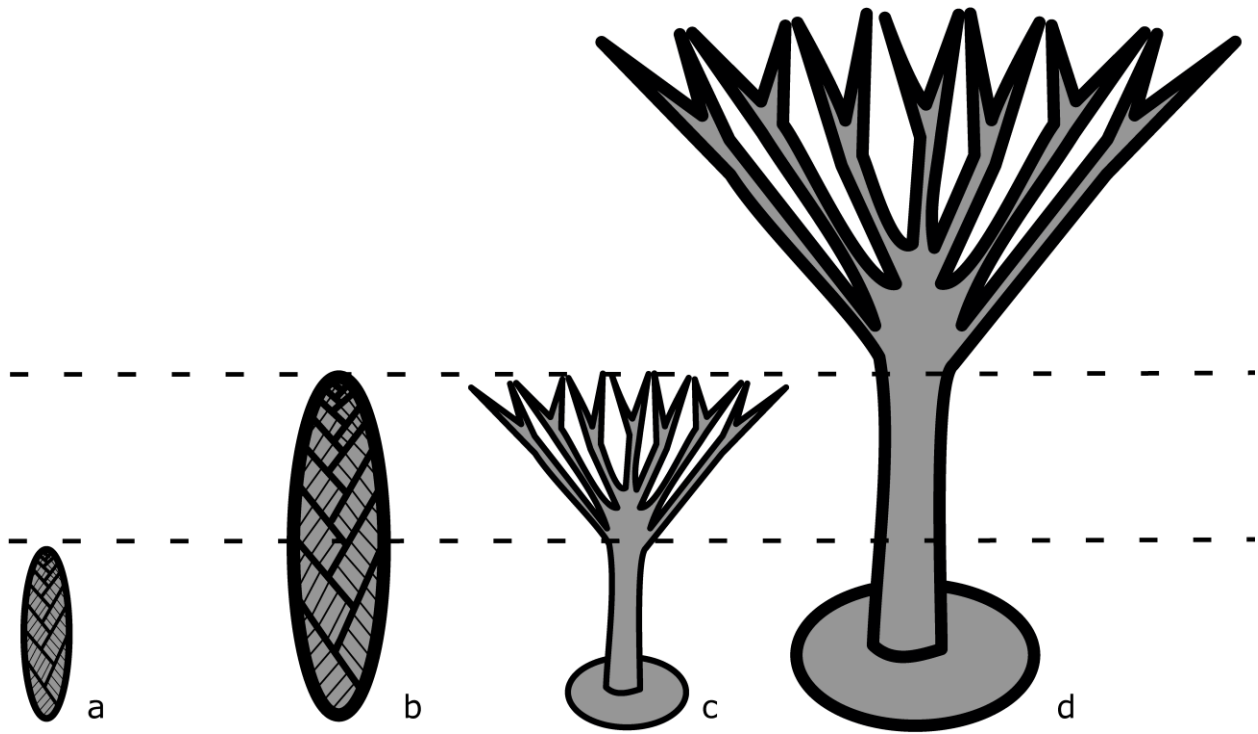
showing *Fractofusus* (blue), *Pectinifrons* (yellow) and *Bradgatia* (Pink). **e,** 'E' surface with

Charniodiscus (red), Holdfast discs with stems (orange), Charniid I (green), *Thectardis* (purple),

Fractofusus (blue), *Bradgatia* (pink) and Feather Dusters (yellow) and **f,** Lower Mistaken Point

showing Charniid A (I), Charniids II (purple) and Ostrich Feathers (red). Data from [12]. Scale

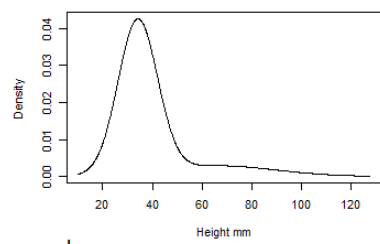
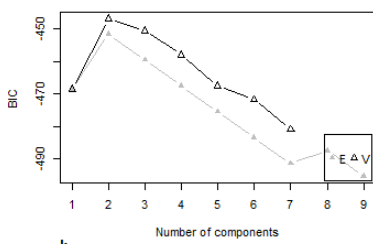
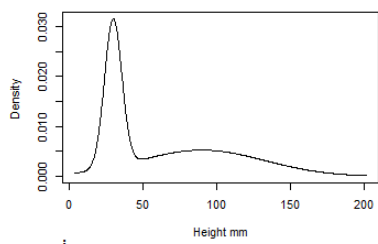
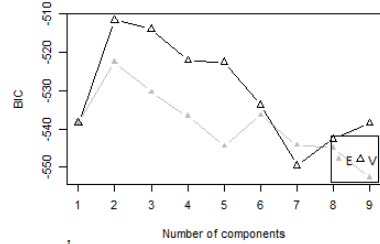
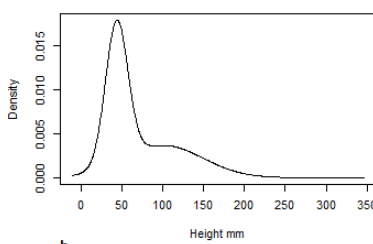
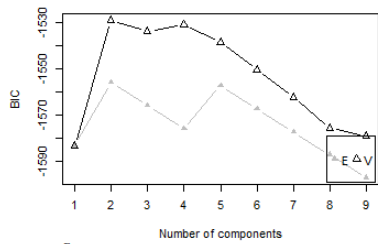
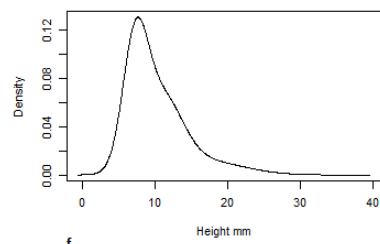
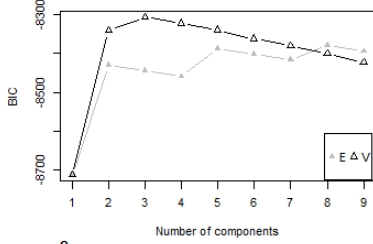
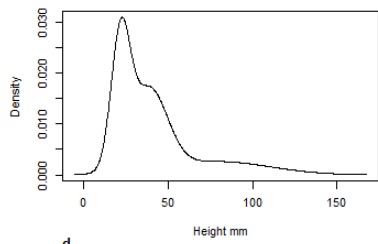
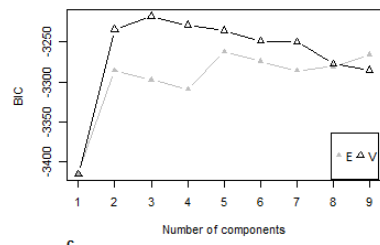
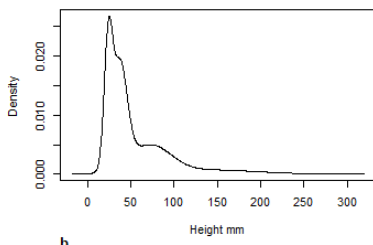
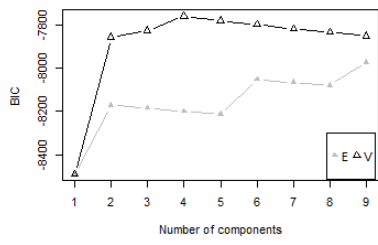
bar 1m.



Supplementary Figure 2. Diagram illustrating DVS and uptake-zone quantification.

Uptake-zone was defined as the part of the organism which exhibited multiple scales of branching. In specimens i and ii, the uptake-zone consists of the entire height because they lack a naked stem. For specimens iii and iv, the uptake-zone is only the top 50% of the specimen, as the naked stem comprises the other 50%. To calculate *DVS*, the specimens within each taxon population were tabulated into 1cm height bins firstly using their height, and secondly their uptake-zone height ranges. For the above community (consisting of specimens i – iv), for the Charniid specimens (specimens i and ii), specimen i occupies a distinct stratum to the Feather Dusters (specimens iii and iv), while specimen ii height overlaps specimen iii in, and thus does not occupy a distinct stratum from Feather Dusters: consequently, the Charniids have a $DVS^{height} = 50\%$. For the Feather Dusters (specimens iii and iv), specimen iii overlaps with ii, so does not occupy a distinct stratum, but specimen iv is not overlapped by any Charniid specimens: so, Feather Duster $DVS^{height} = 50\%$. Community DVS^{height} is the mean of the values for all taxa in the

community: $DVS^{height}_{Community} = 50\%$. The uptake-zone $DVS^{uptake}_{Community} = 50\%$ as well, because the uptake-zones of specimens i and iv occupy distinct strata, but ii and iii do not.



Supplementary Figure 3.

Size distribution analysis of taxa with segregated bivariate PCFs. Size distribution analysis of taxa with segregated bivariate PCFs. **a**, ‘E’ surface *Charniodiscus* height-frequency distributions, and **b**, the results of Bayesian Information Criterion^{54,55} (BIC). Triangles and squares correspond to models assuming equal and unequal variance respectively. High BIC values correspond to a good model fit, so the best-fit model is a three component equal variance model. **c**, ‘E’ surface Feather Dusters height-frequency distributions and **d**, BIC. **e**, ‘E’ surface *Fractofusus* height-frequency distributions and **f**, BIC. **g**, LMP Charniid I height-frequency distributions, and **h**, BIC. **i** LMP Charniid II height-frequency distributions, and (J), BIC, (K), LMP Ostrich Feathers height-frequency distributions, and **j**, BIC.

Surface Taxon	Height DVS			Uptake-zone DVS		
	D	E	LMP	D	E	LMP
<i>Bradgatia</i>	0.6184	0.0000		0.6184	0.4204	
Charniid		0.0000	0.5232		0.1071	0.6821
Charniid II			0.0784			0.2549
<i>Charniodiscus</i>		0.0776			0.5806	
Feather Dusters		0.0000			0.0359	
<i>Fractofusus</i>	0.9957	0.7963		0.9957	0.8831	
Ostrich Feather			0.0000			0.2778
<i>Pectinifrons</i>	0.8057			0.8057		
<i>Thectardis</i>		0.0000			0.1200	

Supplementary Table 1. Table of DVS values for Mistaken Point communities. Table of height and uptake-zone DVS for each taxon population within each of D, E and LMP communities. *DVS* = 0% corresponds to no specimens occupying a unique part of the water column, i.e. the height distribution of that population is totally overlapped by other taxa populations. *DVS* =100% corresponds to no overlap between any specimens, so each taxon occupies a distinct strata.

Surface	D	E	Lower Mistaken Point
Rangeomorph	96.96%	55.15%	71.82%
Stemmed	0.54%	30.18%	42.27%
Other	2.5%	14.67%	14.09%

Supplementary Table 2.

Community compositions. Percentage of taxa from each surface that are rangeomorphs and have stemmed. The “Other category” refers to taxa which cannot be placed as either Rangeomorphs or stemmed taxa due to lack of taxonomic certainty.

Surface	Taxon 1	Taxon 2	PCF _{min}	Size class <i>p</i> value	
				Small	Large
E	<i>Fractofusus</i>	Feather Dusters	0.8852	0.25	0.01
E	Feather Dusters	<i>Charniodiscus</i>	0.8972	0.14	0.01
LMP	Charniid I	Ostrich Feather	0.4932	0.02	0.01
LMP	Charniid II	Ostrich Feather	0.5346	0.92	0.01

Supplementary Table 3.

Segregation test for the different size-classes of segregated bivariate distributions. A value of $p < 0.05$ is significantly segregated, while $p > 0.05$ is not significantly segregated.

Surface	Taxon	σ (m)	Mean Height (mm)	Maximum Height (mm)	Mean mid-point of Uptake-zone (mm)	Maximum mid-point of Uptake-zone (mm)
E	<i>Charnidiscus</i>	0.07	54	291	30	58
E	Feather Duster	0.25	41	153	43	106
E	<i>Thectardis</i>	0.18	102	165	16	104
LMP	Charniid II	0.22	63	185	26	93
LMP	Ostrich Feather	0.18	39	118	14	34

Supplementary Table 4.

Taxon height and cluster sizes. The best-fit cluster size for the Thomas Cluster model of each frondose taxon exhibiting Thomas Cluster aggregation^{4,5}. The mid-point of the active zone height is given by calculating the mid-point between the stem and the top of the frond for each specimen.

Surface	Top of Stem Height				Uptake-zone height				Top of frond Height			
	Mean		Max		Mean		Max		Mean		Max	
	<i>p</i>	R ²	<i>p</i>	R ²	<i>p</i>	R ²	<i>p</i>	R ²	<i>p</i>	R ²	<i>p</i>	R ²
E	<i>0.47</i>	0.54	<i>0.48</i>	0.54	<i>0.78</i>	0.12	<i>0.28</i>	0.82	<i>0.88</i>	0.04	<i>0.03</i>	1.00

Supplementary Table 5.

Linear regression analyses. Linear regressions of the fitted cluster sizes of Table S3 for frondose organisms showing a Thomas Cluster i.e. dispersal process aggregations. The regressions which are significant are given in bold. These analyses could not be repeated for LMP surface due to insufficient sample size.