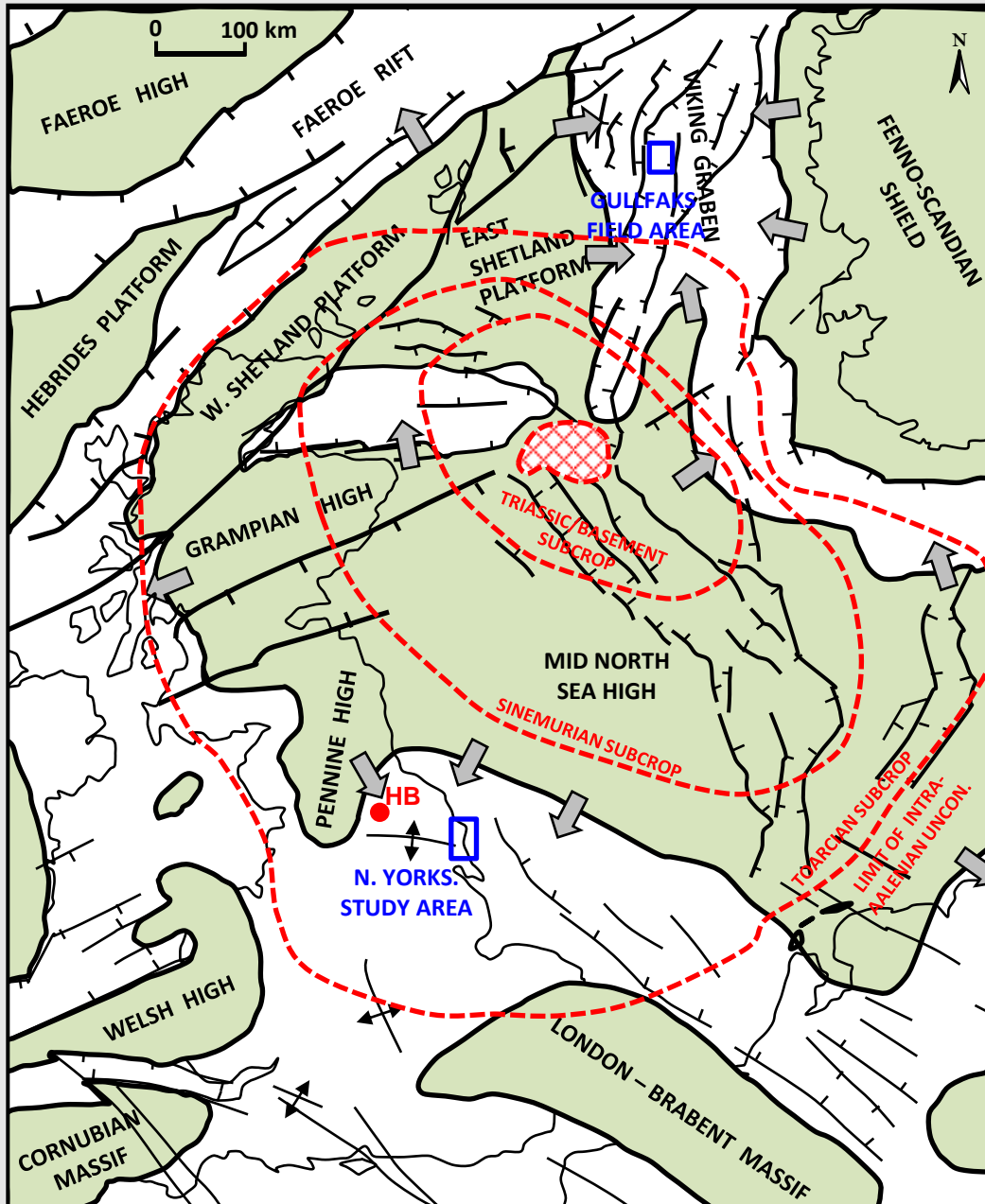


Micropalaeontological analysis of the Aalenian, Hasty Bank plant bed section of N. Yorkshire, UK: a case history illustrating the value of a multi-disciplined approach to fluvio-deltaic, biostratigraphic evaluation

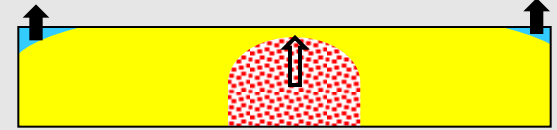


Jurassic thermal doming model (Underhill & Partington 1993)



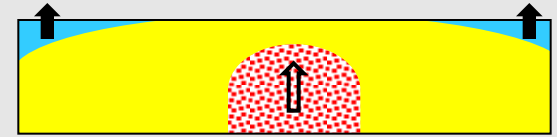
Crustal movement & sea-level change

Maximum uplift → +sediment supply



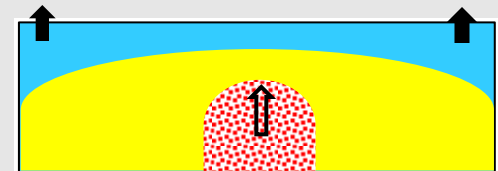
3. Bathonian – E. Callovian

Dome emergence → erosion = uplift



2. Aalenian - Bajocian

Initial doming → local shallowing

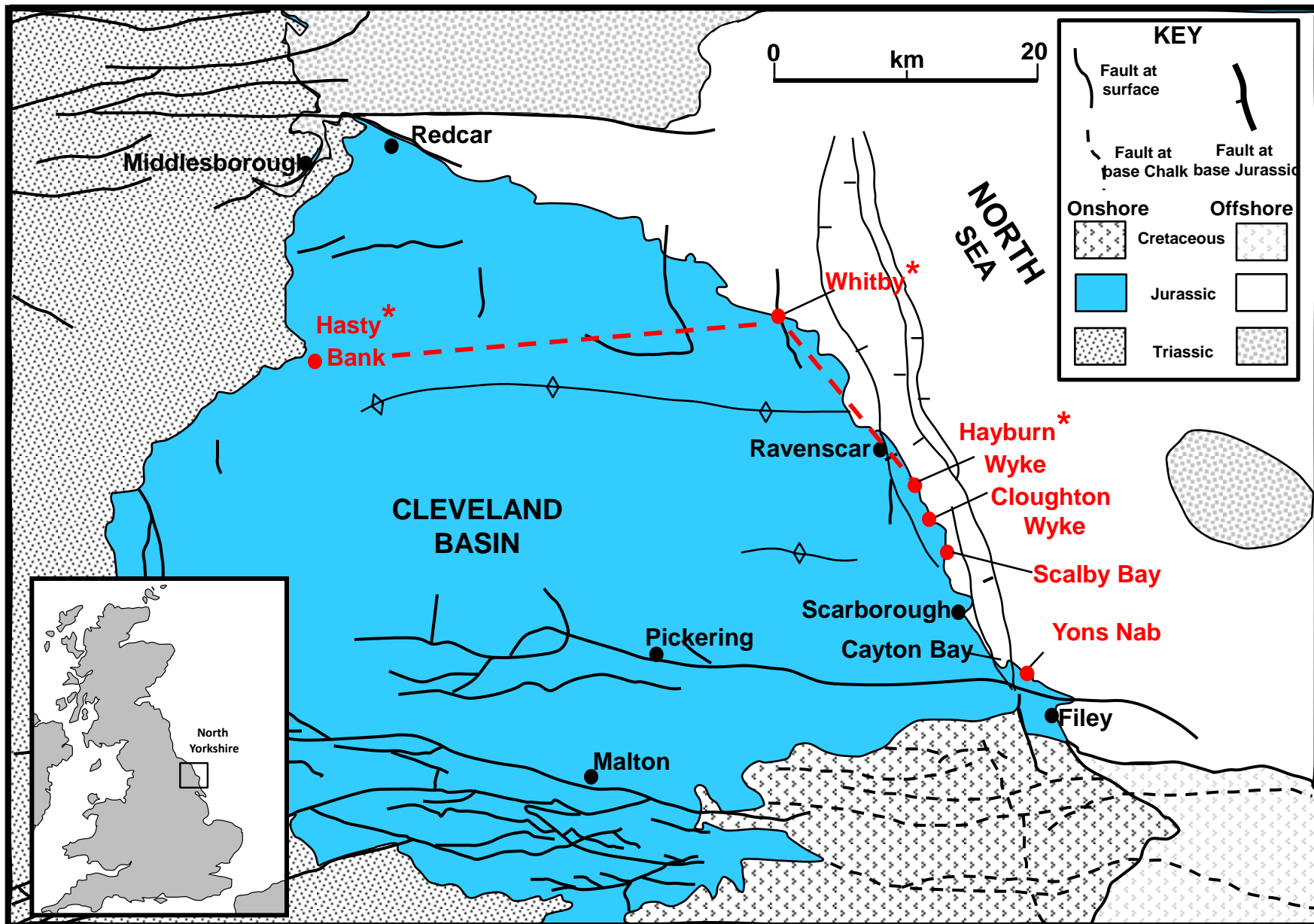


1. L. Toarcian – E. Aalenian






NB: Crustal doming raises sea-level regionally BUT lowers it locally

Sediment supply events
?synchronous

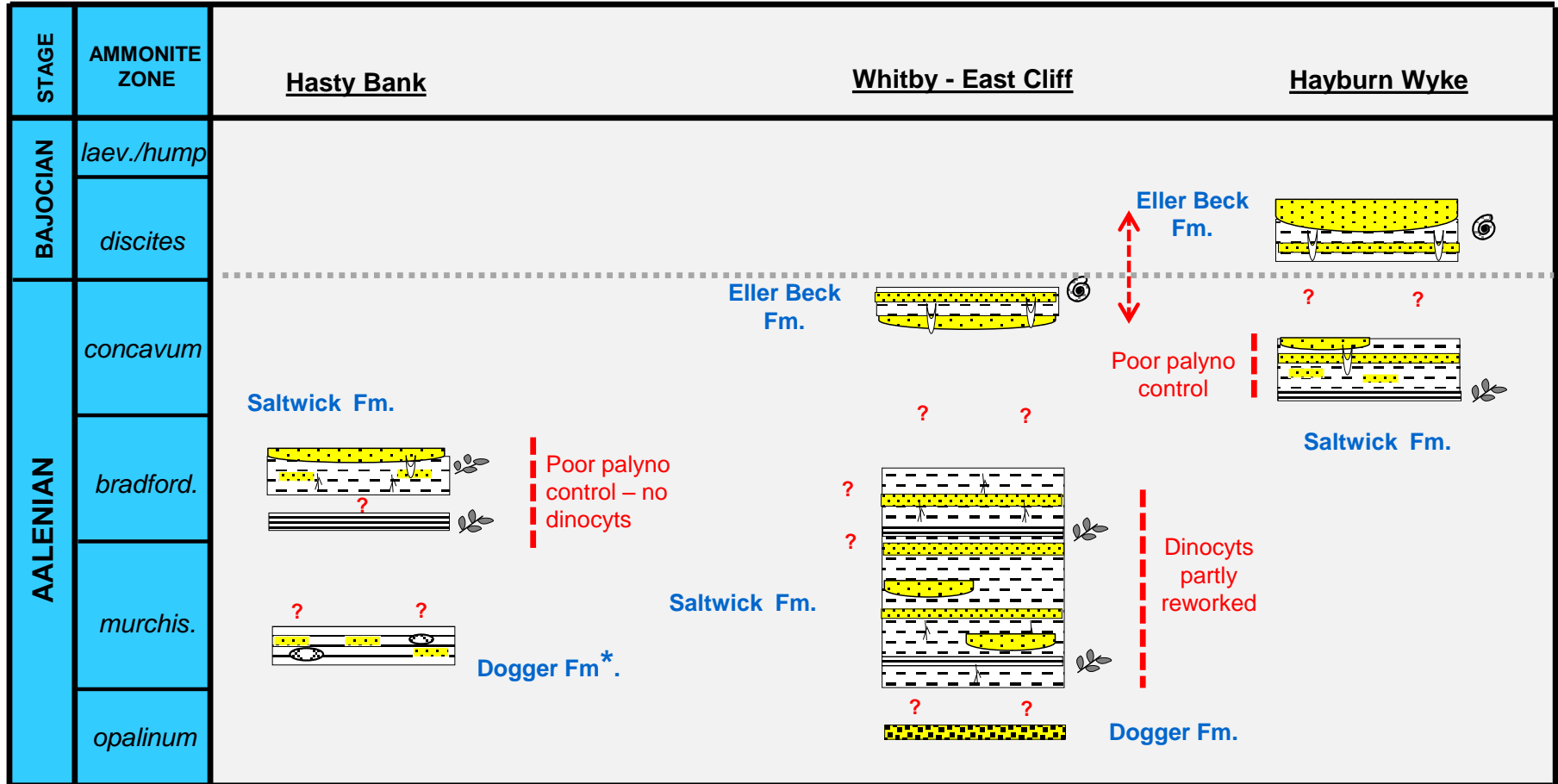
Geological map of N. Yorkshire showing location of sections analysed



Stages assigned to the main M. Jurassic lithostratigraphic units

Epoch	Stage	Lithostratigraphical Division		Age (Ma)	
Middle Jurassic	Lower Callovian	Cornbrash Formation 		166	
	Bathonian	Ravenscar Group	3 Scalby Formation		168
	Upper Bajocian		Long Nab Member		
	?		Scarborough Formation 	170	
	Lower Bajocian	2	Cloughton Formation		Gristhorpe Member
					Lebberston Member 
	Aalenian		Eller Beck Formation 		174
1		Saltwick Formation			
		Dogger Formation 			

Chronostratigraphy of the Saltwick Fm. – studied sections



* unzoned but *L. murchisonae* present at Cotcliff Lodge, N'Allerton

The background of the slide is a close-up photograph of numerous dark brown to black, irregularly shaped rock fragments or fossil pieces. These fragments are densely packed and have a rough, porous, and crystalline texture. The lighting is somewhat dim, highlighting the intricate surface details of the rocks.

*The Hasty Bank outcrop and previous
research*

Drone aerial picture: Hasty Bank – NE face



**'Belted Galloway'
cow**

Section-3

Chris Hill

Section -1

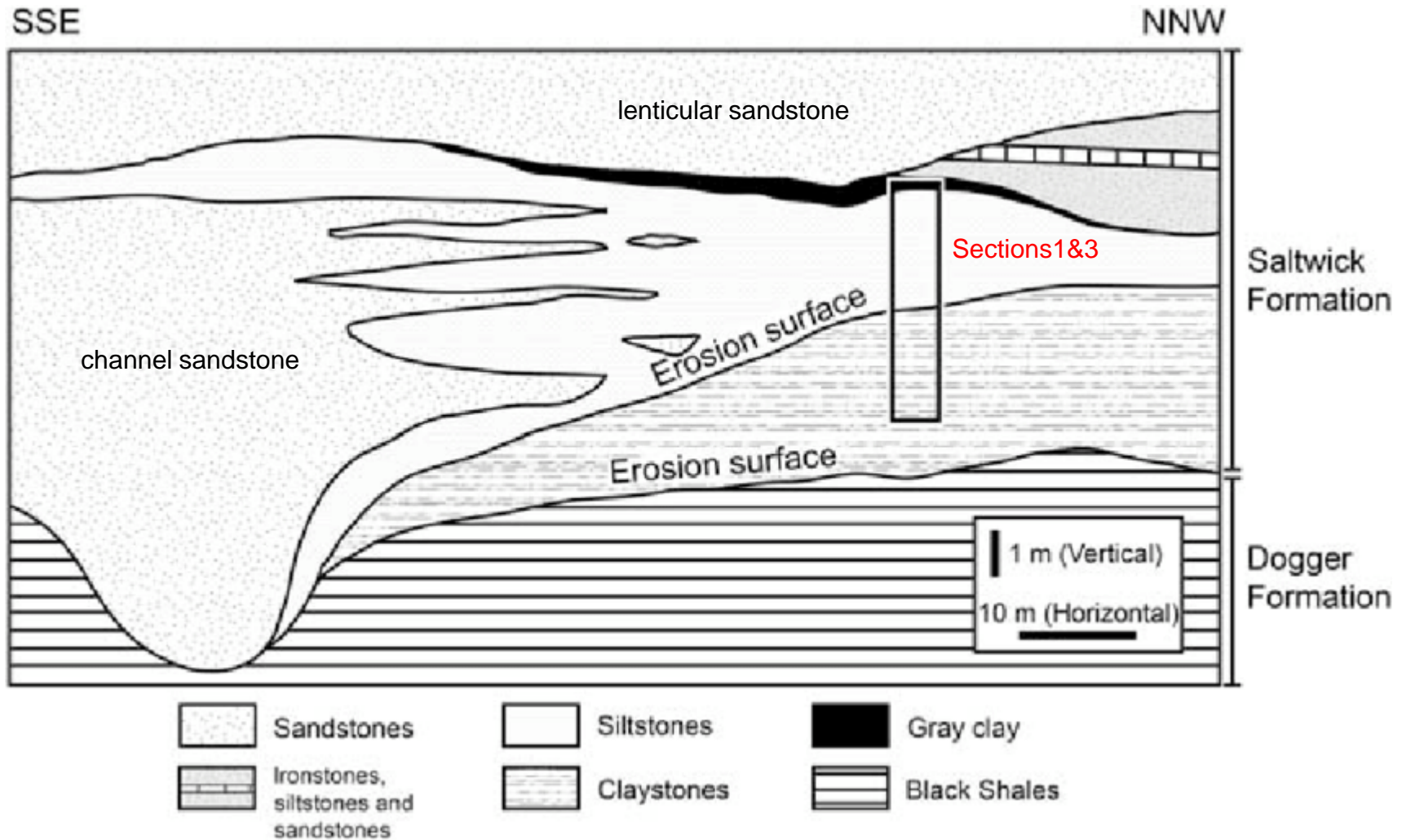
Hasty Bank – NE face, Section -1 (21/08/18)



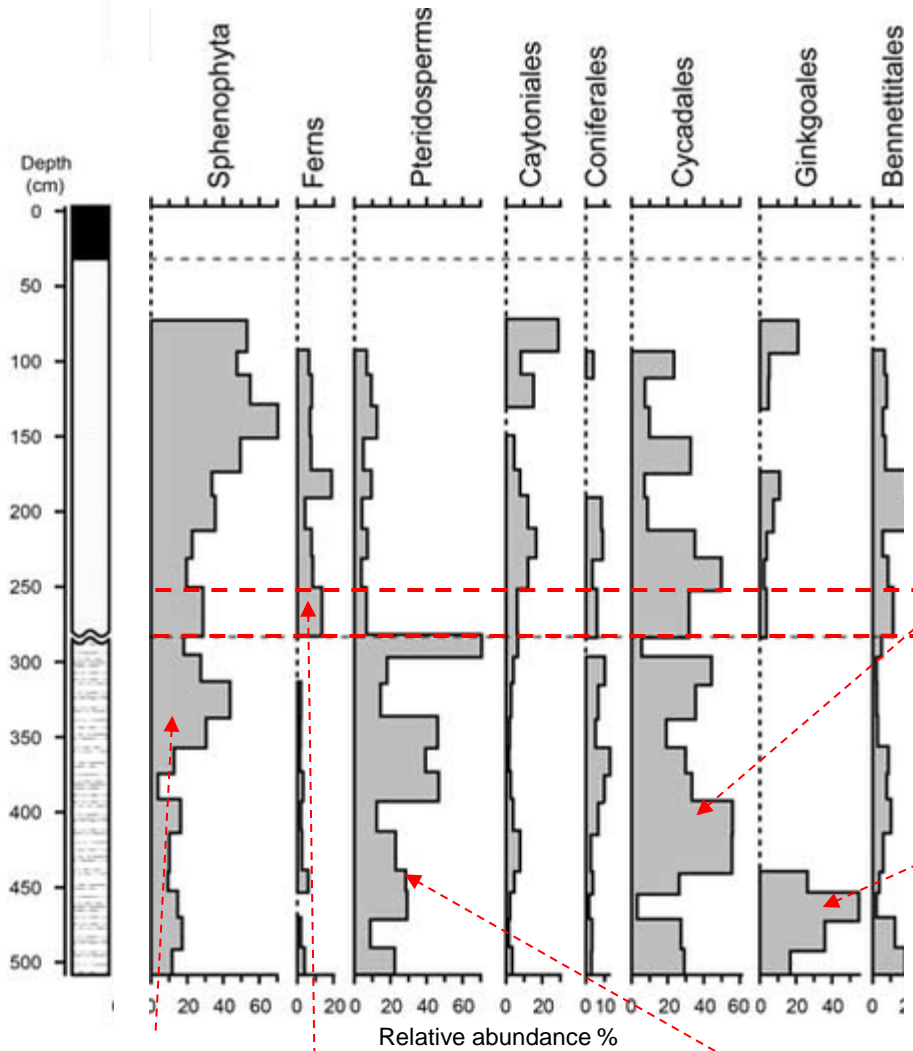
Hasty Bank – NE face, Section 3 (20/08/18)



Schematic section of Hasty Bank looking south – approximate position of sections 1&3 indicated



Relative abundance of fossil plant groups – Section-1 (after Hill 1974)



Floral assemblage - Hill & v.Konij.-v.Cittert 1973

HIGH SPECIES DOMINANCE



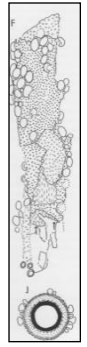
Nilssonia kendalliae



Sphenobaiera gyron



Pachypteris papillosa
>> ?tidal = 'mangrove'



P. papillosa axis with 'berets' (after Harris 1964)

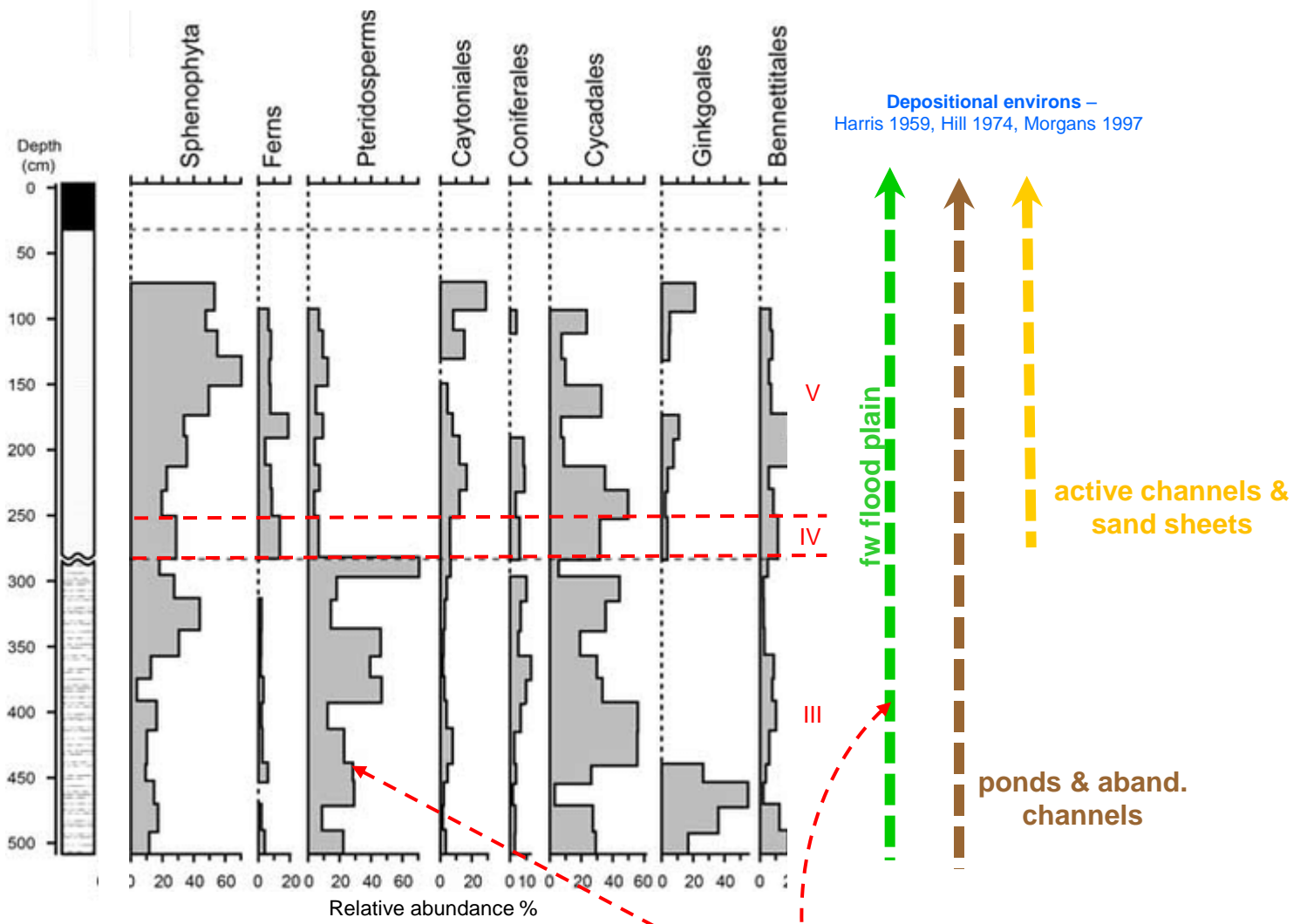


Equisetum columnare



Marrattia anglica

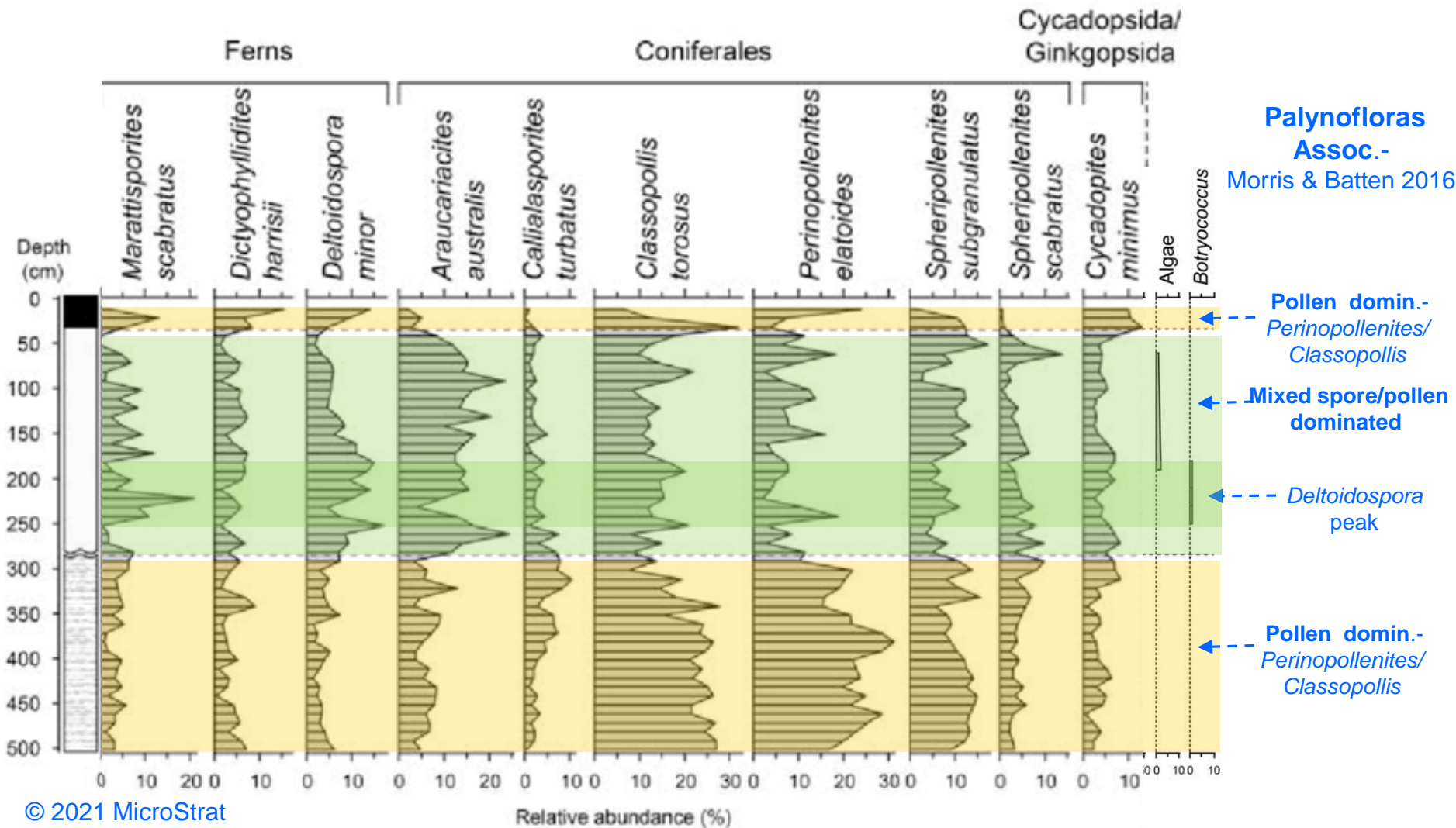
**Relative abundance of fossil plant groups –
Section-1 (after Hill 1974)**



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***Pachypteris papillosa* >>
tidal 'mangrove' habitat –
Harris 1964**

Palynology of Section-1, Hasty Bank showing the distribution of the main spore/pollen species (Slater & Wellman, 2015)



NB: spore-dominated assemblages not clearly evident on sporomorph data compared with Gristhorpe Member



*Micropalaeontological analysis & data
integration*

Micropal. preps. 63 -1000 micron residues: plant derived

Spores

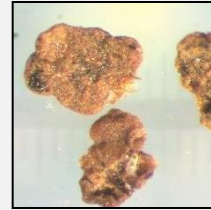


Megaspore - mature



Immat. megaspore tetrad

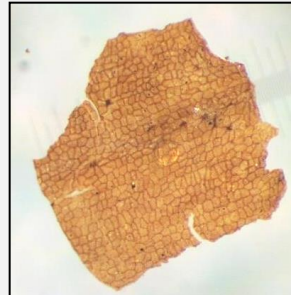
Miospore 'clumps'



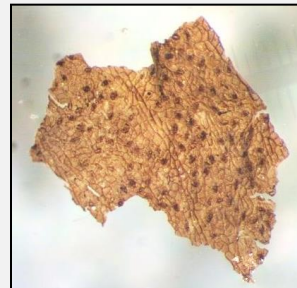
Plant-derived cuticle – main types



amorphous



cellular



stomatol



Tasmanites sp.

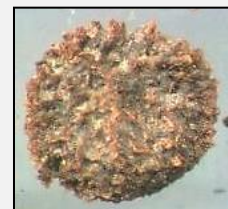
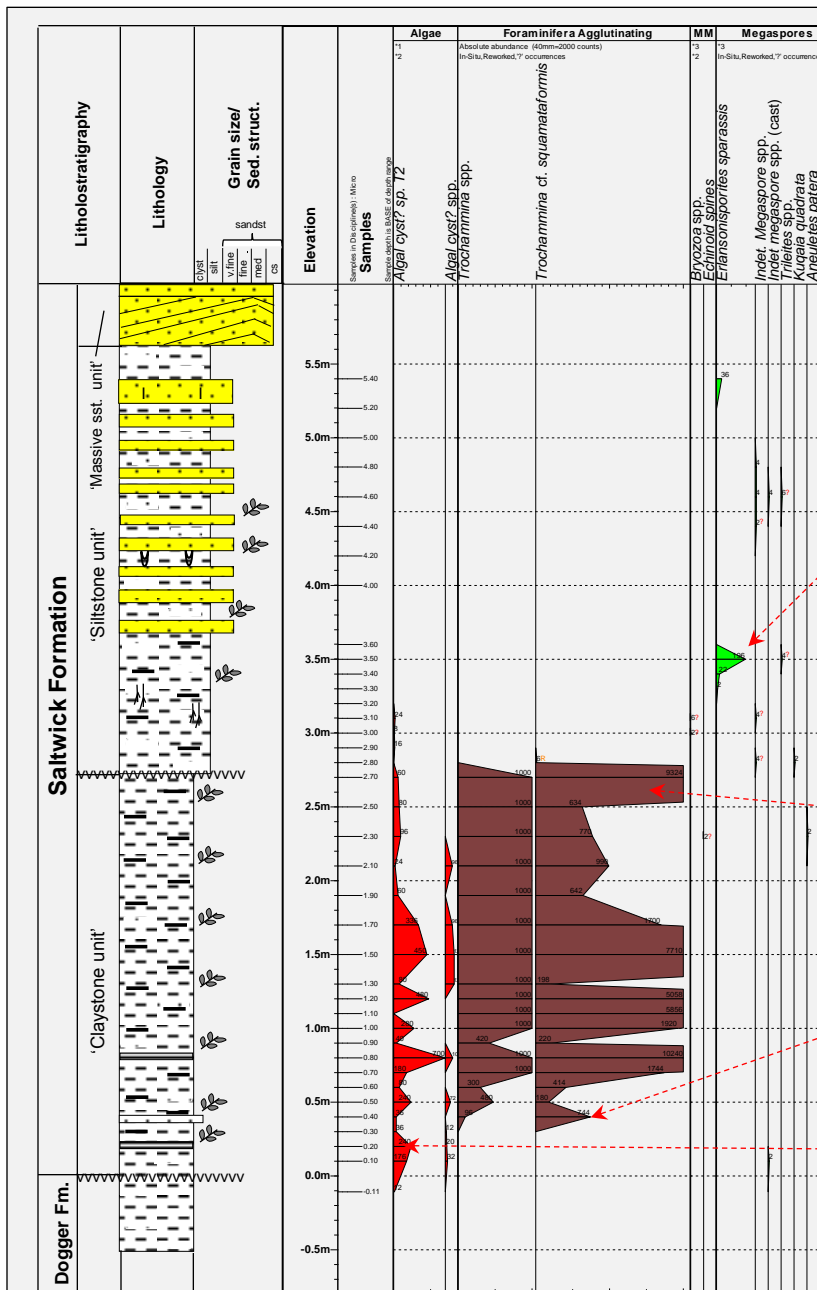


charcoalified



Sporangium? sac

Summary micropalaeontology distribution chart (volum.) – Hasty Bank, Section-3



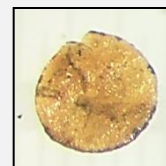
Erlansonisporites sparassis –
>190+ specs/100g

low diversity, megaspore
- dominant assemblages



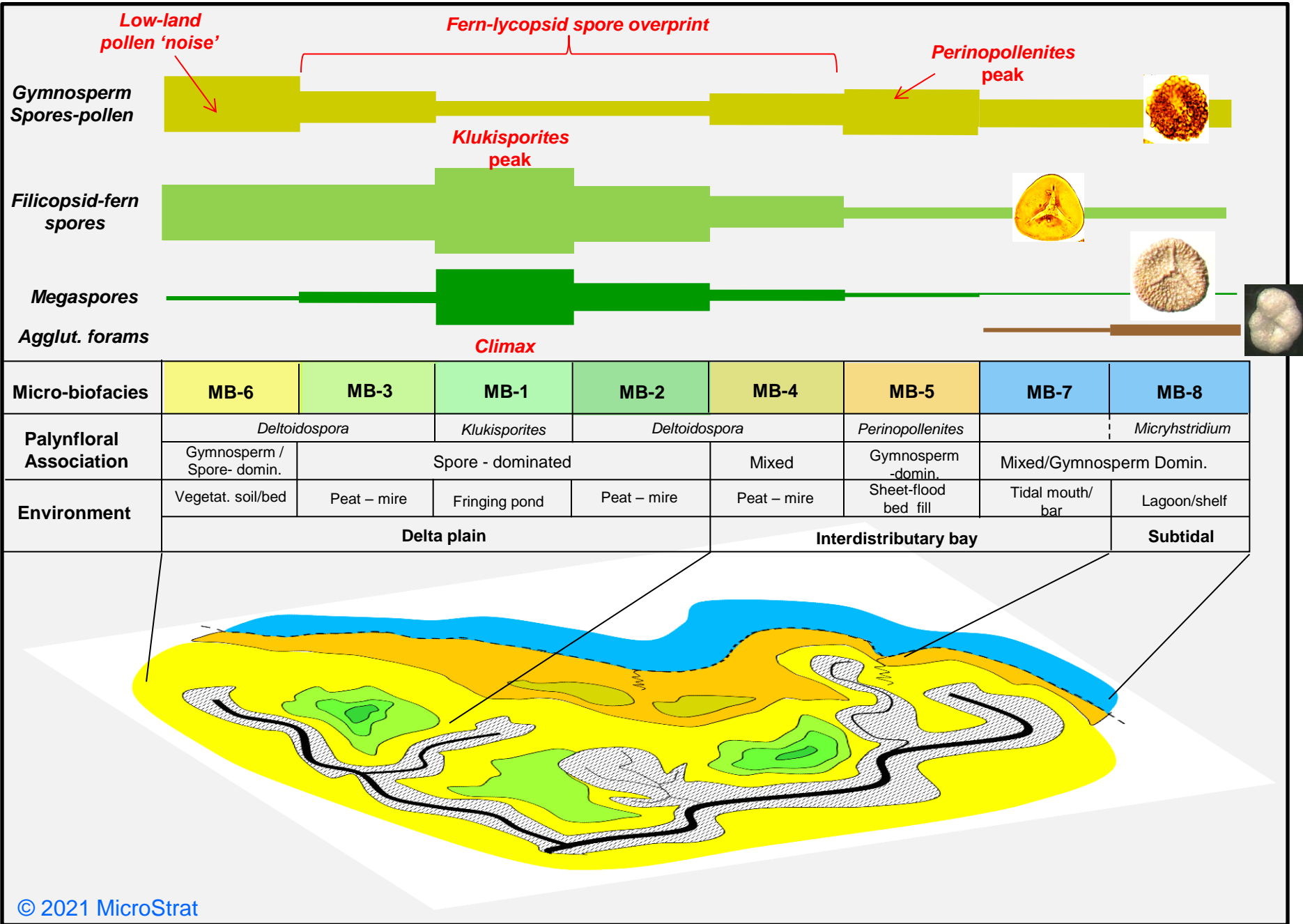
Trochammina cf. squamataformis –
Sabt >9000+ specs/100g

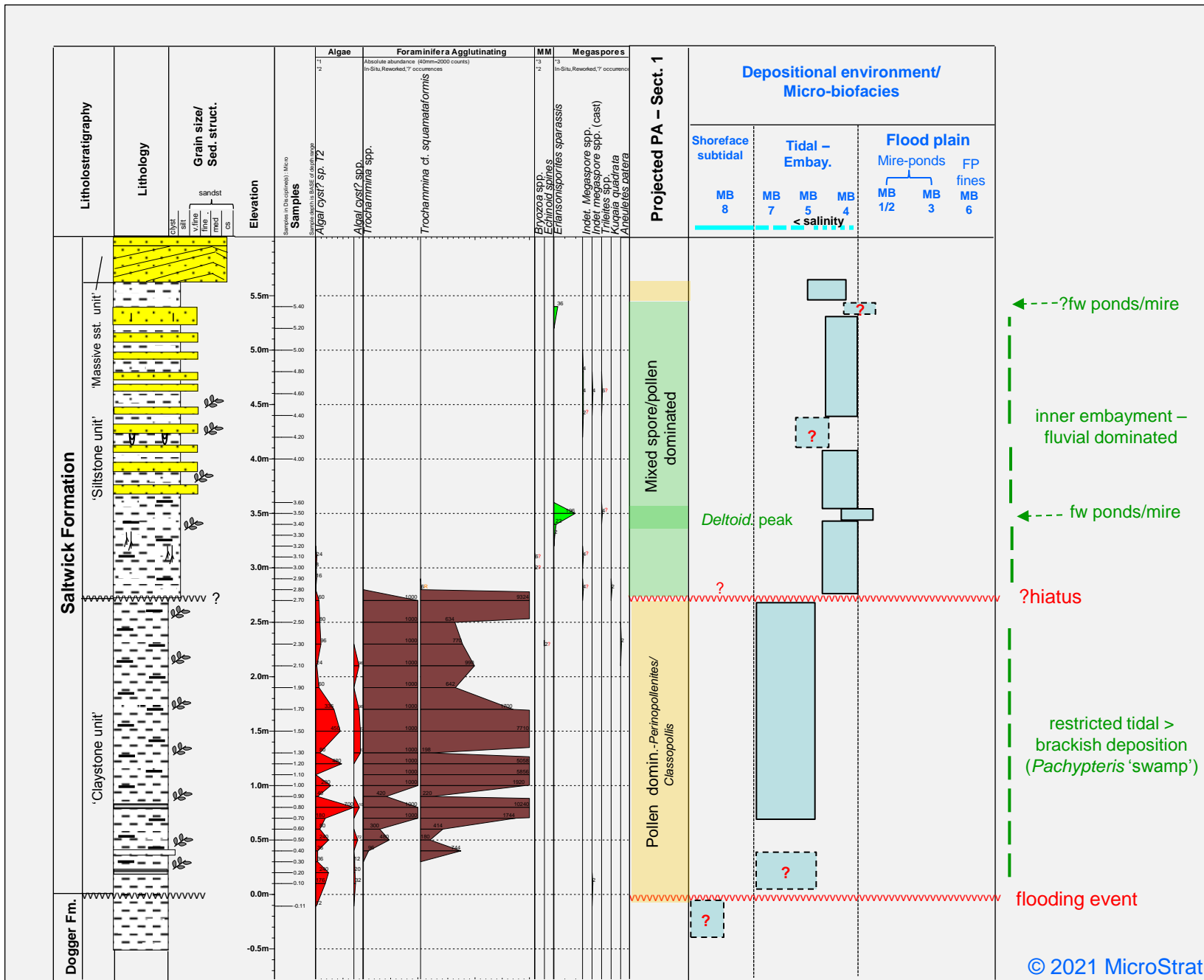
co-occurrence of
monotypic agglutinants
& *Tasmanites*



Tasmanites sp. –
>700+ specs/100g

Gristhorpe Member MB – PA model – after Morris & Batten 2016





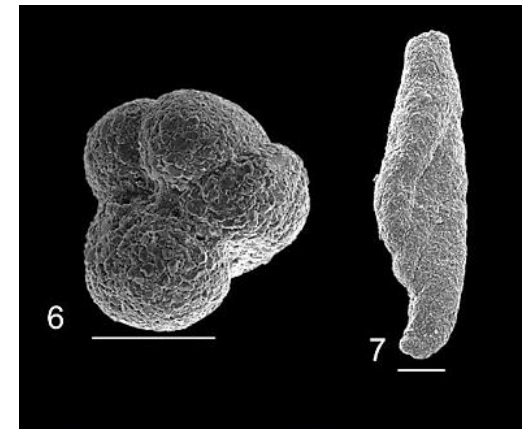
Modern tidal embayment, swamp environments



Modern mangrove swamp, Chukai, Malaysia



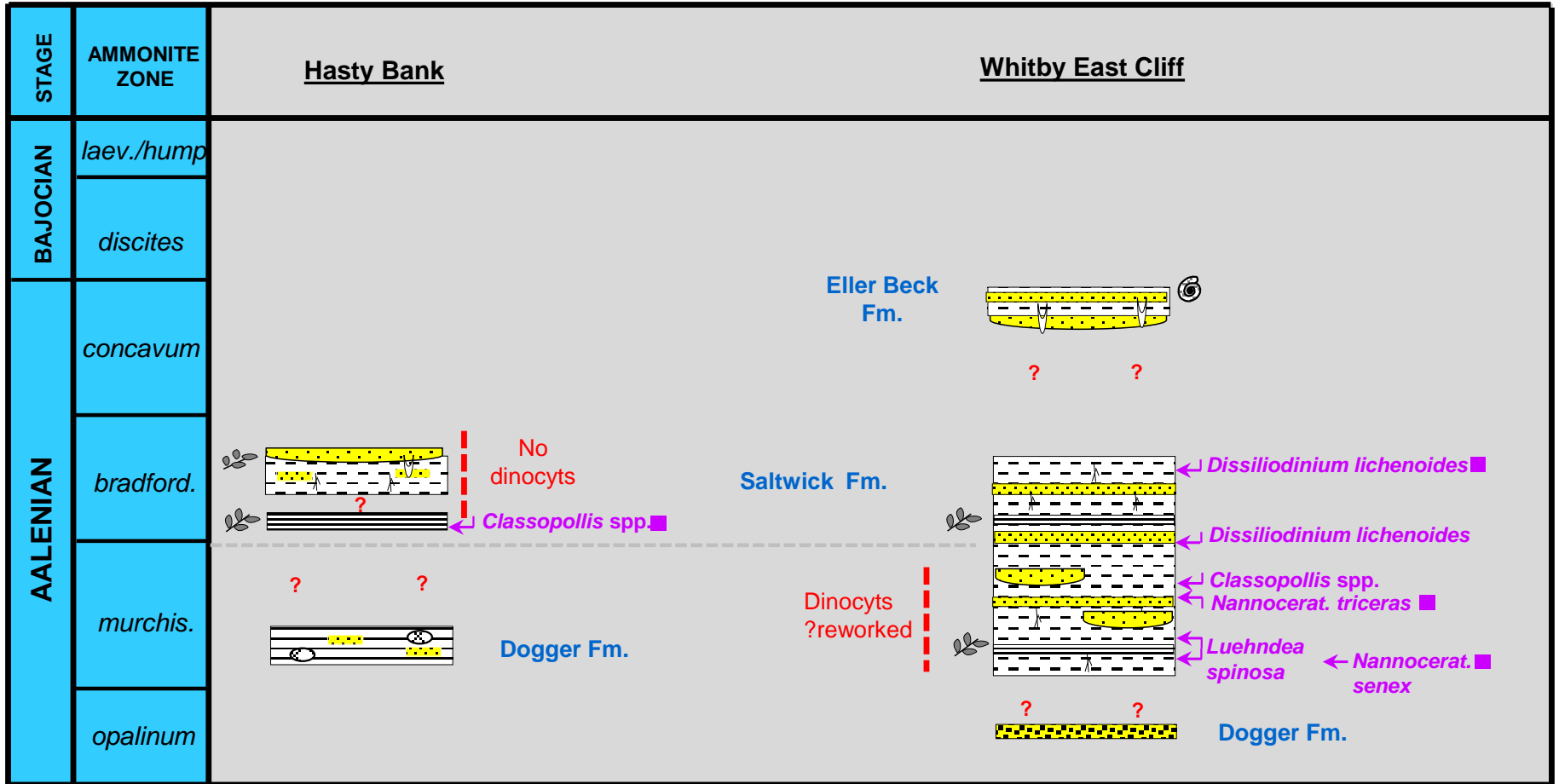
*Low diversity aggluts.
dominate in cored swamp
muds*



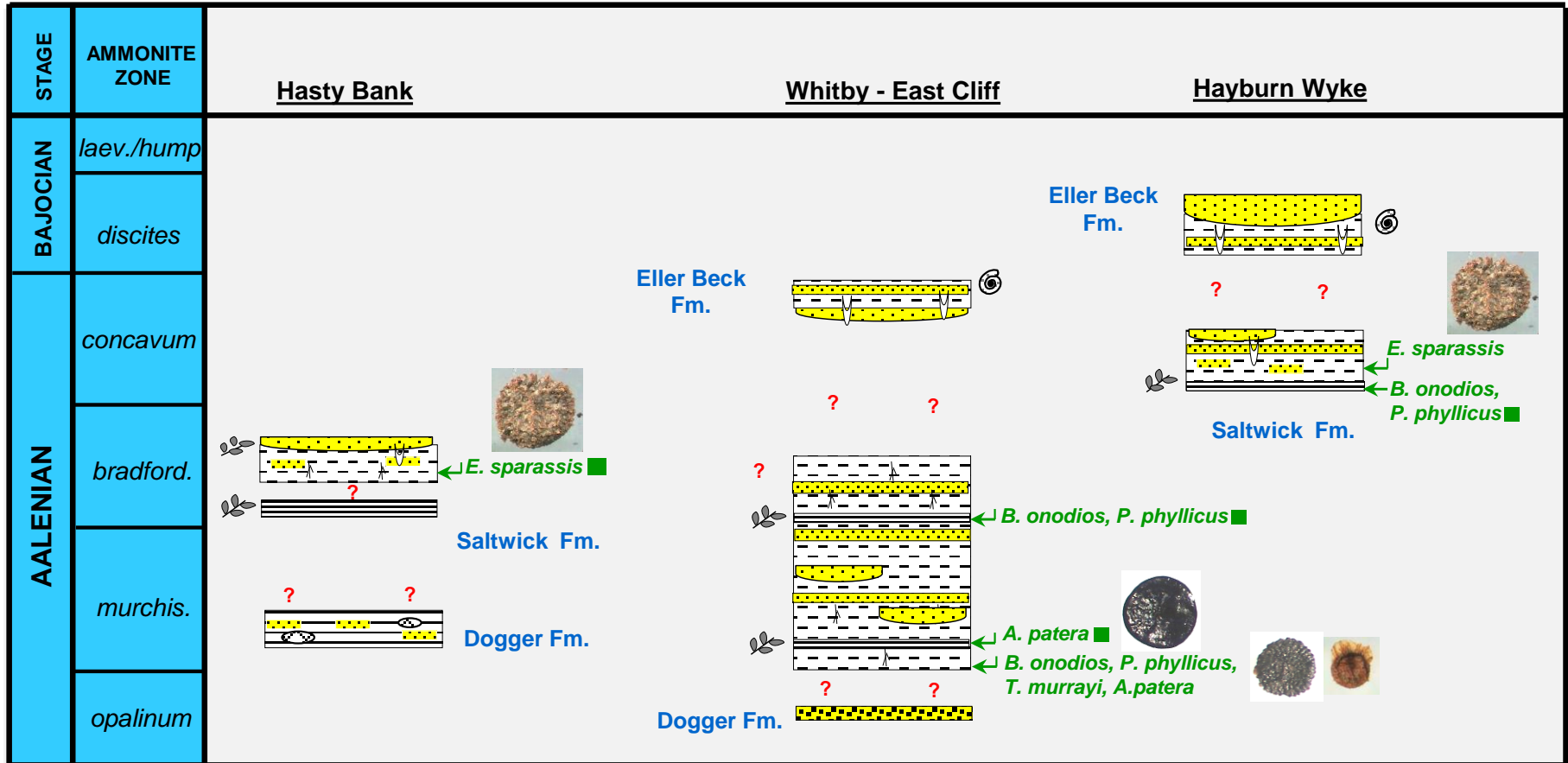


Hasty Bank biochronology

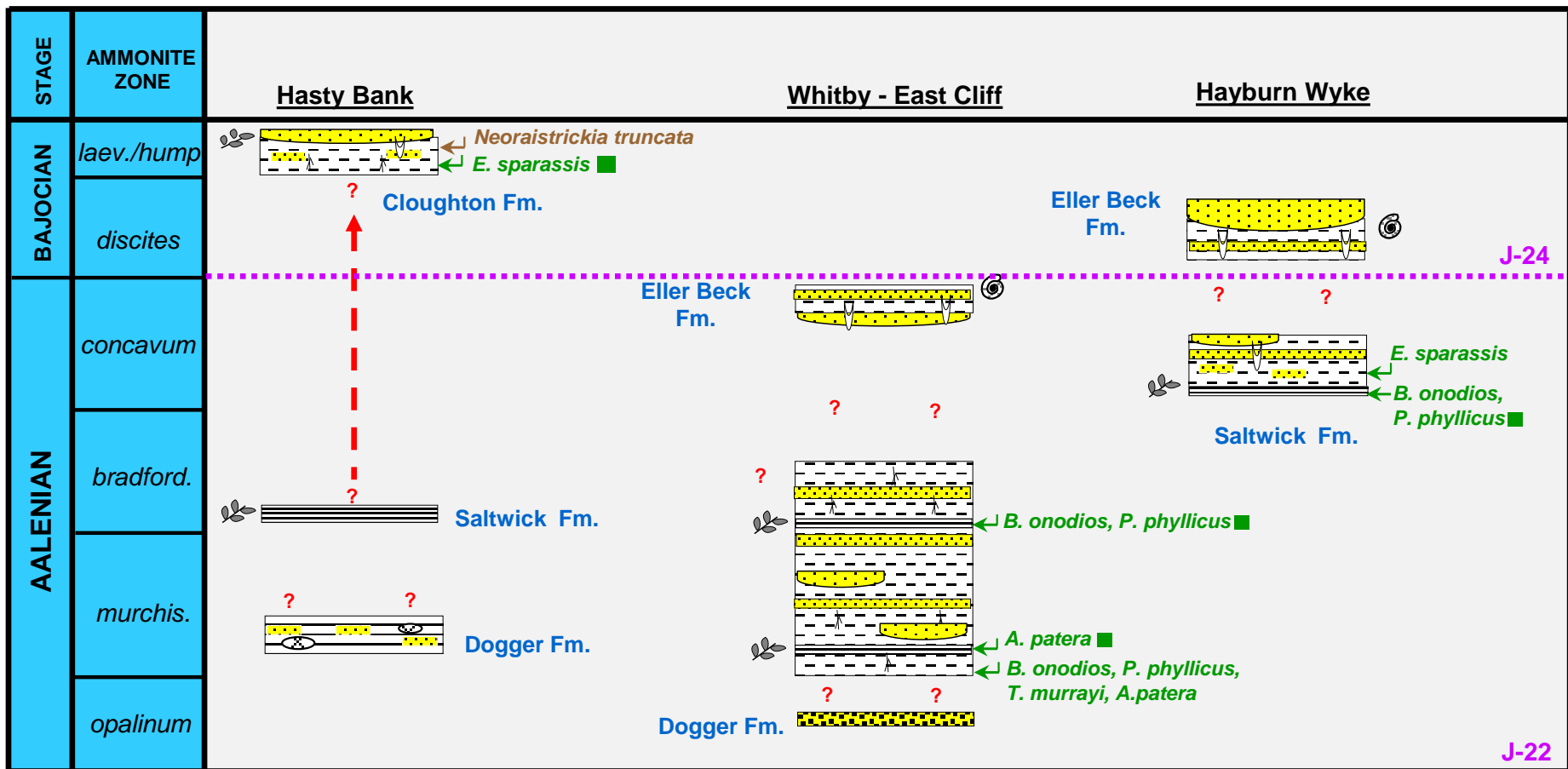
Chronostratigraphy & palynological events – Saltwick Fm.



Chronostratigraphy & megaspore events – Saltwick Fm.



Chronostratigraphy & megaspore bioevents – Saltwick Fm.



Conclusions

- The MB model can be broadly applied to the H.B. sequence - the lower Claystone Unit was deposited in a tidally restricted, outer interdistrib. bay setting with a marked shift towards inner bay, marginal flood-plain through the Siltstone Unit.
- The Claystone Unit displays a peculiar microfossil association which can be closely linked to the occurrence of the pteridosperm *Pachypteris papillosa*: the development of a niche habitat analogous to modern mangrove swamps as proposed by Harris, is supported by the new data.
- Biofacies shift across the Claystone/Siltstone boundary indicates a major erosion surface – localised or regional SB?
- Presence *E. sparassis* through the Siltstone Unit suggests an E. Bajocian age (J24), supported by the inception of *N. truncata*



Aalenian *Pachypteris* swamp, Hasty Bank, Yorkshire (after Harris 1964)