RHAETO-LIASSIC PALYNOMORPHS FROM THE BARNSTONE RAILWAY CUTTING, NOTTINGHAMSHIRE

by

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Summary

Samples from the Barnstone Railway Cutting have been examined palynologically and the microfloral assemblages recovered compared with those recorded from selected Rhaetian sections in the Bristol Channel area. Typically Rhaetian assemblages are found to persist into the Pre-Planorbis Beds (*sensu* Sykes et al. 1970) and the evidence for presuming the presence of "White Lias" is discussed.

Introduction

The Rhaetian succession exposed in the Barnstone Railway Cutting has recently been redescribed by Sykes, Cargill and Fryer (1970). They conclude that in the cutting the Upper Rhaetian comprises some 6' of Cotham Marls overlain by an impersistent Nodular Limestone 3" - 6" thick, which is in turn overlain by $5\frac{1}{2}$' of Liassic Pre-Planorbis Beds.

Jukes-Browne (1885) had previously recorded the presence of "White Lias" in this section and Kent (1970, p. 367) suggests that there may be a "partial representative" of the "White Lias" above the Cotham Beds in South Nottinghamshire. Although the palaeontological evidence cited by Sykes et al. would appear to support their conclusions, the palynology of the interval above the Nodular Limestone would suggest a correlation with the Upper Rhaetian of the Bristol Channel area.

Twelve samples from Barnstone were examined using standard palynological techniques and the results, based on counts of 200 specimens, are summarised in table 1. In the list below, the sample locations refer to those given by Sykes et al. (text fig.3).

Sample 12 - Limestone No. 3.

Sample 11 - Between Limestones Nos. 3 & 2.

Sample 10 - Shale immediately above Limestone No. 2.

Sample 9 - Limestone No. 2.

Sample 8 - Between Limestones Nos. 2 & 1.

Sample 7 - Below Limestone No. 1.

Sample 6 - "Thin Limestone"

Sample 5 - Between "Thin Limestone" & Nodular Limestone.

Sample 4 - Nodular Limestone.

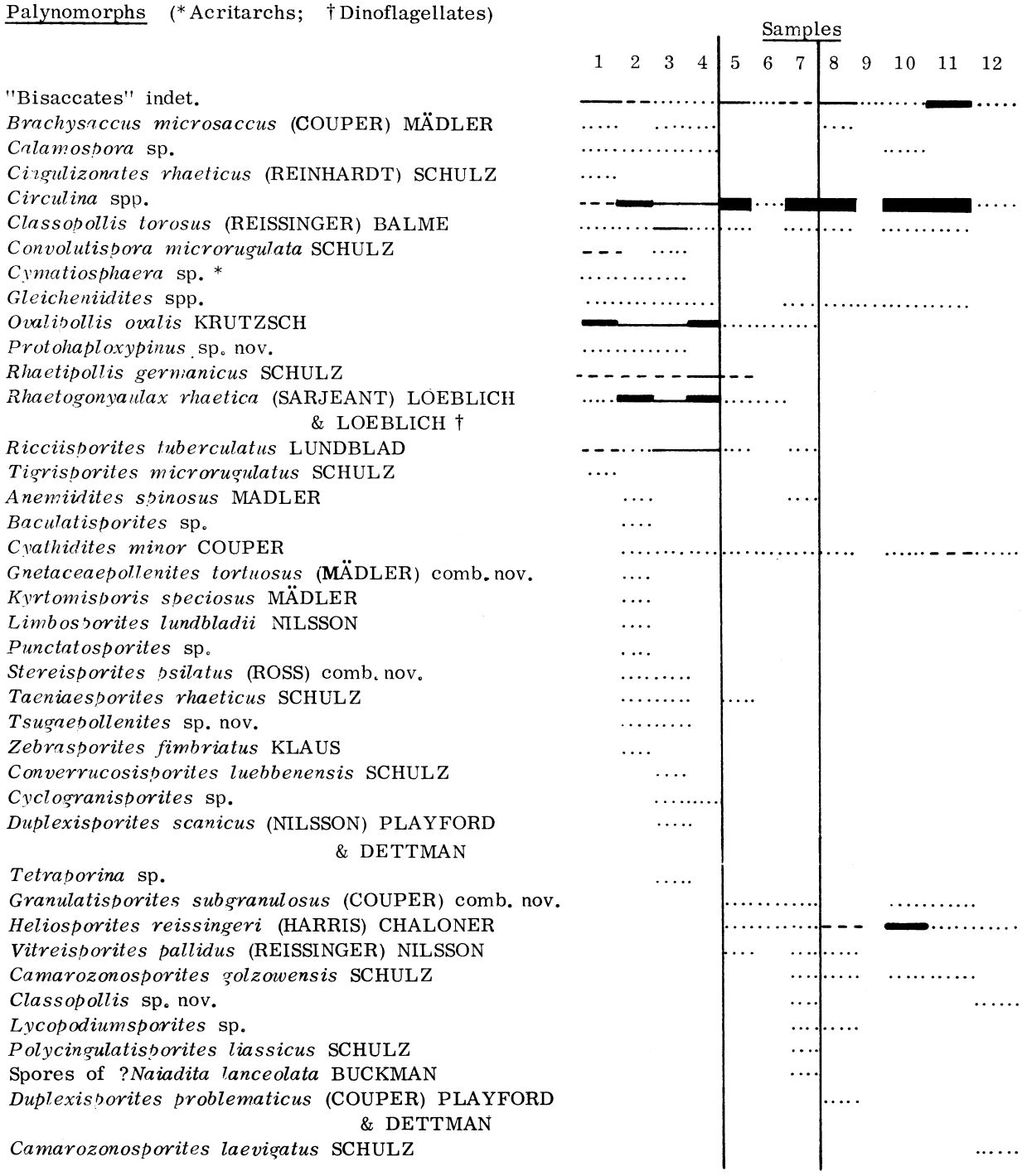
Sample 3 - Immediately below Nodular Limestone.

Sample 2 - 6" (15 cm.) below Nodular Limestone.

Sample 1 - 12"(30 cm.) below Nodular Limestone.

TABLE 1

PALYNOLOGY OF THE RHAETIAN AND "LIASSIC" BEDS OF BARNSTONE



Stratigraphical Palynology

In the North Sea Basin, the transition from the Rhaetian to the Hettangian is accompanied by an abrupt microfloral change which, as Geiger and Hopping (1968) suggest, probably occurs within the Rhaetian rather than at the Triassic Jurassic boundary. This is certainly true of the classic Rhaetian sections in the Bristol Channel region where the major microfloral boundary is found near the base of the Cotham Beds. Here the Sully Beds (Grey Marls), Westbury Beds and Lower Cotham Beds contain a distinctive microflora which correlates with the "typical" Rhaetian assemblages of the North Sea Basin and includes *Cingulizonates rhaeticus* (Reinhardt) Schulz, *Limbosporites lundbladii* Nilsson, *Ovalipollis ovalis* Krutzsch, *Perinosporites thuringiacus* Schulz, *Rhaetipollis germanicus* Schulz, *Ricciisporites tuberculatus* Lundblad, *Tsugaepollenites* sp. nov., *Zebrasporites interscriptus* (Thiergart) Klaus, and *Z. laevigatus* (Schulz) Schulz. These forms range to the base of the "Estheria Limestone" at Garden Cliff, Westbury-on-Severn, Gloucestershire, to Richardson's "Cotham Bed 4" (1910, p. 29) at Lilstock, Somerset and to the base of the Cotham Beds at Lavernock, Glamorgan. At Westbury-on-Severn and Lavernock however, some elements of the Lower Rhaetian microflora, including *Ovalipollis ovalis*, *Rhaetipollis germanicus*, *Ricciisporites tuberculatus* and *Tsugaepollenites* sp. nov., persist in low frequences in the younger Cotham Beds where they are found in association with spores of the bryophyte *Naiadita lanceolata* Buckman. These higher Cotham Beds are also characterised by the appearance of *Camarozonosporites golzowensis* Schulz, *Classopollis* sp. nov., *Lycopodiumsporites* spp. and *Polycingulatisporites liassicus* Schulz together with *Brachysaccus microsaccus* (Couper) Mädler, *Circulina* spp., *Classopollis torosus* (Reissinger) Balme and the dinoflagellate *Rhaetogonyaulax rhaetica* (Sarjeant) Loeblich which persist from the Lower Rhaetian. The absence of *Naiadita* spores and the relative abundance of *Heliosporites reissingeri* (Harris) Chaloner serve to distinguish the Langport Beds from the Cotham Beds but, as yet, there is little positive palynological evidence to differentiate between the Langport Beds, Watchet Beds and Pre-Planorbis Beds. *Classopollis* sp. nov. has not been recorded from the Hettangian however, and *Polycingulatisporites circulus* Simoncsics and Kedves and *Tsugaepollenites mesozoicus* Couper, which are common in the Lower Liassic, appear to be absent from the Rhaetian.

Orbell (1971) has recently published a summary of a palynological investigation of Rhaetian sections from the South of England and his results, in general, corroborate those outlined above.

The four lowest samples (1-4) from Barnstone contain a varied microflora which correlates with the basal Cotham Beds of the Bristol Channel. Samples 5 and 7 (sample 6 was very poorly palyniferous), are completely lacking in species restricted to the lower Rhaetian but, as in the higher Cotham Beds at Westbury and Lavernock, rare specimens of *Ovalipollis ovalis*, *Rhaetipollis germanicus* and *Ricciisporites tuberculatus* are encountered. Sample 7 however also contains *Naiadita* spores, *Camarozonosporites golzowensis*, *Classopollis* sp. nov., *Lycopodiumsporites* sp. and *Polycingulatisporites liassicus* which would appear to confirm the correlation with the higher Cotham Beds. The overlying samples (8-12) have yielded a Rhaeto-Liassic microflora, including *Classopollis* sp. nov. and abundant *Heliosporites reissingeri*, which is comparable with those recorded from the Langport and Watchet Beds.

The inference from these results is that the interval assigned to the Cotham Beds of Sykes et. al. at Barnstone is equivalent to the basal Cotham Beds in Somerset and that the immediately overlying section, to the base (?) of Limestone No. 1, is correlative with the upper Cotham Beds. Although the palynological evidence recorded cannot conclusively prove the presence of Langport Beds at Barnstone, the occurrence in Sample 12 of *Classopollis* sp. nov., which appears to have a restricted stratigraphical range, is of some note. What is apparent is that there was a major marine transgression during the deposition of the Upper Cotham Beds equivalents, with the introduction of a fauna of Liassic aspect. Unless the Rhaetian microfloras resulted from reworking, of which there is no evidence, it must be assumed that either the ranges of the nominally Liassic faunas recorded by Sykes et al. should be extended into the Upper Rhaetian, or that the ranges of the Rhaetian microfloras be extended into the basal Liassic. The Rhaetian microfloral succession in the Bristol Channel area indicates that the higher Cotham Beds are palynologically well defined and there is no evidence to suggest that such forms as, for example, *Rhaetipollis germanicus* and *Naiadita* spores could range into the basal Liassic. As no evidence of a non-

EXPLANATION OF PLATE 8

Fig. 1. *Ricciisporites tuberculatus* Lundblad. Sample 2.

Fig. 2. *Granulatisporites subgranulosus* (Couper) comb. nov. Sample 5.

Fig. 3. *Platysaccus* sp. Sample 1.

Fig. 4. *Taeniasporites rhaeticus* Schulz. Sample 2.

Fig. 5. *Classopollis* sp. nov. Sample 7.

Fig. 6. *Brachysaccus microsaccus* (Couper) Mädler. Sample 1.

Fig. 7. *Gnetaceaepollenites tortuosus* (Mädler) comb. nov. Sample 2.

Fig. 8. *Convolutispora microrugulata* Schulz. Sample 1.

Fig. 9. *Heliosporites reissingeri* (Harris) Chaloner. Sample 10.

Fig. 10. *Tsugaepollenites* sp. nov. Sample 2.

Fig. 11. *Tetraporina* sp. Sample 3.

Fig. 12. *Vitreisporites pallidus* (Reissinger) Nilsson. Sample 5.

Fig. 13. *Duplexisporites scanicus* (Nilsson) Playford & Dettman. Sample 3.

Fig. 14. *Zebrasporites fimbriatus* Klaus. Sample 2.

Fig. 15 & 16 *Classopollis torosus* (Reissinger) Balme. Sample 2.

Fig. 17. *Ovalipollis ovalis* Krutzsh. Sample 1.

Fig. 18. *Rhaetipollis germanicus* Schulz. Sample 1.

Fig. 19. *Camarozonosporites golzowensis* Schulz. Sample 7.

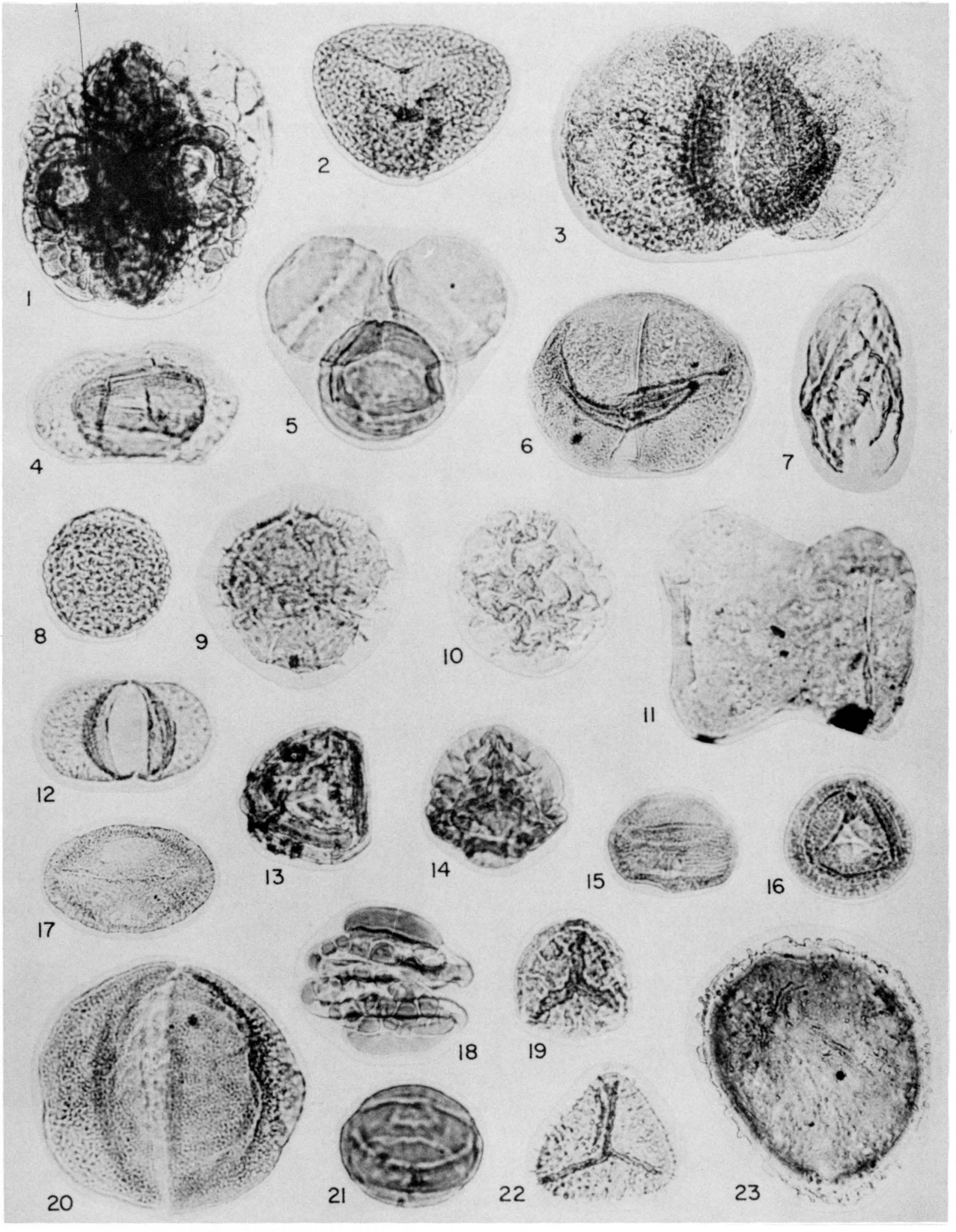
Fig. 20. *Protohaploxypinus* sp. nov. Sample 1.

Fig. 21. *Circulina* sp. nov. Sample 1.

Fig. 22. *Anemiidites spinosus* Mädler. Sample 2.

Fig. 23. *Naiadita* spore. Sample 7.

All x 500 except figs. 12 and 21, x 1000.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sequence above Limestone No. 1 has been recorded by Sykes et al. and as the faunas above and below this unit are comparable, it is thought possible that the Cotham Beds at Barnstone are overlain conformably by Upper Rhaetian Langport Beds.

Conclusions

Correlation with the Rhaeto-Liassic sections in the Bristol Channel area indicates that a relatively complete Rhaetian succession is developed in the Barnstone Cutting. The microfloral assemblages suggest that the lower Cotham Beds are represented by the Cotham Marls and Nodular Limestone of Sykes et. al. and that the upper Cotham Beds are represented by the lower part of the interbedded limestones and shales assigned to the Pre-Planorbis Beds by Sykes et. al. The upper part of the "Pre-Planorbis Beds" *sensu* Sykes et al., to limestone 3 at least, is considered to be equivalent to the Upper Rhaetian Langport Beds ("White Lias").

The marine transgression which terminated the deposition of the Cotham Marls is consequently considered to be of Upper Rhaetian age rather than of Liassic age and, in the section examined, no evidence of undoubted Jurassic microfloras was found.

Taxonomic Notes (see Table 1)

Circulina spp. includes forms referable to *C. meyeriana* Klaus and to *Circulina* sp. nov. (pl. 8, fig. 21).

Protohaploxypinus sp. nov. (pl. 8, fig. 20) has been recorded by Schulz (1967, p. 598) as *Striatites* cf. *microcorpus* Schaarschmidt from the Middle Rhaetian of the Central German Basin.

Ephedripites tortuosus Mädler (1964, p. 194) has been assigned to the genus *Gnetaceaepollenites* (Thiergart) Jansonius because it possesses spiral ribs. *G. tortuosus* has been recorded from the Lower Liassic of England but at Barnstone is found in association with a typically Rhaetian assemblage.

Trilites psilatus Ross, assigned to the genus *Sphagnumsporites* by Couper (1958, p. 131) is here reassigned to the genus *Stereisporites* Pflug which has taxonomic priority.

Tsugaepollenites sp. nov. (pl. 8, fig. 10) has been recorded from the Westbury Beds and basal Cotham Beds in the Bristol Channel region and rarely from the Upper Cotham Beds of Lavernock.

Concavisporites subgranulosus Couper (1958, p. 143), because of the absence of a kyrtome and possession of a granulate exine, has been assigned to the genus *Granulatisporites* (Ibrahim) Potonie and Kremp.

Classopollis sp. nov. (pl. 8, fig. 5) has been recorded from the Upper Cotham Beds of Westbury-on-Severn and the Langport Beds of Lilstock and Lavernock.

The new species noted above will be fully described in Fisher (in prep.).

Acknowledgements

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