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Macropalaeontology of Asfordby Boreholes: Holwell Works

Asfordby Hydro and Asfordby North Shaft

By Dr N J Riley

Summary of results

All three boreholes develop a good C. bipennis fauna indicating the horizon of the Kilburn. Below the Kilburn, Holwell Works Borehole shows the most complete sequence with the major Silesian marine bands developed down into the Marsdenian. Asfordby Hydro appears to have lost much of early Westphalian A and some late Namurian probably as a result of faulting. This borehole penetrates into the Kinderscoutian. Asfordby North Shaft gives tentative correlations below the Listeri MB horizon because only Lingula faunas are developed and much of the sequence below this level is expanded by igneous rocks.

Introduction

These three boreholes were sunk as investigation holes for the siting of a mine shaft. This report is made in response to a contract secured from NCB to correlate the Asfordby boreholes. The biostratigraphic-biofacies information submitted in this report will be integrated into a final report by Dr R Old (IGS).

Asfordby Hydro Borehole has already in part been reported on (PDL 82/404).

Techniques

The author, with the assistance of Dr R Old, collected from racked unboxed core over a 2 day period at NCB Donisthorpe core shed. The core was in good condition but lighting was poor.. The complete core was examined for macrofauna apart from short lengths (often in marine bands) which had been removed for engineering purposes. All the specimens collected are now registered with IGS Leeds. Determinations were carried out by the author using a 'wild' stereo microscope.

Preservation

All three boreholes show a high sulphur content with many non-phosphatic bioclasts preserved as pyritic "ghosts" and moulds. The core samples are already beginning to deteriorate and oxidise. Faunal preservation is on the whole poor.

Asfordby North Shaft showed a high degree of listric development at marine band horizons, making it almost impossible to extract fauna.

DATA

(1) Holwell Works Borehole

Westphalian A Communis Chronozone

C. bipennis "Belt"

BLK 7962-3 510.90 m

Carbonicola aff bipennis

Elonichthys sp.

Rhabdoderma sp.

Rhadinichthys sp.

Comment BLK 7962-3 - This fauna is characteristic of strata immediately overlying the Kilburn Coal.

BLK 7820-1 516-17m

Carbonicola sp. (fgt)

fish debris indet.

Lenisulcata chronozone

Amaliae MB

BLK 7822-7 537-538.05m

Sponge spicules

Lingula mytilloides

brachiopod protegulum

Rhadinichthys sp.

Comment BLK 7822-7 - Since this is the only marine development present in Holwell Works between the Kilburn and Listeri MB a biofacies correlation with the Amaliae MB is most likely, as this is the most persistent marine band at this level in marginal sequences.

BLK 7828-9 599.60m

Carbonicola aff. fallax

fish spine

Listeri MB.

BLK 7833-7855 559.70-562.30m

sponge spicules

Lingula mytilloides

Orbiculoidea sp juv.

productoid debris

coiled nautiloid venter (poor)

Anthracoceratites sp. (juv)

cf Gastrioceras sp. (ghost)

Serpuloides stubblefieldi

platform conodonts (lateral view)

acanthodian spine

fish debris

Comment BLK 7833-7855 - Although zonal species cannot be identified, the biofacies development and relative position to other marine bands indicates that this is the Listeri MB. The presence of productoids is unusual at this level.

Honley MB?

BLK 7856-7862 567.50-569.50m

Lingula mytilloides

fish debris

Comment BLK 7856-7862 - It is not clear which early Westphalian A MB above G. subcrenatum this represents but the Honley MB is the most persistent at this level in the East Midlands hence the correlation given here. The marine band rests on a 50 cm cannel. Dr R Old noted bitumen in the underlying sand (=?Crawshaw Sdst)

Subcrenatum MB?

BLK 7965-7969 578.30-578.63m

Lingula mytilloides

fish debris

Comment BLK 7965-7969 - The biofacies and relative position in the sequence suggests a correlation with the Subcrenatum MB. The underlying sand is therefore the Rough Rock.

NAMURIAN, YEODONIAN STAGE

G. cumbriense MB

BLK 7863-7878 7970-1 592.12-594.75m

Lingula mytilloides

Orbiculoidea cf nitida

ribbed shell fgt

pleurotomarian debris

coiled nautiloid indet

Anthracoceratites sp. juv (solid)

Gastrioceras cf cumbriense juv (strong close transversals)

Gastrioceras sp (badly corroded, tuberculate gerontic)

hindeodelloid conodont

Idiognathodus cf. magnificus

fish debris

BLK 7879-7883 596.50m

Lingula mytilloides

hindeodelloid conodont

fish debris

Comment BLK 7879-7883 - A split developed in the base of the G. cumbriense MB is not unusual in marginal sequences.

G. cancellatum MB

BLK 7884-7899 600.30-602.78m

Lingula mytilloides

Orbiculoidea sp juv.

Productus carbonarius

Anthraconeilo sp

Gastrioceras sp (late adolescent, tuberculate ghost)

Serpuloides stubblefieldi

fish debris

MARSDENIAN STAGE

G? sigma horizon?

BLK 7900-7904 610.30-611.15m

Lingula mytilloides

Serpuloides stubblefieldi

Comment BLK 7900-7904 - A Lingula band is sometimes developed as a couplet with the G. cancellatum MB. In this borehole the band is well spaced from the main G. cancellatum horizon. It is therefore unlikely that it belongs to the G. cancellatum cycle and since it is underlain by B. superbilingue a correlation with the G? sigma MB is proposed.

Non-marine R2C

BLK 7905-7911 618.80-619.62m

cf. Anthraconaia sp. (poor)

Carbonicola lenicurvata

Comment BLK 7905-7911 - C. lenicurvata is a typical late Namurian non-marine bivalve. The band is underlain by the B. superbilingue MB hence assignment to the R2C subzone index.

Bilinguites superbilingue MB

BLK 7912-16 620.20-621.00m

Lingula mytilloides

fish debris

BLK 7917-19 621.15-621.80m

Carbonicola sp (fgt)

fish debris

BLK 7920-7943 621.92-624.05m

sponge spicules

Lingula mytilloides

Orbiculoidea cincta

Crurithyris sp.

Productus sp. (poor)

stroboceratid nautiloid

Bilinguites cf superbilingue

Gastrioceras cf lineatum

platform conodont (lateral view)

Comment BLK 7912-7943 - The marine band contains a thin non-marine intercalation towards the top. The B. superbilingue horizon is characteristically a persistent Marsdenian incursion as reflected in the diverse fauna represented here.

B. metabilingue MB?

BLK 7944-9 626.95-628.30m

Lingula mytilloides

Orbiculoidea cincta

goniatite juv (ghosts)

Comment BLK 7944-9 - This band is tentatively correlated with the B. metabilingue horizon as it underlies the adjacent B. superbilingue MB. This horizon is better developed in Asfordby Hydro Borehole (see later).

B. eometabilingue MB?

BLK 7950-1 643.90m

Lingula mytilloides

BLK 7952-8 645.35-747.35

Bilinguites sp juv (pyritic)

fish debris

BLK 7959-61 649.20

Lingula mytilloides

conulariid debris

Comment BLK 7950-61 - These three closely spaced horizons are here interpreted as splits within one marine band. The splits are associated with volcano-terriginous clastics. The B. eometabilingue MB is well developed in the nearby Asfordby Hydro Borehole (see later).

(2) ASFORDBY HYDRO BOREHOLE

Westphalian A Communis chronozone

BLK 7972-7979 490.00-490.70m

Carbonicola bipennis
Curvirimula aff subovata
Naiadites flexuosus
Geisina arcuata
Spirorbis sp.
fish debris

Comment BLK 7972-7979 - This fauna is consistent with strata immediately overlying the Kilburn Coal.

BLK 7980-4 496.90-497.00m

Elonichthys sp.
Platysomus sp.

NAMURIAN or early WESTPHALIAN A

BLK 7985-88 530.50m

Carbonicola aff extenuata (juv)
Naiadites spat.

BLK 7989-91 531.11-531.30m

Lingula fgt
Orbiculoidea nitida

Comment BLK7989-91 - It is not clear which horizon this represents; it seems that a correlation with the Subcrenatum MB is most likely. It is clear from the proximity of definite late Namurian strata close to the Kilburn Coal that many Westphalian A horizons have been faulted out in this borehole.

Another correlation is that this is a split off the G. cumbriense MB (below).

NAMURIAN YEODONIAN STAGE

G. cumbriense MB

BLK 7992-8044 535.90-539.23m

Lingula mytilloides
Orbiculoidea cincta
Crurithyris sp.
Lissochonetes sp.
Productus carbonarius
Schizophoria sp.
Anthraconeilo sp.
Aviculopecten sp.
Pleurophorella sp.
orthoconic and cyrtoconic nautiloids
stroboceratid nautiloid
Gastrioceras cf crenulatum? (poor)

Serpuloides stubblefieldi

conodont debris

BLK 8045-49 550.20m

Lingula mytilloides

Rhizodopsis sp. scale

Comment BLK 8045-48 - This appears to be the Lingula band seen between the main G. cumbriense and G. cancellatum horizons in Holwell Works Borehole at c. 596m.

Non-marine Gla

BLK 8050-60 555.00-558.00m

Anthraconaia aff lenisulcata

Carbonicola lenicurvata

C. lenicurvata/pseudacuta

C. pseudacuta

Geisina arcuata

G. cancellatum MB

BLK 8061-8088 559.20-564.10m

Lingula mytilloides

Orbiculoidea cf nitida

Crurithyris sp.

Chonetoid indet fgt.

Linoproductus sp.

Productus carbonarius

gastropod indet.

goniatite ghost indet.

Serpuloides stubblefieldi

Comment BLK 8061-8088 - The relative position and biofacies of this marine band suggests a high degree of certainty that this is the G. cancellatum MB. The apparently thick Yeodonian compared to Holwell Works Borehole can be explained by facies changes and the steep dips encountered in Asfordby Hydro.

MARSDENIAN STAGE

Non-marine R2C

BLK 5089-92 577.04-578.05m

Anthraconaia aff. bellula (juv)

Carbonicola aff pseudacuta

Elonichthys sp.

Bilinguites superbilingue MB

BLK 8093-8115 578.30-584.30m

sponge spicules

Lingula mytilloides

Orbiculoidea cf cincta

calcareous brachiopod fgts indet

pleurotomarian indet

Bilinguites superbilingue

cf. Gastrioceras sp. (venter fgt.)

Comment BLK 8093-8115 - The proximity of this horizon to the G. cancellatum MB compared to Holwell Works and the lack of a G? sigma horizon suggests that some strata have been faulted out possibly at the interval 572.45-575.80m, where there was core loss.

Bilinguites metabilingue MB

BLK 8116-8130 601.70-604.10m

Lingula mytilloides
Orbiculoidea sp.
productoid fgt.
Schizophoria sp.
Euphemites sp.
Bilinguites sp. juv
hindeodelloid conodont
fish debris including Rhabdoderma sp.

Comment BLK 8116-8130 - Although B. metabilingue is not recognised in this fauna, the position of the band between B. superbilingue and B. eometabilingue supports a B. metabilingue correlation.

Non-marine R2b

BLK 8131-37 613.60-614.70

Anthraconaia bellula/lenisulcata
Carbonicola lenicurvata
Spirorbis sp.

B. eometabilingue MB

BLK 8138-8144 615.10-616.25m

Lingula mytilloides
fish debris

BLK 8145-8149 616.60-616.80m

Carbonicola aff lenicurvata
C. pseudacuta

BLK 8151-8168 617.80-620.10m

Lingula mytilloides
Orbiculoidea cincta
euomphaloid gastropod indet
Anthracoceratites sp. juv
Bilinguites cf eometabilingue

B. bilingue s.l. MB

BLK 8169-8178 625.85-627.35m

Lingula mytilloides

Bilinguites cf bilingue s.l.

fish debris

B. bilingue

Comment BLK 8169-8178 - It is not clear which of the three horizons present in complete sequences this band represents as the goniatites are poorly preserved.

B. gracile MB

BLK 8179-8184 640.99-641.35m

Sponge spicules

Lingula mytilloides

Orbiculoidea cincta

Bilinguites sp. (ventro-lateral fgt)

fish debris including Listracanthus sp.

Comment BLK 8179-8183 - The close proximity to the underlying R. coreticulatum MB shows that this horizon is almost certainly the B. gracile MB at the base of the Marsdenian Stage.

KINDERSCOUTIAN STAGE

R. coreticulatum MB

BLK 8184-8193 645.60-647.60m

Lingula mytilloides

Orbiculoidea cf cincta

Reticuloceras coreticulatum

Vallites striolatum

Indet Kinderscoutian

BLK 8197-8204 652.80-653.00m

Lingula mytilloides

ribbed shell fgt

turreted gastropod juv

goniatite ghost

conulariid fgts.

fish debris including Elonichthys sp.

BLK 8205 656.98m

Lingula myt.illoides fgt

Comment BLK 8198-8205 - It is not clear which horizons these two marine bands represent but they are presumably late Kinderscoutian.

3. ASFORDBY NORTH SHAFT BOREHOLE

WESTPHALIAN A Communis Chronozone

BLK 8206 511.50m

Carbonicola bipennis

Comment BLK 8206 - the presence of this bivalve confirms that the coal at 514.79m is the Kilburn Coal.

BLK 8207-9 517.88-518.85m

fish debris indet

Lenisulcata Chronozone

Listeri MB

BLK 8211-8221 549.70-552.60m

Sponge spicules

Lingula mytilloides

euomphaloid gastropod?

coiled mollusc fgt indet

Gastrioceras cf listeri (juv with strong transverse ornament)

Comment BLK 8211-8221 - As with all the horizons in this borehole, sampling was difficult due to numerous listric surfaces.

The sand developed between 539 and 544m may have been petroliferous before core racking as the core had characteristic staining.

Indet early Westphalian or late Namurian

BLK 8222-8224 560.00-561.00m

Lingula mytilloides

BLK 8225-7 572.00-572.25m

Lingula mytilloides

BLK 8228 575.30m

Lingula mytilloides

Comment BLK 8222-8228 - These faunal lists are probably incomplete as listric fractures prevented examination of bedding surfaces. I am unable to correlate these horizons precisely, owing to this factor and the obvious effect that the underlying volcanics have had on facies within the sequence, compared to Holwell Works and Asfordby Hydro boreholes.

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