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DISCOVERY OF LOWER CARBONIFEROUS OUTCROPS IN THE FITZROY BASIN WESTERN AUSTRALIA

by

G. A. Thomas

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ABSTRACT

Fossiliferous marine Lower Carboniferous sediments have been discovered in the Fitzroy Basin. The sequence, at least 1000 feet and possibly 1400 feet thick, consists of calcarenite and calcareous siltstone with brachiopods, sharks' teeth, rare corals, nautiloids, pelecypods, conchostracans and ostracods. The sequence is probably unconformable on the Upper Devonian and is overlain unconformably by the Permian Grant Formation.

INTRODUCTION

In 1953 the author, while examining the area in company with geologists of West Australian Petroleum Ltd., collected fossils from near the top of a section two miles north-west of Twelve Mile Bore, Brooking Station, than thought to belong to the Upper Devonian Fairfield Formation. When these fossils were examined they appeared to indicate a Lower Carboniferous age. Consequently the author revisited the area in 1955 and collected an abundant fauna from several sections and numerous localities. This fauna confirmed the presence of a considerable extent of Lower Carboniferous sediments in the area.

LAUREL FORMATION

The Laurel Formation is defined as the sequence of fossiliferous calcarenite and siltstone of Lower Carboniferous age between the Upper Devonian Fairfield Formation and the Permian Grant Formation, probably in unconformable relationship to both.

The name is taken from Laurel Downs pastoral station where the formation crops out over wide areas.

The type locality is near Twelve Mile Bore, Brooking Station and the two type sections (of different party of the formation) are (1) - 2 miles north-west and (11) - 3 miles south-south-east of Twelve Mile Bore, at Latitude 17°55' South, Longitude 125°14'30" East and at Latitude 17°58' South, Longitude 125°2' East respectively.

Type Section 1 was measured in folded sediments, with the lowest bed situated about 2 miles north-west of Twelve Mile Bore. This section was originally examined by West Australian Petroleum geologists in company with the writer who has since re-examined it. As measured and calculated by him, the following section is exposed, in descending order:

(b) Yellowish-brown shelly calcarenite, usually thin bedded, interbedded with poorly exposed thicker sequences. The calcarenite is medium grained; some beds are sandy; the poorly exposed beds are, in part at least, siltstone. Fossils are abundant in some beds; they include brachiopods, shark's teeth, rare corals, nautiloids and pelecypods.

Thickness about 300 feet.

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(a) Pale grey to pale brown sandy calcarenite, mainly thin tough beds with several thicker sequences, interbedded with softer non-outcropping sediments. The non-calcareous sand grains are mostly quartz and are fine-grained to coarse-grained and subangular to rounded. Thin sandstone beds are present near the base. Fossils are rare.

Thickness, about 700 feet.

The upper and lower boundaries of Section 1 are covered by sand and alluvium respectively.

Section 11 part of which may correspond to part of section 1, was measured about 3 miles south-south-west of Twelve Mile Bore. It comprises : yellow brown fossiliferous calcarenite, similar in lithology to that of Section 1b, with poorly exposed sediments interbedded. Fossils are abundant and include forms not present in section 1b; weathered-out specimens are common.

Thickness, about 400 feet.

The lower i.e. eastern boundary of section 11 is a probable fault plane, on the eastern side of which is yellow-brown calcarenite and further east is grey sandy calcarenite, similar to that in section 1a. The upper boundary of section 11 is covered by sand. Section 11 is certainly stratigraphically higher in part than section 1 and may be entirely so. A bed rich in sharks' teeth occurs at the top of section 1 and low in section 11; if these are the same horizon, as appears likely, then nearly all of section 11 will be stratigraphically higher than section 1. In that event, the outcropping section will total about 1400 feet.

DISTRIBUTION AND NATURE OF OUTCROP

Outcrops of the Laurel Formation were identified in the areas shown in Figure 1. At about 6 miles north-west of Twelve Mile Bore, on Spielers Creek, the lower sandy calcarenites are not exposed. Here some 500 to 600 feet of yellow to grey calcarenite crop out. These beds have Lower Carboniferous brachiopods at several levels.

The widest extent of outcrop is in the region south and west of Egan's Bore. The lithologies are similar to those of sections 1 and 11. About 4 miles west of Egan's Bore, beds high in the formation are exposed in gullies. Here thick sequences of grey siltstone interbedded with thinner yellow-brown calcarenite are present; fossils are abundant.

PALAEONTOLOGY AND AGE

The lower grey sandy calcarenite beds have few fossils. The coral Syringopora is present in patches near the base of Section 1 and scattered crinoid stems and small brachiopods, mainly "Camarotoechia" pleurodon var. tripla Prendergast occur at several levels. The higher yellow-brown calcarenite and siltstone are richly fossiliferous and a zonation of forms and assemblages can be discerned. The following associations in ascending order, have been noted in the upper beds - section 1b:

Bradyodont sharks' teeth and "Camarotoechia"; then solitary rugose corals, a productid cf. Pustula, "Camarotoechia" pleurodon var. tripla, Composita sp. and crinoid stems; somewhat higher is a sequence of over 10 feet with numerous cladodont and bradyodont sharks teeth, conchostracans, a spinose productid, "Camarotoechia" and bone fragments.

In section 11, bradyodont and cladadont teeth, and "Camarotoechia" occur low in the section; then follow numerous weathered - out specimens of Cleiothyridina sp., Rhipidomella sp., Composita sp. aff.C.Subtilita Hall., cf.Athyris sp., "Camaratoechia" pleurodon var.tripla, productids cf.Buxtonia sp. and Pustula sp., indeterminate Orthotetaceae and abundant partly silicified Syringopora sp. Next above, follows a rich bed some 10 feet thick with abundant Spirifer cf.tornacensis de Koninck, Composita sp., Linoproductus sp., Pustula sp., "Camarotoechia" sp., an orthotetid cf. Schellwienella sp., cf.Eomartiniopsis sp., large gastracods, smaller Bucanopsis sp., two species of Conchostraca, ostracods, straight nautiloids and Syringopora sp. Next and the highest exposed are beds with "Camarotoechia" sp. and pelecypods of schizodid affinities.

Two of the species have already been described by Prendergast (1935) as Camarotoechia pleurodon var.tripla Prendergast and Composita subtilita Hall.

Most of the forms listed above show close affinities with Lower Carboniferous species from West Europe and/or Russia. Spirifer cf. tornacensis de Kon. is especially useful as an indication of the age. The members of the S. tornacensis group are characteristic of the Tournaisian in the West European, Moscow Basin and Donetz Basin Carboniferous sequences and allied species are present in the early Mississippian of North America.

The lower sandy calcarenite contains fewer and less diagnostic fossils; however as the sequence is conformable with the higher beds and the few forms present are also present higher, they are probably also Carboniferous. Lithologically and faunistically, the lower beds are quite distinct from the richly fossiliferous Fairfield Formation which contains abundant Cyrtospirifer sp., Theodossia sp., Productella sp., numerous other brachiopods, rugose corals and bryozoa. This is the fauna of the "Productella Zone" of Stage 4 or possibly stage 5, Upper Devonian age (Teichert 1949).

Of interest in the faunas, is the presence of conchostracans and sharks' teeth. Both bradyodont and cladodont teeth are present, the latter showing a strong resemblance to certain Lower Carboniferous species such as Ctenacanthus costellatus Traquair. It is not usually possible to identify Palaeozoic sharks generically by teeth alone. The Laurel specimens possess a fluted crown and up to four lateral cusps on each side and have an external enamel layer - figure 2. As far as known to the author, such teeth have not previously been recorded in Australia. The bradyodonts are of several types and are also Lower Carboniferous in aspect. Bradyodonts are known in the Permian rocks of the Carnarvon Basin, Western Australia (Teichert 1943) and are also present in the Permian of the Fitzroy Basin. Bone-like fragments, possibly ossified skull or jaw parts of sharks, are also common in some beds of the Laurel Formation. The presence of conchostracans seems to indicate that during the deposition of the Laurel Formation, the sea received brief influxes of fresh or brackish waters.

STRUCTURE

Outcrops of the formation are folded and faulted. The major structures are indicated on the sketch map - figure 1. The whole sequence appears to be conformable; however, in section 1 and its vicinity, the higher yellow brown calcarenite shows steeper dips than the lower grey sandy calcarenite which dips at about 18°; the strikes are parallel and show considerable folding. Generally in the area near Twelve Mile Bore and further north-west, dips are south-west to south. In the area west and south of Egan's Bore, dips are mainly north-east to north, excepting the area about four miles south west of the bore, where the dip is north-west.

The Laurel Formation has strikes notably different from those of the Oscar Formation - massive Upper Devonian Limestones - which dip at about 15 to 20° south-west. A belt of alluvium separates outcrops of the two formations. This alluvium may mask the Fairfield Formation which crops out at Oscar Hill and on the main road some four miles south of Oscar Hill. The contact between Laurel and Fairfield formations was not observed. It is possible that they are unconformable. Certainly, the fold and fault pattern of the Laurel Formation suggest that it has had a different structural history from that of the Oscar Formation. One possible interpretation is that the Laurel beds were deposited on an eroded surface of the Devonian and thus some of the dips may be initial in part.

The Grant Formation (Permian) unconformably overlies the Laurel Formation in places but generally the upper boundary of the latter is covered by sand or alluvium. It is possible that higher parts of the Laurel Formation or other Carboniferous rocks are present below the sand cover in the areas west of the Laurel Downs homestead.

OTHER OCCURRENCES OF CARBONIFEROUS ROCKS IN THE FITZROY BASIN

An exploratory bore, BMR 2, near Laurel Downs homestead, drilled for the Bureau of Mineral Resources, has revealed the presence of fossiliferous Lower Carboniferous sediments below 80 feet of sandstone of the Grant Formation. These fossiliferous beds in the Laurel Formation. Cores available from 1370 feet are probably still in the Carboniferous.

In 1955 the West Australian Petroleum Grant Range No.1 Bore passed through about 8,000 feet of unfossiliferous Grant Formation and then about 5,000 feet of partly marine and partly freshwater sediments. In these at several levels, Dr. A. A. Opik has identified conchostracans, pelecypods and some plants indicative of Westphalian (Upper Carboniferous) age. Drilling was suspended at 12,915 feet without indication that Lower Carboniferous or older rocks had been reached.

Some of the older literature on the Fitzroy Basin refers to the presence of Lower Carboniferous rocks in the basin. These are incorrect; the beds so designated are either Devonian or Permian. The suggestion that Lower Carboniferous marine fossils are present in certain old bores e.g. the Price's Creek bores can be discounted.

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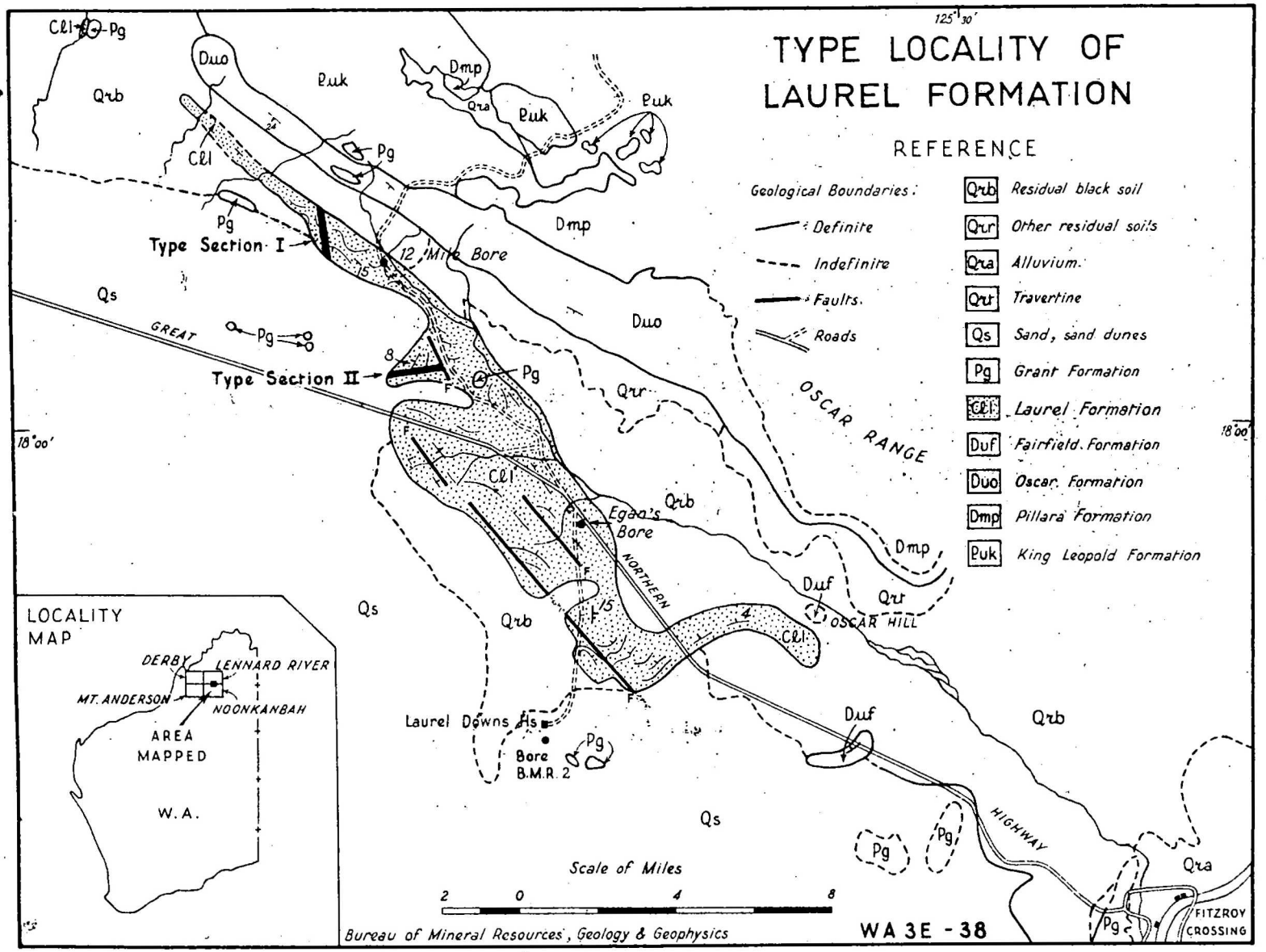
TYPE LOCALITY OF LAUREL FORMATION
REFERENCE
Geological Boundaries:
Definite
Indefinite
Faults.
Roads
Qrb Residual black soil
Qrr Other residual soils
Qra Alluvium.
Qrt Travertine
Qs Sand, sand dunes
Pg Grant Formation
Cll Laurel Formation
Duf Fairfield Formation
Duo Oscar Formation
Dmp Pillara Formation
Puk King Leopold Formation
125°30'
18°00'
Type Section I
Type Section II
12 Mile Bore
Egara's Bore
Laurel Downs Hs
Bore B.M.R. 2
OSCAR RANGE
OSCAR HILL
NORTHERN
GREAT
HIGHWAY
FITZROY CROSSING
LOCALITY MAP
DERBY
LENNARD RIVER
MT. ANDERSON
NOONKANBAH
AREA MAPPED
W.A.
Scale of Miles
2 0 4 8
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