MICROPALAEONTOLOGY AND STRATIGRAPHY OF ROEBUCK NO. I BORE, CANNING BASIN, WESTERN AUSTRALIA.

by

Irene Crespin & M. A. Condon

RECORDS 1956/139.

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Thirty-nine cores from Roebuck Bay No. I Bore were received from West Australian Petroleum Pty. Ltd. for micropalaeontological examination. In a letter dated 24/9/56, core No. 2 was listed as being sent but it was not among the collection received. The depth of core No. 3 in the collection was labelled "205-215 feet"; in the letter of 24/9/56, the depth is given as "295-305 feet". Core No. 4 in the list is from 395-405 feet; it is labelled "395-400 feet".

Cores Nos. 15, 16, 17, 18, 21, 25, 26, 29 and 32 were not forwarded for examination. It is unfortunate that these were not made available as it has not been possible to observe the stratigraphical break between the Mesozoic and Permian which must have occurred between the depths of 1295-1305 feet (core No. 14) and 1590-1600 feet (core No. 19).

Detailed Examination of Cores

Core 1: 95-105 feet. Pink micaceous unfossiliferous sandstone.

Core 3: ?205-215 feet. Unfossiliferous siltstone.

Core 4: ?395-400 feet. White unfossiliferous siltstone.

Core 5: 499-509 feet. Glauconitic sandstone with crushed tests of arenaceous foraminifera.

Foraminifera: *Ammobaculites* aff. *alaskaensis* Tappan
Hyperammina sp.
Trochammina sp.

Core 6: 580-590 feet. Glauconitic claystone. No fossils.

Core 7: 590-600 feet. Pyritic glauconitic claystone with well preserved tests of calcareous species of foraminifera.

Foraminifera: *Enantiodentalina* sp.
Guttulina physalia Leeblich and Tappan
Lenticulina spp.
Saracenaria oxfordiana Tappan
Vaginulina curva Franke
Vaginulina cf. *inspissata* Leeblich and Tappan

Core 8: 690-700 feet. Massive siltstone with a few tests of calcareous species of foraminifera.

Foraminifera: *Lenticulina* cf. *audax* Loeblich and Tappan
Lenticulina sp.
Saracenaria sp.

Core 9: 790-800 feet. Glauconitic, fine silty sandstone with a few foraminifera, crinoid stems and ostracoda indeterminate.

Foraminifera: Lenticulina cf. audax Loeblich and Tappan
Lenticulina sp.
Saracenaria cf. oxfordiana Tappan

Core 10: 890-900 feet. Glauconitic micaceous silty sandstone with a few foraminifera and radiolaria.

Foraminifera: Epistomina sp.
Lenticulina sp.
Rotalid indeterminate

Radiolaria: Cenosphaera sp.

Core 11: 972-982 feet. Glauconitic siltstone with a few foraminifera.

Foraminifera: Epistomina sp.
Lenticulina spp.
Saracenaria oxfordiana Tappan
Saracenaris sp.

Core 12: 1090-1100 feet. Glauconitic silty claystone with a few foraminifera and indeterminate ostracoda.

Foraminifera: Lenticulina sp.
Saracenaria cf. oxfordiana Tappan

Core 13: 1195-1203 feet. Grey slightly glauconitic, micaceous quartz greywacke. No fossils.

Core 14: 1295-1305 feet. Silty claystone. No fossils.
Spores, Ia [illegible]

Core 19: 1590-1600 feet. Dark grey, pyritic, micaceous siltstone with foraminifera rare (Hyperammina spp.)

Core 20: 1690-1700 feet. Dark grey greywacke, with poorly preserved foraminifera (Frondicularia spp. and productid spines.

Core 22: 1890-1900 feet. Grey, finely interlaminated quartz sandstone and micaceous siltstone, with indeterminate arenaceous foraminifera.

Core 23: 1989-1999 feet. Hard grey limestone with a few foraminifera and indeterminate ostracoda.

Foraminifera: Calcitornella stephensi (Howchin)
Frondicularia sp. nov.
Geinitzina triangularis Chapman and Howchin

Core 24: 1999-2006 feet. Hard grey limestone with poorly preserved bryozoa and productid spines.

Core 28: 2290-2300 feet. Silty sandstone of tillitic texture, with some large quartz grains. No fossils.

Core 30: 2446-2453 feet. Silty sandstone of fine tillitic texture. No fossils.

Core 31: 2543-2553 feet. Micaceous sandy siltstone with numerous crushed tests of arenaceous foraminifera and some calcareous forms.

Foraminifera: Hyperammina expansa (Plummer)
Hyperammina spp.
Hyperammina sp. nov.
Glomospirella sp.
Nodosaria sp. nov.
Reophax fittsi (Warthin)
Thuramminoides sphaeroidalis Plummer

Core 33: 2648-2653 feet. Grey siltstone with pyritic nodules, a little carbonaceous material and arenaceous foraminifera.

Foraminifera: Ammovertella sp.
Hyperammina expansa (Plummer)
Hyperammina spp.
Thuramminoides sphaeroidalis Plummer

Core 34: 2738-2748 feet. Massive siltstone with some carbonaceous material. No fossils.

Core 35: 2841-2848 feet. Tillitic siltstone and sandstone, core showing steep dip of about 50 degrees. No fossils.

Core 36: 2941-2951 feet. White, friable, sandy siltstone. No fossils.

Core 37: 3040-3050 feet. White, friable sandy siltstone. No fossils.

Core 38: 3140-3150 feet. Sandy siltstone of slightly coarser texture than Core 37. No fossils.

Core 39: 3242-3260 feet. Uneven-grained silty sandstone. No fossils.

Core 40: 3321-3327 feet. Grey tillitic siltstone. No fossils

Core 41: 3356-3362 feet. Cream limestone breccia, with a few fossil remains including shell fragments, conodonts and ostracoda. Numerous sphaerical bodies are also present. Some may represent radiolaria but others have the character of calcisphaeres.

Core 42: 3420-3426 feet. Cream limestone breccia similar to Core 41.

Core 43: 3515-3522 feet. Hard grey limestone.

Core 44: 3615-3621 feet. Calcareous coarse sandstone showing low core dip of about 10 degrees.

Core 45: 3690-3695 feet. Bright green, ?glauconitic siltstone with crystals of dolomite. No fossils.

Core 46: 3818-3826 feet. Coarse, porous, laminated calcarenite, ?dolomitic.

Core 47: 3920-3930 feet. Calcarenite, not quite as coarse as Core 46.

Core 48: 3983-3993 feet. Grey siltstone, calcareous in parts, and with pyritic nodules and ? invertebrate tracks.

Core 49: 3993-4000 feet. Hard, red, brown and pale green laminated siltstone, calcareous in places.

Notes on the Cores

The stratigraphical sequence, with probable age of the beds is given below:

Cores	Depth in ft.	Age	Formation	Fossils
1-4	95-405	?	-	-
5-12	499-1100	Middle Jurassic	-	Arenaceous and calcareous foraminifera
13-14	1195-1305	?	-	-
19, 20, 22	1590-1900		Noonkanbah	Arenaceous foraminifera
23, 24	1989-2006		Nura Nura	Foraminifera, Bryozoa, Productid spines
		Lower Permian		
28, 30	2290-2453		? Grant	-
31, 33	2543-2653		?	Arenaceous and calcareous foraminifera
34-40	2738-3327		Grant	-
41-43	3356-3522		-	Ostracoda Conodonts
44-49	3615-4000	?Devonian	-	Invertebrate tracks in Core 48

Foraminifera were first found in Core 5 at 499-509 feet. All forms are arenaceous. Cores 6 to 12, from 580 feet down to 1100 feet, contained well preserved tests of calcareous foraminifera belonging to the families Lagenidae and Rotaliidae. One species of Saracenaria was identified as S. oxfordiana Tappan, from the Jurassic of Alaska (Tappan, 1955). This form was recorded in a previous report (Crespin 1956) on two cores from Roebuck Bay Bore No. 1 as S. tricarinata Gumbel. The records of this species in Jurassic sediments passes into the synonomy of S. Oxfordiana. Guttulina physalia was described by Leoblich and Tappan (1950) from the Oxfordian of South Dakota. The many well preserved tests of Lenticulina are apparently new to the Australian Jurassic foraminiferal assemblages. Rotaline foraminifera are rare in the Jurassic but tests are present in Core 10 at 890-900 feet.

Cores 13 and 14 contained no fossil evidence to indicate age.

It is unfortunate that Cores 15, 16, 17 and 18 were not submitted for examination as the stratigraphical boundary between the Mesozoic and the Permian is apparently

present in that interval.

Core 19, at 1590-1600 feet, contained the arenaceous genus Hyperammina, the preservation of some of the tests being similar to that found in subsurface deposits of the Noonkanbah Formation in the Fitzroy and Canning Basins. Fragments of tests of Frondicularia including new species known from the Noonkanbah Formation were present in core 20 at 1690-1700 feet.

Cores 23 and 24 are regarded as being equivalent of the Nura Nura Member of the Poole Sandstone. Core 23 at 1989-1999 feet and core 24 at 1999-2006 feet, were represented by hard grey limestone. Core 23 contained Calcitornella stephensi, Geinitzina triangularis and a new species of Frondicularia, whilst the rock in core 25 contained poorly preserved bryozoa and productid spines. The above species of foraminifera are found not only in the Nura Nura Member but also in the higher Noonkanbah Formation. In the Carnarvon Basin, C.stephensi has not so far been found outside beds of the Callytharra Formation.

Core 28 at 2290-2300 feet and Core 30 at 2446-2453 feet, are sandstones with tillitic texture, resembling the lithology of the Grant Formation.

Cores 31 and 33 contained many poorly preserved tests of arenaceous foraminifera including Hyperammina expansa, which is also found in the Noonkanbah Formation. A new species of Glomospirella was also present. However, the form which indicates that the beds are stratigraphically lower than those of the Noonkanbah Formation is a new species of Nodosaria which is very common in the beds of the Callytharra Formation in the Carnarvon Basin, and so far has been found only in beds which are stratigraphically equivalent of the Callytharra Formation.

No lithological equivalent of the Poole Sandstone is represented in the cores. It appears likely that only the Nura Nura Member is present and represented by Cores 23 and 24. The fossiliferous beds represented by cores 31 and 33 may be part of the Grant Formation, here, as in the Lyons Group of the Carnarvon Basin, including marine fossils.

Cores 34 to 40 are sandy siltstones, some with tillitic texture. Core 35 at 2841-2848 feet shows a core dip of about 50 degrees. The beds in the interval from 2738 feet down to 3327 feet are unfossiliferous and most probably are the equivalent of the Grant Formation.

Core 41 at 3356-3362 feet and core 42 at 3420-3426 feet are fossiliferous limestones containing fragments of ostracoda and conodonts. Sphaerical bodies, which are common, suggest calcisphaeres. These limestones appear to be of reef origin, and are most probably of Devonian age.

Core 44 at 3615-3621 feet is a coarse sandstone showing a low core dip of about 10 degrees.

Core 48 at 3983-3993 feet is a calcareous siltstone containing probable invertebrate tracks.

It is most probable that the sediments of cores 43 to 49 were also laid down in a reef environment and can be included in the Devonian.

Palaeogeographic Significance

The information obtained by this bore gives important indications of the palaeogeography of this part of the Canning Basin. The bore was drilled on geophysical evidence of a basement high in this area: Bureau of Mineral Resources and West Australian Petroleum aeromagnetic surveys and Bureau gravity survey had agreed in indicating a basement ridge trending eastward from Roebuck Bay.

The presence of reef rock indicates that this "ridge" was in existence in the Devonian (if that in fact is the age of the rock) as such reefs can develop only in shallow water. The Grant Formation is generally finer-grained than in outcrop or in Fitzroy Basin bores and appears to contain a marine fossiliferous member. This makes it more like the equivalent Lyons Group of the Carnarvon Basin which has several marine fossiliferous members. The Grant Formation is between 1037 and 1350 feet thick - this is very much thinner than the 8500 feet at Grant Range and tends to confirm the existence of a ridge during the deposition of the Grant Formation. Poole Sandstone is not present apart from its fossiliferous basal member. This indicates either non-deposition or erosion of this formation. The Noonkanbah is at least 310 feet thick but may be about 800 feet. It is thinner than in the Fitzroy Basin but otherwise similar. No Liveringa Formation or Triassic. was seen but in any case they together cannot be more than 490 feet thick. All of this information is consistent in indicating a continuing high area relative to the Fitzroy Basin.

The ridge may have been elevated by tectonic activity before the Devonian or it may be an original topographic ridge on the surface of the Precambrian. In either case Ordovician and possible Cambrian may be present within reach of the drill, although it is possible that they either were not deposited or were removed by erosion during the Silurian regression because of the elevation of the ridge.

References

Crespin, I., 1956 - Micropalaeontological Examination of Bore Cores from Roebuck Bay No. I Stratigraphical Bore, Canning Basin, Western Australia. Bur.Min.Resour. Records 1956/90.

Loeblich, A.R., and Tappan, H., 1950 - North American Jurassic Foraminifera: The Type Redwater Shale (Oxfordian) of South Dakota. J.Paleont. 24 (1), 39-60.

Tappan, H., 1955 - Foraminifera from the Arctic Slope of Alaska. Part 2, Jurassic Foraminifera. U.S.geol.Surv.Prof.Pap. 236 - B.