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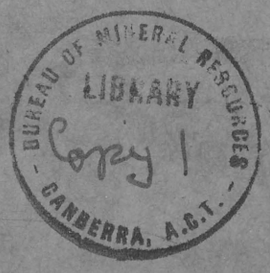

REPORT ON THE BRYOZOAN FAUNAS OF THE NURA NURA LIMESTONE AND THE NOONKANBAH SERIES.

by Joan Beattie, D. Sc.

Also:

Supplementary List of the Bryozoan Faunas of Localities in the Noonkanbah Series represented by Teichert's Collections... pp. L-3

RECORDS 53/67.

Report on the Bryozoan Faunas of the Nura Nura Limestone and the Noonkanbah Series.

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Also:

Bryozoan Faunas from individual Localities.

W 34 B: Fenestella horologia

W 40: Polypora: 6

W 36: Stenodiscus: 1

W 44 B: Hexagonella: 1

W44: Stenopora: 1, Fenestella horologia.

W 42 B: Fistulipora: 1
Evactinopora crucialis
Lyropora: 1
Hexagonella: 2
Polypora: 6

W 42 C: Batostomella spinigera Bass. Fenestella horologia
Streblotrypa marmionensis

PR 137 H: Batostomella: 1
Ramipora ambrosoides
Streblotrypa marmionensis
Polypora megastoma Waag. & W.
Phyllopora: 1

PR 137 G: Prismopora: 3
Streblotrypa marmionensis

PR 136: Goniocladia timorensis Bass.
"Sulcoretepora," sp. indet.
Streblotrypa marmionensis
Fenestella horologia
Fenestella columnaris
Polypora: 1
Polypora: 3
Polypora: 4
Polypora: 5

Dadja Hill: Streblotrypa marmionensis

PR 288 (NK 20): Ramipora ambrosoides
Prismopora: 3
Batostomella: 1
Batostomella spinigera Bass.
Rhombopora multigranulata
Streblotrypa marmionensis

PR 284 S: Dyscritella: 2

PR 126: Prismopora: 3
Stenopora nr. Leioclema: 3
Stenodiscus: 4
Streblotrypa marmionensis

PR 284 R: Batostomella spinigera Bass.
Dyscritella (?): 1
Rhabdomeson: 1
Rhombopora multigranulata

R 478:
Hexagonella bifida
Hexagonella: 1
Prismopora: 3
Stenopora spicata Bass., var. nov. (small type)
Rhabdomeson mammillata
Rhabdomeson grande Bass.
Streblotrypa marmionensis

PR 302A:
Fistulipora vacuolata
Prismopora: 3
Stenopora, nr. Leioclema: 6
Polypora: 1
Polypora:

PR 291:
Fistulipora: 2
Fistulamina: 1
"Sulcoretapora": 1
Ramipora ambrosoides
Goniocladia indica Waag. & W.
Rhabdomeson mammillata
Rhabdomeson bisponosa
Rhombopora: 1
Streblotrypa marmionensis
Fenestella: 1
Polypora: 2(nr gigantes W & W)
Polypora: 4
Synocladia spinosa, var. nov.

GG 2:
Evactinopora crucialis
Eridopora (?) sp.
"Sulcoretepora" meridianus
Stenodiscus: 1
Ramipora ambrosoides
Rhabdomeson mammillata
Streblotrypa marmionensis
Fenestella horologia
Fenestella columnaris
Polypora: 1

NK 32:
Batostomella spinigera Bass.
Rhombopora: 1
Streblotrypa marmionensis

PR 284 N:
Prismopora: 1
Ramipora ambrosoides
Batostomella: 2
Streblotrypa marmionensis
Fenestella horologia
Phyllopora: 1

G 51:
Eridopora: 1
Fistulamina: 1
Evactinopora crucialis
Batostomella: 1
Bastostomella spinigera Bass.
Rhabdomeson: 1
Streblotrypa marmionensis
Polypora fovea
Polypora megastoma Waag. & W.
Minilya duplaris

R 422:
Prismopora: 3
"Sulcoretepora" : 2
"Sulcoretepora": 3
Stenopora spicata var. nov.,
Rhombopora: 1
Rhombopora: 3
? Fenestella basleoensis Bass. large type

KW:
Eridopora: 1
Hexagonella australe
Prismopora: 3
Evactinopora: 1
Tabulipora: 1
Stenopora: 3
Batostomella: 1
Bastostomella: spinigera Bass.
Dyscritella adnascens Bass.
Bastostomellid gen indet.
Rhabdomeson: 1
Rhombopora multigranulata
Rhombopora filiformis
Streblotrypa marmionensis
Fenestella horologia
Fenestella disjecta
Fenestella valentis
Fenestella cacuminatis
Fenestella columnaris
Polypora fovea
Polypora multiporifera
Polypora: 1
Polypora: 4
Polypora: 5
Minilya duplaris
Minilya princeps
Protoretepora ampla
Ramipora ambrosoides
Goniocladia timorensis
Goniocladia n. sp.

PR 284 J:

Fistulipora: 4
Hexagonella: 1
Coscinium: 2
Coscinium: 3
"Sulcoretepora": 2
Stenopora spicata var. nov.,
Stenopora nr. Leioclema: 4
Stenopora nr. Leioclema: 5
Bastostomella spinigera Bass.
Dyscritella adnascens Bass.
Dyscritella: 2
Rhombopora: 3
Streblotrypa marmionensis
Fenestella horologia
Fenestella valentis
Fenestella columnaris
small type
Polypora megastoma de Kon.
Polypora: 3
Phyllopora: 1

PR 256:

Eridopora: 1
Hexagonella bifida
Fistulamina: 1
"Sulcoretepora" meridianus
"Sulcoretepora" : 1
Stenopora nr. Leioclema: 6
Tabulipora: 1
Batostomella: 2
Batostomella spinigera Bass.
Dyscritella: 2
Ramipora ambrosoides
Goniocladia indica Waag. & W
Rhabdomeson mammillata
Rhombopora: 1
Streblotrypa marmionensis
Streblotrypa minutula Bass.
Fenestella columnaris
Fenestella: 1
Polypora fovea
Polypora woodsi
Polypora: 3
Polypora: 4
Synocladia spinosa var. nov.

PR 113:

Dyscritella: 2

PR 284 H:

Stenodiscus: 3

PR 281:
(NK 15)

Fistulipora: 2
Eridopora: 1
Stenopora spicata var. nov.,
Tabulipora: 1
Stenodiscus: 3
Dyscritella: 2
Rhabdomeson mammillata var nov.
Rhombopora multigranulata
Rhombopora: 1
Streblotrypa marmionensis
Streblotrypa minutula Bass.
Fenestella horologia
large type
Fenestella disjecta
Fenestella columnaris
Polypora fovea

PR 298:
(NK 12)

Hexagonella australe
Coscinium: 1
"Sulcoretepora": 1
Ramipora ambrosoides
Tabulipora: 1
Dyscritella cf. spinulosa Bass.
Rhabdomeson mammillata var. nov.
Rhabdomeson: 1
Rhombopora: 1
Rhombopora: 3
Streblotrypa marmionensis
Streblotrypa minutula Bass.
Fenestella horologia
Fenestella disjecta
Fenestella columnaris
Polypora woodsi
Polypora 2 nr. gigantea Waag. & W.

PR 284C:

Hexagonella: 1
Prismopora: 2
Coscinium: 1
"Sulcoretepora": 2
Ramipora ambrosoides
Stenopora spicata var. nov.,
Stenopora: 3
Streblotrypa marmionensis
Fenestella horologia
Fenestella disjecta
Fenestella columnaris
Polypora woodsi
large type
Polypora: 1
Polypora: 2 nr. gigantea

PR 284 B: Fistulipora vacuolata
Coscinium: 1
"Sulcoretepora" : 1
Rhabdomeson mammillata var. nov.
Streblotrypa marmionensis
Fenestella horologia
Minilya duplaris

SR 84: Fistuliporoid gen. indet.
Stenodiscus: 2

PR 284 A: Eridopora: 1
Hexagonella: 1
Coscinium: 1
"Sulcoretepora" : 1
Ramipora ambrosoides
Goniocladia timorensis Bass.
Stenopora spicata var. nov.,
Dyscritella: 2
Rhabdomeson mammillata var. nov.
Rhombopora: 1
Rhombopora: 3
Rhombopora sp. nr. R. wanneri Bass.
Streblotrypa marmionensis
Streblotrypa minutula Bass.
Fenestella horologia
Fenestella disjecta
Fenestella columnaris
Fenestella basleoensis
Polypora multiporifera
Polypora mègastome de Kon.
Polypora: 1
Polypora: 4
large type
Polypora: 5
Minilya duplaris
Minilya princeps
Phyllopora robusta Bass.
Phyllopora: 1
Phyllopora: 2

SR 6: Streblotrypa marmionensis

SR 1 E:

PR 261: Fistulipora: 3
Coscinium: 1
Stenodiscus: 3
Rhabdomeson mammillata var. nov.
Rhombopora: 1
Rhombopora: 3
Streblotrypa marmionensis
Minilya duplaris

NE 5: Stenodiscus: 2
Batostomella: 1
Dyscritella: 3

Distribution of species occurring in areas other than the Kimberley District.

Hexagonella australe (Bretnall): (KW, NK 12): Callytharra.

Hexagonella: 1: (W 44 B, R 478, PR 284 j, PR 284 C, PR 284 A): Common in the Callytharra at Jacob's Gully and other localities, and recorded from there under the name H. dendroidea (Hudleston), a similar but distinct species.

Evactinopora crucialis Hudleston: (W 42 B, GG 2, G 51: also T 202 Teichert, highest beds of Noonganbah, Mt. Marmion): Common in the Callytharra from which it was first described; has also been recorded by Etheridge (1915) from Mt. Marmion.

Ramipora ambrosoides (Bretnall): (PR 137 H, PR 288, PR 291, GG 2, PR 284 N, KW, PR 256, PR 281, PR 298, PR 284 C): Common in the Callytharra and Wandagee Series; also Basleo Beds, Timor.

Goniocladia timorensis: (PR 136, KW, PR 284 A): Bassler; Basleo Beds, Timor.

Goniocladia indica Waagen and Pichl: (PR 291, PR 256): Middle Productus Limestone, Salt Ra.; Basleo Beds, Timor.

Stenopora spicata (Bassler): (Varieties at: R 478, PR 284 J, R 422, PR 284 C, PR 284 A): Koeka near Baung, Timor.

Batostomella spinigera (Bassler): (W 42 C, PR 288, PR 284 R, NK 32, G 51, KW, PR 284 J, PR 256, PR 284 C): Callytharra - unrecorded; Thie near Baae, Island of Rotti.

Dyscritella adnascens Bassler: (KW, PR 284 J): Callytharra - unrecorded Basleo Beds and at Noil Nalien, Timor.

Dyscritella spinulosa Bassler: (similar form at NK 12): Basleo Beds, Timor.

Rhabdomeson bispinosa Crockford: (PR 291, also B 119 of Teichert, just N. of Hill C, Grant Ra.): Callytharra.

Rhabdomeson grande Bassler: (R 478): Bitaoeni Beds, Timor.

Rhombopora wanneri Bassler: (PR 284 A): Basleo Beds, Timor.

Streblotrypa marmionensis Etheridge: (from W 42 C to PR 261): Callytharra through to Wandagee Series; Basleo and Amarassi Beds, Timor.

Streblotrypa minutula Bassler: (PR 256, NK 15, NK 12, PR 284 A): Basleo and Amarassi Beds, Timor.

Fenestella horologia Bretnall: (W 34 B to PR 284 A): Common from Callytharra through to Wandagee Series; Bitaoeni and Basleo Beds, Timor: Permian, Vancouver Island; Dilly Stage, Queensland.

Fenestella disjecta (Crockford): (KW, NK 15, NK 12, PR 284 C, PR 284 A) Linoproductus Stage of Wandagee.

Fenestella columnaris (Crockford): (PR 136, GG 2 KW, PR 284 J, PR 256, NK 15, NK 12, PR 284 C, PR 284 A): Calceolispongia Stage of the Wandagee: does not occur in the Callytharra from which I unfortunately recorded it instead in a faunal list by mistake.

Fenestella basleoensis Bassler: (? R 422; PR 284 A): Basleo Beds.

Polypora fovea Crockford: (G. 51, KW, PR 256, NK 15): Calceolispongia Stage of the Wandagee.

Polypora woodsi (Etheridge): (KW, PR 256, NK 12, PR 284 C): Callytharra; Bitaoeni Beds, Timor; Dilly Stage and Lake's Ck., Qld.; Upper Marine, N.S.W.; Granton, Tasmania.

Polypora multiporifera Crockford: (PR 284 A): Calceolispongia Stage of Wandagee.

Polypora megastoma de Koninck: (PR 137 H, G 51, PR 284 J, PR 284 A): Middle Productus Lst., Salt Ra.

Polypora gigantea: Waagen and Wentzel: (similar form, PR 291, PR 284N) NK 12, PR 284 C): Middle Productus Lst., Salt Ra.

Lyropora: W 42 B: probably species is same as an undescribed form from the Callytharra.

Minilya duplaris Crockford: (G 51, KW, PR 284 C, PR 284 B, PR 284 A): Callytharra to Wandagee; Dilly Stage and Lakes Ck: probably Middle Productus Lst.

Protoretepora ampla (Lonsdale): (KW) : Muree Stage, NSW.

Phyllopora robusta Bassler: (PR 284 A): Bitaoeni Beds, Timor.

Synocladia spinosa Crockford var.: (PR 291, PR 256, PR 284 A): similar to species abundant in Cundlego Series.

Rhombopora filiformis Crockford: (KW): Upper Marine, N.S.W.

Generalised consideration of facies.

The variations of zoarial form adopted within almost every genus of bryozoan makes the occurrence of individual genera almost valueless in considering the facies, which is best indicated by the growth form developed by individual species from any given area.

The most important considerations in this regard are firstly that the dominant zoarial form will be that adapted to make the most of the available food supply in any given habitat, and secondarily that the amount of wave or current action must be insufficient to damage or destroy growing colonies of this dominant form. From these two factors a comparatively clear idea of the facies of any fauna can be gained without identification of individual forms.

Bryozoa occur typically in the littoral and sub-littoral zones; distribution of the species evolved in any faunal province should be quite rapid, as the larval stages are free and many modern forms, and presumably some of their Palaeozoic counterparts, may be rapidly disseminated in their adult stages by attachment to seaweeds, etc. In the American late Palaeozoic they have been found to be commonest in the initialand final stages of a marine cyclothem; this does not appear to hold true in the late Palaeozoic of Australia, but the distance above the base of a series at which abundant faunas appear has possible implications on the rapidity of sedimentation in the initial stages of a marine phase, or may perhaps indicate a change in climatic conditions.

A survey of the range of habitat of Cainozoic Bryozoa of various zoarial forms was made by Stach (1937), and the conclusions at which he arrived can be applied generally to similar Palaeozoic forms. He also pointed out that lateral variation of faunas is "quantitative rather than qualitative, and does not result in the elimination of a large number of forms". This means that "determination of the absolute ranges in time" of the forms present "is a major desideratum in the development of a

zonal tables rather than ... the relative abundance of certain forms, which could not be recognisable through the full extent of the area".

With regard to the Nura Nura and Noonkanbah faunas, the probable facies indicated by various zoarial types is as follows:-

Fenestrate zoaria - i.e. including as well as the fenestellids such forms as Goniocladia and Coscinium, and also grading into the sub-pinnate Ramipora and Synocladia - formed a relatively strong growth form, which offered little resistance to currents and a good access to food supply for individual zooecia in rapidly moving waters; this is particularly true of Polypora, whose strong rigid zoaria could be expected to flourish in the more strongly moving waters of the sub-littoral zone. The finer, thinner branched fenestellids with their more fragile zoaria would be adapted to a more placid habitat within the sub-littoral zone, but still suggest a growth form particularly suited to obtaining the maximum food supply in moving waters. A general idea of the facies may therefore be gained by considering the strength or fragility of the growth form of the fenestrate species especially abundant in and therefore adapted to the habitat of any horizon.

Fine rigid zoaria, especially those of the finer species of Batostomellidae and Rhabdomesontidae, would suffer much damage from moving water, and, with their zooecial apertures opening around a tiny cylindrical stem, are more adapted to gaining their food in still or deeper waters; an horizon where such forms are developed abundantly, and to the exclusion of the almost ubiquitous fenestellids, can therefore be assumed to belong to the deepest waters of the sub-littoral zone, and to be a lateral variation of facies of an horizon where the same species were associated with the finer fenestellids.

Coarse ramose zoaria also seem, perhaps rather surp-

risingly, to occur mainly in a rather deep-water facies, despite their apparently stronger zoarial form.

Massive fistuliporoids and heavy frond-like bifoliate zoaria, according to Moore and Dudley (1944), who had available large collections of such forms from the late Palaeozoic of mid-continent North America, are not clearly associated with any particular faunal assemblage or sedimentary environment. In the Western Australian sequence however massive forms seem more likely to indicate the littoral or top part of the sub-littoral zone, as do also the heavier forms of rayed zoaria, such as Evactinopora crucialis or the four-rayed fistuliporoid at SR 84.

Fine strap-like, and easily broken, zoaria such as "Sulcoretepora", and some zoaria of specialised form such as Prismopora": 1 which would be readily damaged by strongly moving waters, suggest the deeper part of the sub-littoral zone: heavier zoaria of the same genera, as Prismopora: 3, would be better adapted to shallower waters.

Species which directly and firmly encrust a sub-stratum generally imply a littoral habitat, but of the thin encrusting forms here this seems only to apply to Fistulipora: 1, from W 42, and Dyscritella: 3, from NE 5, and perhaps to the occurrence of Eridopora spp. at G 51 and GG 2, while other encrusting species occur in habitats which otherwise appear to belong within the sub-littoral zone.

Individual species with some of these zoarial forms, however, sometimes have quite contradictory occurrences; this applies especially to the fine ramose zoaria of Streblotrypa marmionensis, which occur on nearly every horizon and in nearly every type of habitat in the Western Australian Permian; here possibly the development of the numerous "mesopore-pits" beneath the apertures may have contributed to a greater-than-usual flexibility for a fine ramose zoarium, or less probably, may have given a greater bouyancy to fragmented zoaria and widened their distribution by current or wave action away from their habitat;

this species also is one which, because of the unusual degree to which variation of its characters is commonly developed within an individual zoarium, would more readily adapt itself to a variety of habitats. Some fenestrate zoaria, such as Fenestella horologia or Minilya duplaris, are also unusually wide-spread species, but these, though they have an overall fine growth form, are still firmly built and robust zoaria, and are similarly adapted to almost any type of habitat.

Among recent Bryozoa, the type of sub-stratum, sandy or muddy, also has considerable effect upon the development of faunas in any habitat, but the effect of this upon any group of Palaeozoic faunas is difficult to assess; within the Noonkanbah faunas the distribution of strap-like zoaria seems rather inclined towards the more limey facies and their absence from some of the shaley deposits in which usually associated zoarial forms are abundant may be due to such an influence.

From these considerations, it should ideally be possible to trace, as an horizon passes laterally through various facies, the domination of one zoarial type being gradually replaced by another; and two horizons which are widely separated vertically often have a strong superficial resemblance because of the morphological similarity of the zoarial forms adapted to their particular facies, but may differ widely in their actual faunal assemblages.

Fauna of the Nura Nura Limestone.

W 42 B, C, AND W 40 possess a well defined fauna of a type quite distinct from the Noonkanbah, although three species extend upwards into it; this fauna is characterised by Polypora: 6 and has a satisfactory correlation with the Callytharra indicated by the presence of Lyropora, a genus which is not uncommon in the Callytharra, where at least three species occur, but is unknown from higher horizons in Western Australia (or elsewhere).

W 34 B, has only one indentifiable form, Fenestella horologia, a common species which ranges throughout the Western Australian sequence and is adaptable to almost any facies.

W 36 has one well-preserved specimen of Stenodiscus: 1, which occurs at only one other locality, GG2; Stenopora: 1 occurs at W 44; stenoporids do not usually occur on such a low horizon in the Western Australian sequence, but Stenopora: 1 closely resembles S. hemispherica Waagen and Wentzel, from the Lower Productus Limestone, and is possibly identical (the Indian species was described briefly from a single poorly preserved specimen and was illustrated by only a natural size figure, so that definite identification is not possible); the remaining species at W 44 are long ranged forms, Hexagonella: 1 and Fenestella horologia, each abundant both in the Callytharra and the Noonkanbah.

The whole of this fauna appears to be rather a shallow water facies, suggesting the uppermost part of the sub-littoral or the littoral zone; the heavy rayed zoarium of Evactinopora crucialis, the small massive zoaria of the stenoporids, the heavy growth form of Polypora: 6, and the thick encrusting zoarium of Fistulipora: 1, all suggest growth in fairly shallow waters. This is a type of fauna which would probably show quite rapid. variation away from the shore line unless the shallow water conditions were very constant, and within a short lateral distance could be expected to become quite unrecognisable.

The Noonkanbah localities which show the greatest similarity to the Nura Nura, GG2 and G 51, seem primarily areas of a similar, close off-shore, facies.

The typical Callytharra fauna has many forms superficially similar to, but actually quite distinct from, the deeper sub-littoral zone faunas of the Noonkanbah, and it is quite possible, or actually probable, that the Nura Nura also would grade laterally into this general type of fauna as its facies changes.

Fauna of the Noonkanbah Series.

The distribution of Bryozoa in the Noonkanbah Series falls into three probable faunal zones.

First, the lower middle part of the Series, which seems to form a fairly distinct faunal zone if the faunas are considered as belonging to the shallower part of the sub-littoral zone on these horizons, with a few localities at the top of the sub-littoral or in the littoral zone. This group includes the following typical localities:

PR 137 G, PR 288, PR 126, R 478, PR 302 A, R 422, and KW

The most distinctive form linking these localities is Prismopora: 3, and the fauna, of a generally similar type, and composed mainly of fenestellids, fine ramose batostomellids, and Rhabdomesontidae, becomes gradually richer until it reaches its main development at KW. The occurrence at R 422 of "Sulcoretepora": 2, Rhombopora: 1, and Rhombopora: 3, and the general appearance of the fauna at that horizon, are the first indication of the introduction of any of the forms characteristic of the higher part of the Noonkanbah, and this horizon and KW appear to be the upper limit of Prismopora: 3. Species of Stenopora approaching Leioclema are characteristic of a section of this zone and are absent from higher horizons. PR 136 probably represents a slightly different facies within this zone, containing the presumably deeper water "Sulcoretepora" and Goniocladia, and lacking Prismopora: 3.

Of the remaining localities listed as in the lower part of the sequence, G 51 and GG 2 seem to be a shallower facies, with the large strong zoaria of Evactinopora crucialis and at both localities an encrusting Eridopora (which however though generally such forms are characteristic of shallow water is not a very good guide). GG 2 however also contains Rhabdomeson mammillata and "Sulcoretepora" meridianus; the fauna at this locality is rather fragmentary and scattered and perhaps could include forms swept in from deeper water. Both these faunas however seem definitely to belong within the Noonkanbah; about half the forms at each locality are long ranged species (Evactinopora crucialis, Ramipora ambrosoides, Batostomella spinigera, Streblotrypa marmionensis, Fenestella horologia, and Minilya duplaris); but the occurrence at G 51 of Eridopora: 1, Fistulamina: 1, Batostomella: 1, Rhabdomeson: 1, Polypora fovea, and P. megastoma, and at GG 2 of "Sulcoretepora" meridianus, Rhabdomeson mammillata, Fenestella columnaris, and Polypora: 1, seem to be quite definite indications of Noonkanbah age. The only form which perhaps indicates a correlation with the Nura Nura is the occurrence of Stenodiscus: 1 at GG 2; the only other specimen of this form was from W 36, but the occurrence of four definite Noonkanbah forms seems more important.
In facies, these two localities seem to belong to a shallower part of the sub-littoral zone than do any other of the Noonkanbah localities, and in this they resemble the Nura Nura faunas; therefore it seems probable that their resemblance to the Nura Nura is superficial and induced by similarity of depositional conditions rather than of age.

PR 291 seems to belong higher in the middle part of the sequence, and to be equivalent to PR 256.

NK 32, which is probably a deeper water facies than any other in the middle part of the series, seems, from the presence of Rhombopora: 1 which first appears at R 422 and is absent from KW and PR 284 J, to lie near the top of this middle part of the Noonkanbah or a little higher; the probable position of this

horizon was not given in the stratigraphic list of localities.

The faunas of Dadja Hill, PR 284 S, and PR 284 R, are too limited for comparison.

A definite introduction of new forms occurs at PR 284 N and J. The faunas of these horizons are distinctly different from any others in the lower or middle part of the sequence but do not persist into the higher part of the series; at least two forms however have direct derivatives on higher horizons (Coscinium: 2 and Stenopora spicata n. var. of which only small zoaria occursat PR 284 J). These faunas suggest a slightly deeper water facies than KW, and also indicate an horizon a little below R 422.

A second, fairly distinct faunal group appears at PR 256 and PR 291, which contain closely related and abundant faunas belonging to the deeper part of the sub-littoral zone; PR 256 particularly seems to show incipient, but still not especially strong, relationships to the fauna of the higher part of the sequence. Probably these horizons, with NK 32, would represent the deepest submergence during the Noonkanbah (that is, of course, unless their geographical position, which was not given, places them in any case in the deepest section of the basin).

PR 113 and PR 284 H each contain only a single species, in each case a form restricted to the Noonkanbah but not representing any special section of it.

A different and very distinctive faunal assemblage is found in the higher section of the Noonkanbah from NK 15 and NK 12 upwards, and this upper zone contains several bryozoans which should serve to identify it quite readily. The most characteristic of these are Coscinium: 1, from NK 12 upwards, and Rhabdomeson mammillata var. nov., associated with large zoaria of Stenopora spicata var nov., which occurs first at R 422, Streblotrypa minutula (extending from PR 256), and Rhombopora: 1 (extending from NK 32 and PR 291). The association of forms and

the absence of a large proportion of the earlier species produces a distinct faunal assemblage in this upper part of the sequence. This fauna remains distinct and recognisable through an apparently fairly wide facies range.

Portions of this fauna remain at PR 261, which belongs to this same faunal zone and facies; the virtual absence of fenestellids, which after persisting throughout most of the Palaeozoic dies out at about this horizon throughout the world, is noticeable at PR 261.

SR 84 could possibly be a shallower facies within this zone, though it does not resemble the shallow water facies of the top of this zone at Mt. Marmion; it shows more resemblance to the fauna of NE 5, the fauna of which indicates a littoral facies.

Tables 1 and 2.

Details of the distribution of individual species of Bryozoa within the Noonkanbah and the Nura Nura are given in Tables 1 and 2.

Table 1 gives the distribution of species with the localities from which the collections were made listed stratigraphically as in the approximate stratigraphic section sent to accompany the specimens. The occurrences of those species which seem to have most stratigraphic significance are shown in red. The species are in this Table arranged taxonomically with the various forms grouped together in their respective families and genera.

Table 2 gives the occurrence of species grouped together in order of their first appearance in the fauna; the localities are again listed stratigraphically as before, and the same species as in Table 1 and listed in red.

Comparison with other Permian faunas.

The forms present in these collections from the Noonkanbah show, as did the collections previously described from this Series, fairly distinct relationships with the Bitaoeni and Basleo Beds of Timor and with the Middle Productus Limestone faunas of the Salt Range. In comparing the Noonkanbah faunas with those from Timor, there are a larger number of forms common with the Basleo than with the Bitaoeni Beds, but the similarities in the faunas are not sufficient to suggest correlation of the Noonkanbah with any single horizon in Timor, and it is also not possible to consider that the different faunal groupings of the Bryozoa within the Noonkanbah indicate correlation of individual horizons with either the Bitaoeni or the Basleo Beds.

A smaller number of species are common to the Noonkanbah and the eastern Australian Permian sequence, and here the common species are forms which occur in New South Wales in the Upper Marine Series.

List of the Bryozoan Faunas of localities in the Noonkanbah Series represented by Teichert's specimens.

(Numbers following generic names refer to the undescribed species previously determined in, and listed under the same number from, the collections previously supplied from the Nura Nura Noonkanbah).

Locality A 607: "2 miles East of Christmas Creek Homestead" (coll. A. Wade).

Streblotrypa marmionensis Etheridge
Streblotrypa marmionensis, large variety
Fenestella basleoensis Bassler
Minilya duplaris Crockford
Protoretepora ampla (Lonsdale), s. str.
Polypora megastoma de Koninck
Polypora: 2
Synocladia spinosa Crockford, var.nov.

Other forms (Polypora, Batostomella, Stenopora, Hexagonella) are present in material from this locality, but are fragmentary and too poorly preserved for specific identification.

Locality KP 201: About 4 miles N 25 W of Duchess Dome, St. George's Ra. (coll. Caltex).

Prismopora: 3

Suggests an horizon in the earlier section of the Noonkanbah (ie R 422 or lower in the Series).

Locality KP 206: 3/4 mile SW of Bore, Noonkanbah Station (Coll. Caltex): the full locality was not supplied.

Prismopora: 3
Rhabdomeson mammillata Bretnall, large variety
Polypora: 1

This locality also contains a fairly abundant, but fragmental and specifically indeterminate bryozoan fauna. The association of Prismopora: 3 and the large variety of Rhabdomeson mammillata suggests that the horizon is near the top of the earlier section of the Series (probably near or slightly above R 422).

M 12: .65 miles S. of Trig. 248, Meeda Station (coll. Caltex).

Fistulamina: 1
Rhabdomeson bispinosa Crockford

Resembles PR 291.

B 119: Just North of Hill C, Grant Ra.

Evactinopora crucialis Hudleston
Hexagonella bifida Crockford
Batostomella spinigera Bassler
Rhabdomeson bispinosa Crockford
Streblotrypa marmionensis Etheridge
Streblotrypa minutula Bassler

B 119:

The fauna suggests a littoral facies, and the majority of the species are long-ranged forms. Streblotrypa minutula first appears elsewhere in the Noonkanbah at PR 256, and Hexagonella bifida occurs at R 478 and PR 256.

A 23: ½ mile East of Fence, Duchess Ridge.

Streblotrypa etheridgei Bretnall
Streblotrypa marmionensis Etheridge
Rhombopora: 1
Rhabdomeson mammillata Bretnall, large variety.

Specimens very similar in matrix and facies to NK 32; Rhabdomeson mammillata, large variety, and Streblotrypa etheridgei, however, indicate an horizon higher in the Noonkanbah than that suggested by the fauna which was present in the collections from NK 32, although the specimens are superficially almost identical.

2793; 6½ miles North of Mt. Anderson.

Hexagonella australe (Bretnall)
Ramipora ambrosoides (Bretnall)
Dyscritella adnascens Bassler
Streblotrypa marmionensis Etheridge
Fenestella horologia Bretnall
Fenestella disjecta (Crockford)
Fenestella valentis (Crockford)
Minilya duplaris Crockford
Polypora: 1
Polypora megastoma de Koninck

The fauna, though here represented by fewer species, and the matrix are similar to those of Keevies Well, the locality of which Teichert gave as 8 miles N. of Mt. Anderson.

2757, 2792: 9 miles ENE from Trig Station G 2, St. George's Range.

Fistulipora n. sp. (resembling F. crescens, but with smaller apertures and different shape of lunaria)
Eridopora: 1
Eridopora sp. cf. E. major Bassler
"Sulcoretepora" meridianus (Etheridge)
"Sulcoretepora" : 1
"Sulcoretepora" : 3
Goniocladia n. sp. (occurs also at Keevie's Well)
Goniocladia timorensis Bassler
Goniocladia indica Waagen and Pichl
Ramipora ambrosoides (Bretnall)
Rhabdomeson mammillata Bretnall, s. str.
Rhabdomeson mammillata Bretnall, large var.
Rhabdomeson bispinosa Crockford
Rhombopora multigranulata Bretnall
Rhombopora: 3
Streblotrypa marmionensis Etheridge
Streblotrypa marmionensis, large var.
Fenestella horologia Bretnall
Fenestella ruidacarinata (Crockford)
Fenestella disjecta (Crockford)
Fenestella columnaris (Crockford)
Minilya duplaris Crockford
Polypora woodsi (Etheridge)
Polypora fovea Crockford
Polypora multiporifera (Crockford)
Polypora: 1
Polypora: 4

2757, 2792:

This was, apart from Keevie's Well, the most abundant fauna in Teichert's collections. It is a limey matrix crowded with bryozoan fragments, including, as well as those listed, numerous fragments not specifically identifiable. The absence of stenoporids in such an abundant fauna is noteworthy; in this it resembles PR 291 and PR 256, in both of which only occasional stenoporids occur; they are probably a similar but slightly deeper water facies. R 422 is also fairly similar in facies, but has fairly abundant specimens of Prismopora: 3, which is common in and typical of the earlier bryozoan horizons of the Noonkanbah.

2757 also, apart from Rhabdomeson mammillata, large variety, has none of the characteristic species of the topmost part of the Series, several of which would be expected to occur in this facies if 2757 was within the top part of the Series.

The most definite resemblance, both in the general assemblage present and in the absence of certain other forms, is to the fauna of Keevie's Well, of which 2757 seems almost certainly a lateral and probably slightly deeper water variant.

T 202: M: M 18: F 37: Highest fossil horizon of Noonkanbah: SE2 side of Mt. Marmion, near foot of slope.

Fistulipora vacuolata Crockford
Fistulipora crescens Crockford
Fistulipora wadei Crockford
Fistulipora: 2
Hexagonella lineata Crockford
Hexagonella plana Crockford
Evactinopora crucialis Hudleston
"Sulcoretepora" meridianus (Etheridge)
"Sulcoretepora" n. sp., broad form
Ramipora ambrosoides (Bretnall)
Stenopora spicata Bassler, n. var, large form
Dyscritella adnascens Bassler
Batostomella spinigera Bassler
Batostomella: 1
Streblotrypa marmionensis Etheridge
Streblotrypa marmionensis, large var.
Rhombopora multigranulata Bretnall
Fenestella horologia Bretnall
Fenestella columnaris Crockford
Fenestella lennardi Crockford
Fenestella disjecta Crockford
Fenestella basleoensis Bassler
Minilya duplaris Crockford
Polypora spp. indet.
