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REVISED TERMINOLOGY OF THE LATE CAMBRIAN-ORDOVICIAN SEQUENCE OF THE FLORENTINE-DENISON RANGE AREA, AND THE SIGNIFICANCE OF THE "JUNEE GROUP"

by K.D. Corbett, Department of Mines, Hobart, and

Maxwell R. Banks, University of Tasmania.

(with one text-figure)

ABSTRACT

The area of Lewis's original "Junee Series" is unsuitable as a basis for definitive stratigraphy and correlation,even with units in adjacent areas. A review of the various usages and concepts associated with the "Junee Group" indicates considerable diversity in meaning and application of the term, and suggests that the sequences are better considered in terms of a lower clastic unit and an upper limestone unit rather than as a single group. Accordingly, the Late Cambrian-Ordovician sequence in the Florentine Synclinorium is defined in terms of the Denison Subgroup, comprising four formations between the basal unconformity on the Denison Range and the base of the limestone, and the Gordon Subgroup, comprising three limestone formations and the Westfield Beds. These two Subgroups together approximate to the "Junee Group".

INTRODUCTION

The contribution by Brown *et al.* (this volume), on the basal beds of the Junee Group, raises many questions as to the terminology applied to the Early Palaeozoic sequences in Tasmania. A previous definition proposed by us (Corbett and Banks 1974) for the Junee Group is criticized on the grounds that, by including the Reeds Conglomerate (from the Denison Range) as well as the Tim Shea Sandstone in the definition, we have introduced a questionable correlation and have contravened the Australian Code of Stratigraphic Nomenclature with respect to the location of type sections and the validation of terms by later workers.

We accept that the correlation is not provable and that any possible ambiguity should be removed. Our definition was influenced by our firm view that Lewis's (1940) area of the "Junee Series" is unsuitable as a basis for definitive stratigraphy and for regional correlations, and that to define the group from strictly within that area would make for an impracticable term. That view we still hold.

Because it was originally poorly defined, the "Junee Group" has been used in different ways by different authors, depending on their concept of its regional significance. We review these usages and concepts in the light of new information and the arguments of Brown *et al.*, and conclude that the usefulness of the "Junee Group" is limited in either a generalized form or as designated by Lewis in the Junee area. A terminology based on a lower clastic unit and an upper limestone unit seems more useful, and our earlier terminology for the Florentine-Denison area is revised accordingly.

USAGE OF THE "JUNEE GROUP"

Although Lewis (1940) originally defined the "Junee Series" from the Tyenna Valley area (including The Needles, Tim Shea, Wherrett's Lookout, and the Junee - now Maydena - area) he did not specify any type sections or give formation names.

Hills and Carey (1949) borrowed the term for their "Junee Group", comprising formations from widely-separated areas of Tasmania, and this generalized usage was

continued by Banks (1962), who defined the group in terms of the Jukes Conglomerate, Owen Conglomerate, Caroline Creek Sandstone, Florentine Valley Mudstone, Gordon Limestone and "Fenestella Shale". This generalized term has been used in discussions of the Tasmanian sequence for many years, and is still used by some people.

The present authors (1974), in redefining the group in the Florentine Synclinorium, attempted to amalgamate the generalized "Junee Group" usage with the ill-defined "Junee Series" by using only formations which could be defined in the general Tim Shea - Florentine - Denison Range area. We did not feel obliged to restrict the definition entirely to within the area of Lewis's "Junee Series" because: (a) there was a long historical precedent for using the term outside that area; (b) the area selected was adjacent to and physically continuous with that of Lewis; (c) there were serious problems due to the lack of exposure of Lewis's area, as discussed below; and (d) there were well-established precedents for not using the first-designated area to define an important group if the area was unsuitable or impracticable. For example, the Dundas Group was first designated by Waller (1905) as the sequence on the NE Dundas Tram but was redefined by Elliston (1954) on the Dundas Rivulet; and the Eldon Group of Gould (1866) from the inaccessible Eldon River area was redefined by Gill and Banks (1950) near Zeehan. Both these terms are accepted and in general use.

Williams (in Jennings *et al.* 1967) referred the term "Junee Group" to the Maydena - Tim Shea area, and the Geological Survey of Tasmania in recent years has referred to sequences elsewhere as "Junee Group correlates" without specifying the composition or origin of the "Junee Group" referred to (e.g. Williams and Turner 1974). It is unfortunate that the Survey's assessment of the validity or otherwise of the "Junee Group" usage of Banks (1962) and others, was not made clear at an earlier date, since by inference Brown *et al.* (this volume) would regard this usage as invalid.

CONCEPTS ASSOCIATED WITH THE "JUNEE GROUP"

Several concepts have been associated with the "Junee Group" and have influenced the application of the term over the years, but need re-evaluation in the light of new information. The idea of the group as a single major cycle of sedimentation, from non-marine conglomerate to limestone, was put forward by Carey (1947) and has been fairly generally applied since then (e.g. Banks 1962). Together with this has been the idea that the group encompassed most or all of the Ordovician Period, since the lowermost fossils were of Early Ordovician age and the uppermost probably Late Ordovician. Thus "Junee Group" and "Ordovician System" have been used almost synonomously (e.g. Banks 1962; Williams and Turner 1974). The recent discovery by one of us of middle Late Cambrian fossils in a marine facies of the lower part of the Owen Conglomerate correlate on the Tyndall Range (Corbett in press) indicates that the "Junee Group" (sensu Banks) can contain an earlier marine cycle and that the lower part may include much of the Late Cambrian Series. This is also demonstrated by the Denison Range sequence (Corbett this volume).

The concept that the "Junee Group" marks the beginning of deposition of siliceous clastics, following the greywacke sedimentation typical of the Cambrian, has been expressed more recently (e.g. Williams, Solomon and Green 1975). However, in some areas at least, considerable amounts of siliceous conglomerate and sandstone were deposited in Middle or Late Cambrian sequences which must be regarded as pre-"Junee Group", e.g. in the Strahan area (Baillie *et al.* in press), and in the Trial Ridge area (A.V. Brown and N.J. Turner, *pers. comm.*; Corbett this volume).

Because of the varying usages and concepts, the meaning of the "Junee Group" in regional correlations and discussions has become confused, and its value as a widely usable term is doubtful. Another means of considering the Late Cambrian-Ordovician sequences of Tasmania has emerged in recent years. This involves splitting the sequence into a lower clastic unit of mainly conglomerate and sandstone, and an upper limestone

unit. This two-fold division has been used on recent Geological Survey one mile maps (e.g. Barton *et al.* 1966; Barton *et al.* 1969), with the clastic sequence being generally referred to as "correlates of Owen Conglomerate", and the limestone sequence as "correlate of Gordon Limestone". The same subdivision is being used on the recent 1:250,000 scale compilations (e.g. Williams and Turner 1974), and on the 1:500,000 geological map of Tasmania (in preparation).

We believe that this two-fold subdivision reflects a fundamental character of the sequence, and is therefore likely to be of more future benefit than a single group term. The terminology of the Denison-Florentine sequence has accordingly been designated in terms of two subgroups, one for the lower clastic sequence, which is best developed in the Denison Range area, and one for the limestone sequence of the Florentine Valley. These two subgroups approximate to the old "Junee Group", but are designed so that they can be used independently, with the aim of eventually raising them to group status if the usage of "Junee Group" becomes impracticable.

THE LOWER CLASTIC SEQUENCE (DENISON SUBGROUP)

On the Denison Range the clastic sequence is some 3390 metres thick (fig. 1) and comprises four formations (Singing Creek Formation; Great Dome Sandstone; Reeds Conglomerate; Squirrel Creek Formation) defined as the Denison Subgroup (Corbett this volume). The Squirrel Creek Formation is a correlate of the Florentine Valley Formation and is of Early Ordovician age. The basal Singing Creek Formation comprises siltstone, quartzwacke and siliceous conglomerate, and contains middle Late Cambrian (Franconian) fossils. It rests with angular unconformity on Middle Cambrian beds, and this unconformity can be traced south through the Ragged Range to Frodshams Pass (Corbett 1970; Corbett and Banks 1974). East of this, the area of the unconformity is covered by dense forest, but the siliceous sandstone-conglomerate sequence transgresses various Precambrian and Cambrian rock types and structural features, and the unconformity is again exposed at Tim Shea (fig. 1).

The clastic sequence at Tim Shea, which is in the area mapped by Lewis as "Junee Series", is only some 750 m thick (fig. 1) and comprises the poorly fossiliferous Tim Shea Sandstone and the fossiliferous Florentine Valley Formation (Corbett and Banks 1974). The basal unconformity is on Precambrian dolomite on the south flank of the peak, although Lewis did not recognise it here (see Carey and Banks 1954). The Tim Shea Sandstone probably corresponds to the lower unit of Lewis's "Junee Series", the "quartzites with conglomerates and breccias interbedded", and the Florentine Valley Formation to Lewis's second unit, the "yellow mudstones with trilobites and other fossils of lower ordovician age".

The area first mentioned by Lewis (1940) as "Junee Series" is that around Junee (now Maydena) and Sunshine Spur, the latter some 8 km southeast of Tim Shea. Here he recognised a lower quartzite unit overlain by yellow fossiliferous mudstone followed by limestone. This relationship was also mapped by Everard and Hughes (in Hughes 1957, fig. 47) and has since been confirmed by R.K. Whyte (*pers. comm.*). Dense vegetation precludes tracing of the lower units between here and Tim Shea, although Lewis's correlation to Tim Shea is probably correct. The basal part of the sequence is exposed only at Sunshine Spur, where poor exposures suggest unconformity between basal conglomeratic beds and an underlying sandstone-siltstone sequence of unknown age.

The Denison Range section has many advantages over those at Tim Shea and Sunshine Spur as the basis for definition of the lower clastic sequence, as for example:
(i) The Tim Shea Sandstone is atypical in that it lacks the coarse conglomerates which occur along the whole western part of the synclinorium. These conglomerates reach their maximum development (1560 m) on the Denison Range (Corbett and Banks 1974).
(ii) Use of the Tim Shea or Sunshine Spur sections would leave doubt as to whether the Singing Creek Formation, which does not appear to be represented in the latter areas, should or should not be regarded as part of the group or subgroup.

Similarly it would be arguable if the Great Dome Sandstone (fig. 1) should be included, as evidenced by the discussion of Brown *et al.* (this volume).
(iii) Since the Tim Shea sequence sets directly on Precambrian rocks, the relationship to Cambrian sequences is difficult to specify. On the Denison Range, however, the unconformity is on fossiliferous Cambrian beds, and its significance and time range are more readily apparent.
(iv) There is no control on the age of the base at Tim Shea or Sunshine Spur, whereas on the Denison Range the beds above the unconformity contain a well-preserved and dated fauna (Corbett this volume).
(v) The Sunshine Spur section is poorly exposed.

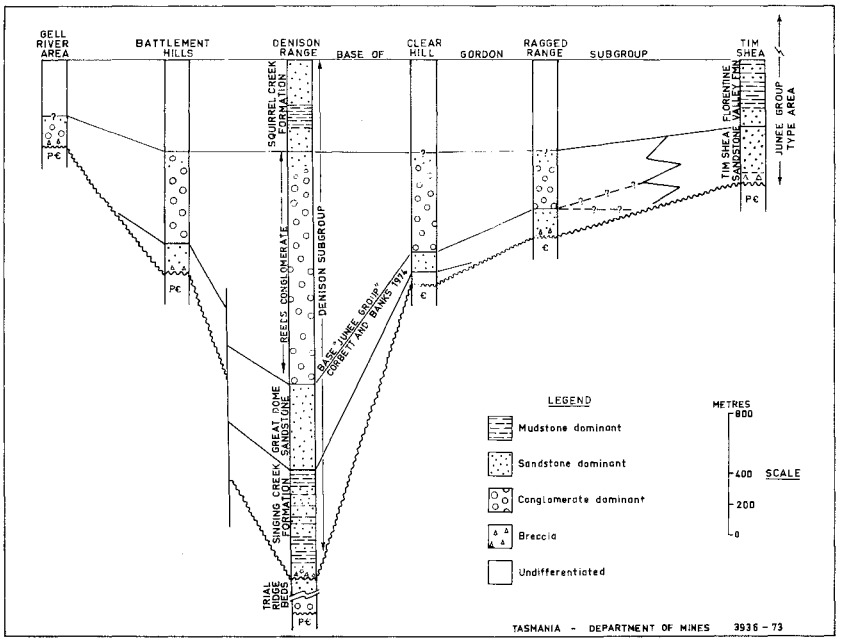

FIG. 1. - Correlation chart for lower clastic sequence in Florentine Synclinorium; horizontal distances not to scale; thicknesses approximate.

It was for these reasons that we earlier decided that a Junee Group defined either at Tim Shea or in the Junee area would be of little value, and accordingly defined an alternative base for the group in the Denison Range section (Corbett and Banks 1974). We selected the base of the Reeds Conglomerate for what we then considered were several good reasons: (a) we wished to exclude the fossiliferous Late Cambrian beds since these did not appear to be present at Tim Shea and their inclusion would create problems of correlation to western Tasmania; (b) the use of a conglomerate as the base agreed with previous usage (e.g. Banks 1962); (c) we were influenced by the cycle of sedimentation concept; and (d) we regarded the Reeds and Tim Shea Formations as equivalents (fig. 1), although realizing that this was probably not provable.

Several arguments indicate that the Junee Group should not be defined in this way. Firstly, as pointed out by Brown *et al.* (this volume), there is a questionable correlation involved in the definition which makes it confusing. Secondly, there is the question of extending the type area beyond that of Lewis's original "Junee Series", and while we believe there is good precedent for doing this, there is little point if users of the term object. Thirdly, there is recent geological evidence to indicate that the base of the Reeds Conglomerate is not the most logical place for the base of the group. In particular, the discovery of a fossiliferous Late Cambrian marine facies

in the lower part of the Owen Conglomerate indicates that the Junee Group (sensu Banks 1962) can include equivalents of the Singing Creek Formation.

The unconformity which occurs below the Singing Creek Formation, and which almost certainly corresponds to that in Lewis's type area, is the logical place for the base of the clastic sequence, just as the Denison Range is the logical place to define the sequence. The Denison Subgroup has been established accordingly, and while it is not defined as being part of the Junee Group (sensu stricto) it may be regarded as approximating the pre-limestone part of that group.

THE LIMESTONE SEQUENCE (GORDON SUBGROUP)

Conformably overlying the lower clastic sequence is a thick limestone succession with some minor siltstone-sandstone units. The limestone is poorly exposed in the Denison Range area because of the cover of superficial gravels, but is well exposed in the Florentine Valley. We used sections in the latter area to define our Gordon Limestone Subgroup (comprising three formations) and an overlying passage unit of siltstone and sandstone called the Westfield Beds.

The limestone sequence of the Florentine Valley is partly the same unit as Lewis's "blue Junee limestone" of the "Junee Series", but is outside his area. The basal limestone formation can be traced (Whyte, *pers. comm.*) from Junee into the Florentine Valley where it has been named Karmberg Limestone (Corbett and Banks 1974). Where mapped by Lewis, the limestone sequence is truncated unconformably by the Permo-Carboniferous beds, and to define the unit here would leave doubt as to the constitution of the upper part of the sequence and the relationship with the Siluro-Devonian sequence (Eldon Group correlates). This relationship is well shown in the Florentine Valley, however, and the exposures of limestone there are much better.

It is clearly preferable to use the Florentine Valley sections to define the limestone sequence, but there could be argument as to whether the sequence here corresponds precisely to that of the "Junee Series". We therefore do not define the Junee Group as containing this sequence, but regard it as approximating the "Junee limestone" of Lewis.

For convenience of correlation, we hereby slightly amend our earlier terminology in order that all the units below the Eldon Group correlates, and above the lower clastic sequence, be included in a single subgroup. We define the *Gordon Subgroup* as including the Westfield Beds at the top as well as the three limestone formations, i.e. the Karmberg Limestone at the base, the Cashions Creek Limestone, and the Benjamin Limestone. All units have previously been defined by Corbett and Banks (1974). The base of the Subgroup can be traced, as far as outcrop allows, from the Junee area to the valley of the Gordon River east of the Dension Range,where the Gordon Subgroup rests conformably on the Denison Subgroup.

REFERENCES

Baillie, P.W., and others, in press: Geological Atlas 1:50,000 Series. Strahan. *Dept. of Mines, Tasm.*

Banks, M.R., 1962: Ordovician System in THE GEOLOGY OF TASMANIA (A.H. Spry and M.R. Banks Eds.). *J. geol. Soc. Aust.*, 9 (2), 147-176.

Barton, C.M. and others, 1966: Geological Atlas 1 Mile Series. Mackintosh. *Dept. of Mines, Tasm.*

_____, 1969: Geological Atlas 1 Mile Series. Quamby. *Dept. of Mines, Tasm.*

Brown, A.V., Turner, N.J. and Williams, E., 1975: The basal beds of the Junee Group. *Pap. Proc. Roy. Soc. Tasm.*, this volume, 107-110.

Carey, S.W., 1947: Report of the Government Geologist. *Rept. Dir. of Mines, Tasm. for 1945*, 21-29.

_____ and Banks, M.R., 1954: Lower Palaeozoic unconformities in Tasmania. *Pap. Proc. Roy. Soc. Tasm.*, 88, 245-269.

Corbett, K.D., 1970: Sedimentology of an Upper Cambrian flysch-paralic sequence on the Denison Range, southwest Tasmania. *Unpub. Ph.D. thesis, Univ. of Tasm.*

_____, 1975: The Late Cambrian to Early Ordovician sequence on the Denison Range, southwest Tasmania. *Pap. Proc. Roy. Soc. Tasm.*, this volume, 111-120.

_____, in press: Preliminary report on the geology of the Red Hills-Newton Creek area, West Coast Range, Tasmania. *Tech. Rep. Dep. Mines Tasm.*, 19.

_____ and Banks, M.R., 1974: Ordovician stratigraphy of the Florentine Synclinorium, southwest Tasmania. *Pap. Proc. Roy. Soc. Tasm.*, 107, 207-238.

Elliston, J., 1954: Geology of the Dundas district, Tasmania. *Pap. Proc. Roy. Soc. Tasm.*, 88, 161-183.

Gill, E.D. and Banks, M.R., 1950: Silurian and Devonian stratigraphy of the Zeehan area, Tasmania. *Pap. Proc. Roy. Soc. Tasm., (1949)*, 259-271.

Gould, C., 1866: On the position of the Gordon Limestones; relatively to other Palaeozoic formations. *Pap. Proc. Roy. Soc. Tasm.*, 4, 27-29.

Hills, C.L. and Carey, S.W., 1949: Geology and mineral industry in HANDBOOK FOR TASMANIA. *Aust. Ass. Adv. Sci.*, Hobart.

Hughes, T.D., 1957: Limestones in Tasmania. *Miner. Resources Tasm.*, 10.

Jennings, I.B., Noldart, A.J. and Williams, E., 1967: Geology and mineral resources of Tasmania. *Tasm. Dept. Mines, Geol. Surv. Bull.*, 50.

Lewis, A.N., 1940: Geology of the Tyenna Valley. *Pap. Proc. Roy. Soc. Tasm. (1939)*, 33-59.

Waller, G.A., 1905: Notes on the geological structure of the West Coast of Tasmania. *Aust. Ass. Adv. Sci.*, 10 (1904), 622-630.

Williams, E. and Turner, N.J., 1974: Geol. Surv. Expl. Rept., Geological Atlas 1: 250,000 Series. Burnie. *Tasm. Dept. of Mines.*

_____, Solomon, M. and Green, G.R., 1975: The geological setting of metalliferous ore deposits in Tasmania in ECONOMIC GEOLOGY OF AUSTRALIA AND PAPUA NEW GUINEA (C.L. Knight Ed.). Aust. Inst. Min. Met., Melbourne.

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