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The Permian Stratigraphy of Douglas Creek, Pelion Range

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Introduction:

As a preliminary to the formation mapping of Du Cane Quadrangle, a reconnaissance was made of Douglas Creek between the Pelion Plains and Mt. Doris. Co-ordinates used in fixing positions are based on those shown on the 4-mile Map of Tasmania, the unit used being 100 feet.

General Geology: The Permian rocks rest upon an irregular surface developed in Precambrian quartzite, and are capped with a widespread dolerite sill, although in some areas the dolerite boundaries are discordant.

The Precambrian outcrops on Pelion Plains near the Old Pelion Hut, or Emhlangana, at 4032/8498. Between there and the New Pelion Hut or Pelion Chalet, at 4042/8493, and trending roughly WSW to link Lake Ayr and the northern end of Frog Flat, is a fault or steep stratigraphic boundary, as the rocks exposed at Pelion Chalet are Liffey Group sandstones which are fairly high in the Permian sequence.

Permian Stratigraphy:

General: Plate 2 of the Geological Survey Mineral Resources No. 7, The Coal Resources of Tasmania, gives a schematic representation of the Permian stratigraphy of this area (Pelion-Barn Bluff). The sequence shown is 100 feet of basal conglomerate, 30 feet of Lower Marine Mudstone, 50 feet of Greta Coal Measures, 960 feet of Upper Marine Mudstone, and 730 feet of Tomago Coal Measures.

The present mapping identifies the Greta Coal Measures with the Liffey Group, the upper Marine as the Woodbridge and Ferntree Groups, and the Tomago Coal Measures as the Cygnet Coal Measures or as Triassic—coal samples have been forwarded for pollen analysis which should resolve this question.

Details of the Douglas Creek traverse are given below. The traverse commences in the sandstones of the Liffey Group and there is fair outcrop up to what is probably the Ferntree Group, with a major covered interval at the top of the Ferntree. However an examination of this part of the sequence in the creek running N.W. from the Thetis Saddle (intersects 401/848) shows that the lithology of the Ferntree Group is very uniform near the top, and the missing portion of the Upper Coal Measures has been investigated on Thetis Saddle and Pelion East.

The traverse crosses one fault of unknown downthrow to the north, striking probably westerly through 4042/8496. The summary of the stratigraphy shows sandstones of the Liffey Group (Formations 1, 2, 3, 4?) as at least 96 feet thick, the Woodbridge Group (Formation 5?) as 102 feet thick, and ignoring the throw on the fault, the Ferntree Group (Formations 6, 7, 8?) as at least 368 feet thick. With observations from Pelion East, where the top of the siltstone is at 3470 feet a.s.l., the probable thickness of the Ferntree Group is about 511 feet, with the overlying sandstones 930 feet thick on Pelion East.

DOUGLAS CREEK TRAVERSE.

The commencement point was the doorstep of Pelion Chalet at 4042/8493, which is about 2,800 feet above sea level. In Douglas Creek just east of the hut is a timbered, water-filled shaft, 2' 6" square and 25 feet deep, with its lip 25' 8" below the hut step. The stratigraphy has been measured from the bottom of this shaft which is about 2750 feet a.s.l.

Except for those units which could be directly measured, measurements were made with a tape and abney, and checks were made against the map contours and barometer heights. It should be noted that the abney was damaged before use, and the thicknesses given are corrected for the instrument error, which is thought to have remained constant during the survey.

Formation 1: Unit 1: Dump material from the shaft is tough, coherent sandstone, consisting of 70 percent quartz, 20 percent mica, 10 percent feldspar, and has carbonaceous laminae with plant fragments. The matrix is yellow, well sorted, with low porosity. There are occasional pebbles of crystalline pyrite. Thickness 25'.

Covered interval: 4" (From top of shaft to first outcrop in creek).

Unit 2: White, fine grained sandstone, weathering red, consisting of 80 percent quartz, 20 percent feldspar, with occasional mica flakes. The rock is compact, non-fissile, coherent, non-porous, with thickness 1' 6".

Unit 3: This is a fissile laminated sandstone. There are lenticular laminae of coarse sandstone, white, yellow and red, consisting of 60 percent quartz and 40 percent feldspar between micaceous, carbonaceous laminae. The laminations are about $\frac{1}{8}$ inch thick. Measured thickness 1' 6".

Unit 4: Resembles unit 2. Thickness approximately 3 feet.

Unit 5: Resembles unit 3, but with 1/16" laminations. Thickness 2' 10".

Unit 6: Crossbedded sandstone 3" to 9" thick with wavy top interbedded with laminated sandstone 5"—12" thick. Total thickness 1' 2".

Unit 7: White, sparkling, coherent, well sorted sandstone consisting of spherical, subrounded quartz, 80 percent, 20 percent feldspar, and mica and carbonaceous fragments. Thickness slightly more than 4 feet.

Fault or major joint strikes 130°, dips at 87° to the south-west.

Unit 8: Sandstone with flaggy bedding, approximately 9 feet thick.

Unit 9: Laminated sandstone, 2 feet thick.

Unit 10: Blue micaceous shale with no bedding or banding, coherent, non-porous, with weak parting. It contains occasional subrounded boulders up to 12" diameter, and one lenticular band of conglomerate up to 6" thick. Thickness about 8 feet.

Unit 11: Laminated sandstone, 9" thick.

Unit 12: Sandstone with sole markings on the lower surface. 11" thick.

Unit 13: Laminated sandstone, 6" thick.

Unit 14: Sandstone, 1' 10" thick.

Unit 15: A distinctive conglomerate with 60 percent pebbles of quartzite, subrounded to rounded, spherical to subspherical, averaging 1" diameter but up to 4" diameter. The pebbles are mostly white, but 10 percent are black. The matrix is euhedral to subhedral glassy quartz up to $\frac{1}{8}$ " diameter, averaging $\frac{1}{16}$ ", and is poorly sorted, friable, porous with no bedding. This unit forms the waterfall at the swimming pool, and is approximately 2 feet thick.

Formation 2: Is an interlaminated and interbanded sandstone and shale. The sandstone occurs in bands 1"-2" thick, from 2"-4" apart in a regular pattern. The sandstone weathers yellow, consists of approximately 60 percent quartz, 40 percent feldspar, with up to 5 percent of rock fragments.

The rock is coarse siltstone near the base of the formation but the grain size decreases rapidly upwards to a blue, micaceous fissile shale.

Both the shale and sandstone bands have $\frac{1}{8}$ " laminations.

There are several occasional 1" conglomerate bands near the base, containing rounded spherical quartzite pebbles averaging $\frac{1}{2}$ " diameter.

This formation is 18' thick.

Formation 3: A coarse grey sandstone, consisting of equal amounts of quartz and feldspar with occasional lumps of a soft white mineral averaging $\frac{1}{16}$ " diameter. The grains are angular, not rounded. There is a large amount of black graphite or carbonaceous material, including plant stems up to 3" long. The rock is friable, porous, with no bedding. The base is conglomeratic, and the top 9" consists of a fissile conglomerate with rounded, spherical pebbles of quartzite averaging $\frac{1}{2}$ " but up to 3" diameter.

Thickness is slightly more than 3' 9".

Formation 4: Lithologically identical with formation 2. Total thickness is 10'.

Formation 5: A sequence of 11 units consisting of fossiliferous pebbly mudstones and limestones.

Unit 1: a grey, fine grained, coherent, tough calcareous mudstone with rare angular to rounded boulders of white quartzite up to 6" diameter and spherical, subangular pebbles of quartz averaging $\frac{1}{2}$ " diameter and forming about 2 percent of the rock. Thickness is a little more than 1'.

Unit 2: A fossiliferous pebbly mudstone in beds from 12" to 3' 6" thick, with tessellated pavement jointing. The matrix is blue, consisting of about 60 percent quartz, shell fragments, muscovite flakes, and (?) graphite, and is a fine arenite. Spherical and subrounded quartz fragments averaging $\frac{1}{2}$ " diameter comprise about 2 percent of the rock. There are also shell fragments, including whole spiriferids, martiniopsids and pectinids, up to 12" long), and plant stems up to 4" long. The fossils occur in bands or lenses about 3" thick, commonly with erratics of quartzite and schist, well rounded and subspherical, averaging 1" diameter but up to 6". In most fossils only one valve is preserved, but sometimes in the case of brachiopods both valves are preserved. Thickness is 8 feet.

Unit 3: A bryozoan mudstone with tessellated pavement jointing. Fossils form at least 50 percent of the rock, which has partings at about $\frac{1}{8}$ " separation, due to abundant fenestellids. Fossils include small spiriferids, productids, stenoporids and fenestellids, the last group being dominant. The matrix is coherent, blue, fine siltstone, with occasional subangular erratics up to 4" diameter. Thickness is 11', of which 6' is covered.

Unit 4: A coarse conglomeratic siltstone with a matrix consisting of 80 percent quartz, 20 percent felspar, an indeterminate amount of calcite and occasional mica flakes. Pebbles of subrounded, subspherical quartzite, averaging 2" diameter but up to 6", are very common in bands. Shell fragments, rounded quartzite, and black schist fragments averaging $1/16$ " form about 5 percent of the rock. The rock is coherent, tough, with no banding or fissility, in beds about 2 feet thick. Thickness is 4 feet.

Covered interval with siltstone outcrops, 8'.

Unit 5: Six inch beds of blue siltstone with quartz and shell fragments of fine arenite size are separated by fissile shale. The fissility is due to abundant fenestellids, with stenoporids and gastropods also present. Rare erratics up to 12" diameter occur. Thickness is 5'.

Covered interval with siltstone outcrops, 11'.

Unit 6: A highly fossiliferous calcarenite. The matrix is blue lutite, averaging 80 percent shell material. The colour is brown where shell material is particularly abundant. Macroscopic fossils including stenoporids, fenestellids, and productids, form 60 percent of the rock, with a few angular quartzite erratics averaging 4" diameter. The limestone weathers yellow, and has bedding marked by fossil layers 4" apart, but is also highly fossiliferous between layers. Thickness is 3'.

Covered interval, 8'.

Unit 7 is a blue spheroidally weathering, compact, non-fissile siltstone containing perhaps 30 percent quartz. There are rare spiriferid fossils and no pebbles. Thickness is 2'.

Covered interval of 14'.

The traverse has here reached 4000/8000, near the 2900' contour on the map. Surveyed altitude is 2920'.

Unit 8 is a fossiliferous pebbly sandstone. The matrix is green, consisting of 40 percent rounded, spherical quartz and 30 percent angular shell fragments. Pebbles are white and black quartzite averaging 1" but up to 4" diameter. Fossils are spiriferids, contained mainly in lenses. The rock is compact, in beds 4' and 2' thick. Thickness is 6'.

Unit 9 is a blue, fissile calcareous mudstone, with abundant spiriferids and fenestellids, and is 2' 6" thick.

Unit 10 is a highly fossiliferous, brown pebbly calcareous siltstone. Fossils are up to 6" across. The spiriferids are notably alate. The rock occurs in beds 1', 2', 2', 4' thick; total thickness 9'.

Covered interval with stenoporids in siltstone 2'.

Unit 11 is a fossiliferous pebbly sandstone, resembling unit 8. Thickness is 8'. This forms a waterfall with the succeeding rock type.

Formation 6: Unit 1 is a pebbly siltstone, white, weathering yellow, consisting of 50 percent quartz, 50 percent felspar. Spherical rounded quartzite pebbles average 1" diameter, but angular boulders up to 12" occur. The rock is unfossiliferous, friable, with bedding weakly defined. Thickness is 6'.

Hard, tough siltstone consisting of 60 percent quartz and rock fragments in a fine grained, green matrix with erratics up to 4". Thickness is 2'.

Covered interval.

White, pebbly siltstone, in 8" and 2" beds, 13' thick.

Unit 2: Waterfall over blue siltstone consisting of quartz and rock fragments averaging 1/64" diameter in a finer matrix. The rock is compact, weakly fissile, slightly unctuous, with rare pebbles and spiriferids. Bedding is poor, averaging 12" thick. Thickness is 4' 6".

Siltstone with sparse pebbles and fossils, and with weak, irregular thin dark laminations. Thickness 3'.

Siltstone with strong drag dip of 37° to the north. Contains bands of spiriferids. Allowing for the drag dip, the stratigraphic thickness surveyed is 33', the increase in altitude being 3'.

Covered interval of 40'.

This point is at the foot of the waterfall at 4044/8467, near the 3000 foot contour on the map. Surveyed altitude is 3048'.

Unit 3: A blue, spheroidally weathered siltstone forming a waterfall. Bedding is poorly defined, and very irregular. The matrix contains quartz, and dark bands as irregular wavy laminations. There are occasional alate spiriferids, and rare pebbles of white and black quartzite, averaging 1/4" diameter but up to 4", forming less than 1 percent of the total volume of the rock.

Within this siltstone are bands from 12" to 6 feet thick of fine arenite, in which angular fragments of quartz and rock averaging 1/32" diameter form 10 percent of the rock.

Thickness is 66'. This brings the traverse to the Overland Track from Cradle Mountain to Lake St. Clair at 4043/8467, near the 3100 foot contour. Surveyed altitude is 3114'.

Covered interval in siltstone, 117'.

Unit 4: A blue siltstone, weathering to mottled red and orange. The rock is coherent, tough, with no bedding but weak horizontal parting.

Rock fragments including biotite form 30 percent of the rock, in a fine grained groundmass. There are no pebbles or fossils. Thickness is 14'.

Formation 7: A quartzite 2 feet thick, with tessellated pavement jointing enclosed in fissile siltstone. Boulders present are angular to subrounded quartzite up to 12" diameter. Portions of the rock consist of 50 percent rock fragments, mainly quartzite and schist, averaging 1/4" diameter. The matrix is green, tough, with conchoidal fracture, consisting of rock flakes averaging 1/64" diameter in a fine grained groundmass.

Formation 8: Immediately overlying formation 7 is a fissile siltstone without pebbles or fossils. Thickness is 2 feet.

Overlying this a coarse felspathic siltstone, 7' thick.

Covered interval, 43'.

Mottled blue siliceous siltstone without pebbles, fossils, bedding or fissility, forming a waterfall. Thickness is 3 feet.

Covered interval, 9'.

Siliceous mudstone, 5'.

Covered interval, 60'

Pleistocene till (a dolerite boulder bed with rock flour matrix) outcrops in the creek over a vertical interval of 96'. At this height the creek was left, and the traverse taken towards Mt. Doris. From the creek to the foot of the sandstone cliffs on Mt. Doris was a vertical interval of 294'.

The traverse was concluded at the foot of the cliffs, north face of Mt. Doris, at 4042/8454, near the 3800 foot contour on the map. Surveyed altitude is 3764'.

Summary of Stratigraphy, Douglas Creek.

Sandstone, Mt Doris.

Covered Interval

450'

Formation 8: Siltstone without pebbles or fossils

70'

Formation 7: Conglomeratic siltstone

2'

Formation 6: Pebbly siltstone with occasional fossils.

Unit 4: Mottled, unfossiliferous siltstone without pebbles

15'

Unit 3: Pebbly siltstone with rare fossils and coarse bands (exposed thickness)

181'

FAULT OF UNKNOWN THROW

Unit 2: Siltstone with rare pebbles and fossils (exposed thickness)

70'

Unit 1: Pebbly siltstone

21'

Total thickness (neglecting fault throw)

296'

Formation 5: Fossiliferous pebbly mudstones and limestones.

Unit 11: Fossiliferous pebbly sandstone

8'

Unit 10: Pebbly calcareous siltstone

11'

Unit 9: Fossiliferous, calcareous mudstone

2'

6"

Unit 8: Fossiliferous pebbly sandstone

6'

Unit 7: Siltstone with rare fossils, no pebbles

16'

Unit 6: Calcareneite

11'

Unit 5: Fossiliferous siltstone with rare erratics

16'

Unit 4: Conglomeratic siltstone

12'

Unit 3: Bryozoan siltstone

11'

Unit 2: Fossiliferous pebbly mudstone

8'

Unit 1: Pebbly calcareous mudstone

1'

Total thickness	102'
Formation 4: Interlaminated, interbedded, sandstone and shale	10'
Formation 3: Conglomeratic, carbonaceous sandstone	3' 9"
Formation 2: Interlaminated and interbedded sandstone and shale	18'
Formation 1: Carbonaceous crossbedded massive and fissile sandstones.	
Unit 15: Conglomerate with euhedral quartz	2'
Units 11-14: Sandstones	4'
Unit 10: Blue micaceous shale with occasional pebbles	8'
Units 1-9: Sandstones	50' 4"
Total thickness exposed	64' 4"

TOTAL THICKNESS OF PERMIAN TRAVERSED 1015 feet.

Upper Coal Measures: These sandstones are 930 feet thick on Pelion East. The basal 215' (approx.) consist of alternating massive sandstone with beds of mudstone, which may be the Cygnet Coal Measures. The top 715' (approx.) are alternating massive sandstones and fissile sandstones, probably Triassic.

On Pelion East, two coal seams were found, a 3" seam with a roof of pebbly sandstone and a shale floor at 4053/8463, 3520 feet a.s.l., and a 16" seam with a roof and floor of grey fissile sandstone at 4054/8463, 3700 feet a.s.l., or 50 and 230 feet respectively, above the base of the sandstone.

On Paddys Nut a 21" seam with sandstone roof and shale floor was found at 4020/8460, 3785 feet a.s.l., with mine workings, which is approximately 175 feet above the base of the sandstone.

On the Thetis Saddle a 4" seam with sandstone roof and floor was found at 4013/8460/3860 feet a.s.l., or 250 feet above the base of the sandstone.

An 8" seam was found at 4085/8352, on the Acropolis Track at 3300 feet a.s.l., with a sandstone roof and shale floor. This is no more than 500 feet above the base of the sandstone, and probably much less.

Conclusions: In the Douglas Creek section all units below the Liffey Group are missing and above this the sequence is interrupted by frequent superficial cover and one fairly large fault. Examination of several more sections would be desirable, to check this one, as well as to determine any stratigraphic variation. The best sections are to be obtained in deeply cut gorges with a rapid fall, so that the best remaining sections are probably from Falling Mountain into the Mersey River near Du Cane Hut, from Horizontal Hill down the gorge to the southwest, and from Macs Mountain down into the Wallace River.

APPENDIX.

Specimens from Douglas Creek, Du Cane Quadrangle.

- 52S1: Conglomerate from Liffey Group (Formation 1, Unit 15).
- 52S2: Sandstone band from interbanded sandstone and mudstone, Liffey (?). Formation 2.
- 52S3: Mudstone from interbanded sandstone and mudstone. Formation 2 (Liffey ?).
- 52S4: Sandstone, Formation 3 (Liffey?)
- 52S5: Calcareous mudstone, Formation 5, Unit 1 (Woodbridge?)
- 52S6: Mudstone, Formation 5, Unit 3 (Woodbridge?)
- 52S7: Coarse siltstone, Formation 5, Unit 4 (Woodbridge?)
- 52S8: Siltstone, Formation 5, Unit 5 (Woodbridge?)
- 52S9: Calcarenite, Formation 5, Unit 6 (Woodbridge?)
- 52S10: Siltstone, Formation 5, Unit 7 (Woodbridge?)
- 52S11: Fossiliferous pebbly sandstone, Formation 5, Unit 8 (Woodbridge?)
- 52S12: Siltstone, Formation 6, Unit (1) (Ferntree?)
- 52S13: Siltstone, Formation 6, Unit 3 (Ferntree?)
- 52S14: Sandstone band from Formation 6, Unit 3 (Ferntree?)
- 52S15: Siltstone, Formation 6, Unit 4 (Ferntree?)
- 52S16: Tough siliceous siltstone, Formation 7 (Ferntree?)
- 52S17: Conglomeratic band from Formation 7 (Ferntree?)
- 52S18: Mottled, fine siltstone from Formation 8 (Ferntree?)