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Correlation of the Devonian Formations in the Blantyre Sub-basin, New South Wales with the Adavale Basin, Queensland

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Abstract: The Devonian stratigraphic sequences of the Blantyre Sub-basin in the central part of the Darling Basin, New South Wales and in the Adavale Basin in south central Queensland have been reviewed and correlated, and are broadly comparable, but the former is in a more intracratonic or proximal situation than is the latter. The three major units of the Blantyre Sub-basin can be correlated with the eleven lithostratigraphic units of the Adavale Basin. The information obtained is particularly relevant to an understanding of the petroleum prospectively of the Blantyre Sub-basin.

Keywords: Blantyre Sub-basin, Darling Basin, Adavale Basin, Devonian sequence, lithostratigraphic units, stratigraphic correlation, seismic lines, wireline logs, lithofacies.

INTRODUCTION

This paper presents the results and major conclusions of a regional seismic stratigraphic and well log analysis of the Devonian sequences in the Blantyre Sub-basin of the Darling Basin in New South Wales and the Adavale Basin in Queensland. This paper is one of the first detailed, comprehensive published accounts of a comparison of the stratigraphy and sedimentology of the Blantyre Sub-basin and the Adavale Basin. Of the studies of the Blantyre Sub-basin which have already been published, that by Khalifa (2009) and Khalifa & Ward (2009, 2010) have been the most important in defining subsurface stratigraphic and sedimentological framework in the central part of the Darling Basin.

The Blantyre Sub-basin is proving to be an important region for petroleum exploration, and is typical of sedimentary sub-basins in the Darling Basin, western New South Wales. Figure 1 shows the geographical location of the Blantyre Sub-basin in the central part of the Darling Basin in NSW and Adavale Basin in Queensland. The Adavale Basin is of approximately the same age and size as the Darling Basin (Bembrick 1997a; Alder et al. 1998; Passmore and Sexton 1984; Geological Survey of Queensland 2005, 2006; McKillop et al. 2007; Campbell & King 2009).

Many previous authors have documented and debated the age range of the Devonian sequence in the Darling Basin (Packham 1969; Ward et al. 1969; Brown et al. 1982; Glen 1979, 1982a, b; Glen et al. 1996; Byrnes 1985; Neef et al. 1989, 1995, 1996a, b; Neef 2003, 2004, 2009; Mullard 1995; Bembrick 1997a, b; Alder et al. 1998; Cooney & Mantaring 2007; Blevin et al. 2007; Khalifa 2005, 2006a, 2009; Khalifa & Ward 2009).

Several authors (e.g. Bembrick 1997a, b; Alder et al. 1998) have used four seismic marker unconformities (A, B, C & D), originally described by Evans (1977), to divide the stratigraphic sequence of the Darling Basin into three informal units.

Aspects of the lithostratigraphic units in the Blantyre Sub-basin and Adavale Basin have been described in the literature by authors such as Auchincloss (1976), Paten (1977), Catuhe & Laws (1979), Glen (1979, 1982a), Price (1980), Pinchin & Senior (1982), Sexton (1983), Moss & Wake-Dyster (1983), Passmore & Sexton (1984), Evans et al. (1990), De Boer (1996), Bembrick (1997a, b), Alder et al. (1998), Scheibner & Basden, (1998), McKillop et al. (2007) and Campbell & King (2009). A more recent appraisal of the subsurface stratigraphy and sedimentary facies of the Blantyre Sub- basin, relevant to the present discussion, is given by Khalifa (2005, 2006a, b, 2009) and Khalifa & Ward (2009, 2010).

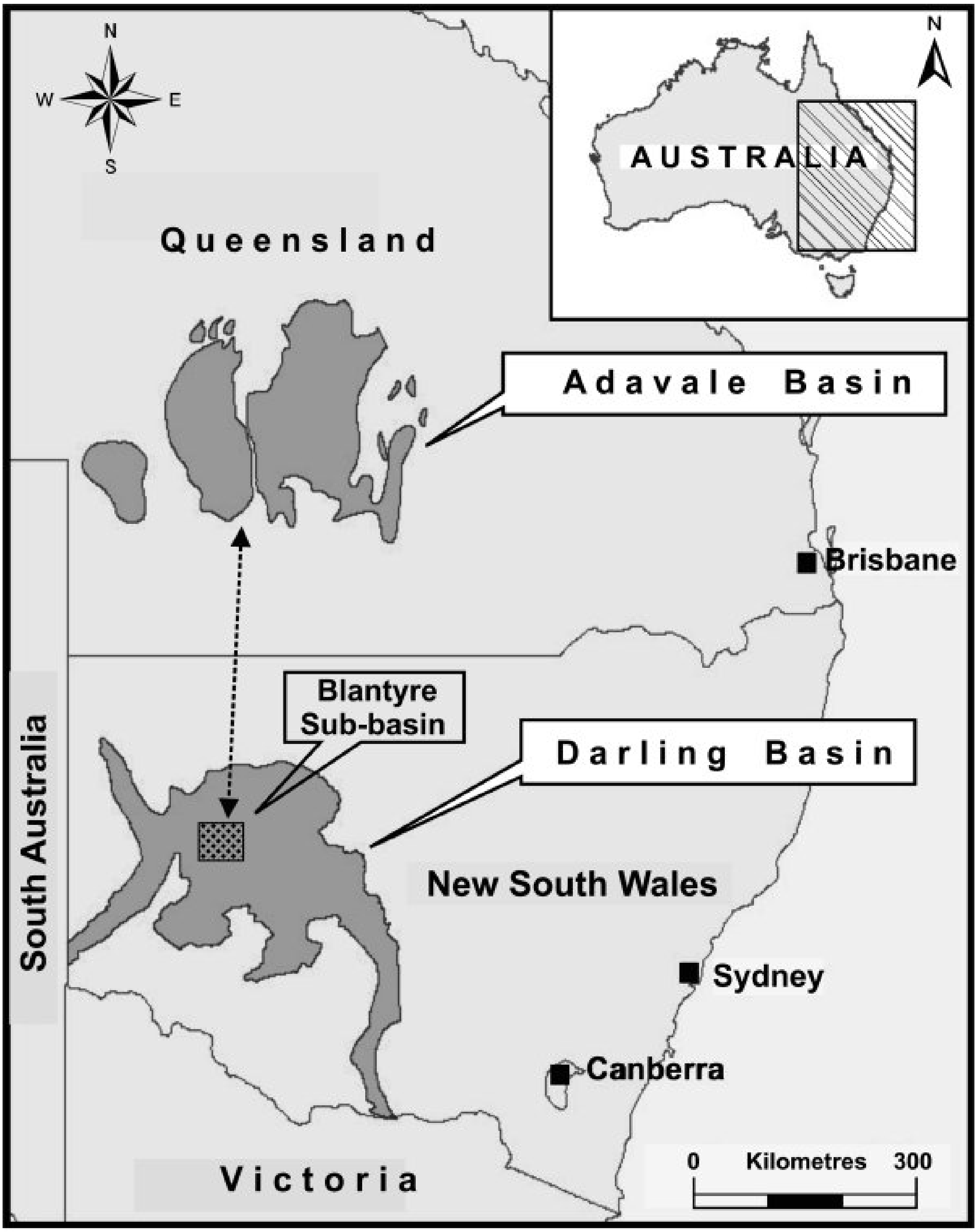

Figure 1. Geographical location of the Blantyre Sub-basin in the central part of the Darling Basin, NSW, in relation to the Adavale Basin, in south-central Queensland with boxes indicating the study areas used in the text (modified after Cooney & Mantaring 2007).

The scope of the current investigation was to review the Blantyre Sub-basin Devonian sequence and compile a framework of the stratigraphic sequence and lithostratigraphy into which information from further studies could be integrated. The purpose of this paper is to compare the lithostratigraphic units of the whole of the Blantyre Sub-basin, and relate them to several different the stratigraphic units within the Adavale Basin using the subsurface stratigraphy for correlation. A series of seismic lines, wireline logs and lithological logs has been used in this research.

STRATIGRAPHIC SETTING

The Devonian Stratigraphy of the Blantyre Sub-basin

The Devonian stratigraphy of the Blantyre Sub-basin has been summarised by Khalifa (2005, 2009) and Khalifa & Ward (2009) and consists of three main lithostratigraphic sequences - the Winduck, Snake Cave and Ravendale Intervals - separated by regional seismic sequence boundaries mapped as horizons 1, 2, 3 and 4/5 shown in Figure 2. The distribution of the seismic markers defining the lithostratigraphic sequences is illustrated in a series of regional seismic sections, using the Blantyre-1 and Mount Emu-1 wells for control, as interpreted by Khalifa (2005, 2006a, 2009) and Khalifa & Ward (2009) in Figures 3a, b and c. In the current paper key horizons are designated utilizing a similar nomenclature to that applied by previous authors to the Darling Basin (Bembrick 1997a, b; Alder et al. 1998; Cooney & Mantaring 2007; Blevin et al. 2007). These key divisions correspond to the four seismic horizons A, B, C and D identified in the lithostratigraphic sequences of latest Silurian to late Devonian age by Evans (1977).

Khalifa (2005, 2006a, 2009), Khalifa & Ward (2009), Khalifa & Mills (2010) suggested that Horizon 1 is the base of the Winduck Interval/top of undifferentiated Proterozoic complex and/or Cambro-Ordovician sediments, Horizon 2 is the base of Snake Cave Interval/top of Winduck Interval, Horizon 3 is the base of Ravendale Interval/top of Snake Cave Interval and Horizon 4/5 is the base of undifferentiated Upper Carboniferous-Permian sediments. Horizon 4/5 may be the top of either the Snake Cave, or Ravendale Intervals, or even locally the top of Winduck Interval within the sub-basin (Figure 2).

In general the stratigraphic framework of the Blantyre Sub-basin comprises three lithostratigraphic sequences of latest Silurian to Devonian age, the succession in the sub-basin is subdivided on the basis of regional seismic horizons into three major intervals as follows: (1) Latest Silurian to Early Devonian (Pragian) Winduck Interval and equivalents, (2) Early Devonian (Emsian) to Middle Devonian (Eifelian) Snake Cave Interval and equivalents, and (3) Middle Devonian (Givetian) to Late Devonian (Famenian) Ravendale Interval and equivalents (cf. Bembrick 1997a, b; Alder et al. 1998; Cooney & Mantaring 2007). The generalised stratigraphy is summarised in Figure 2, which shows major sedimentological changes across the Blantyre Sub-basin based on earlier work such as Khalifa (2005, 2006a, 2009), Khalifa & Ward (2009, 2010) and Khalifa & Mills (in prep) provide updated summaries of the scheme, as discussed below.

The Devonian Stratigraphy of the Adavale Basin

The Adavale Basin is an onshore entirely concealed subsurface basin, approximately 850 kilometres west-northwest of Brisbane in south central Queensland. The preserved areal extent of the basin is 66,000 square kilometres, including the Warrabin and Barcoo Troughs. The basin overlies a basement of early Palaeozoic metamorphic and igneous rocks of the Lachlan or Thompson Fold Belts (Heikkila 1966; Slanis & Netzel 1967; Auchincloss 1976). During the Early and Middle Devonian, the basement rocks were overlain by volcanics and continental clastics, and by marine clastics deposited in a westerly-transgressive sea (Galloway 1970; Paten 1977; Price 1980).

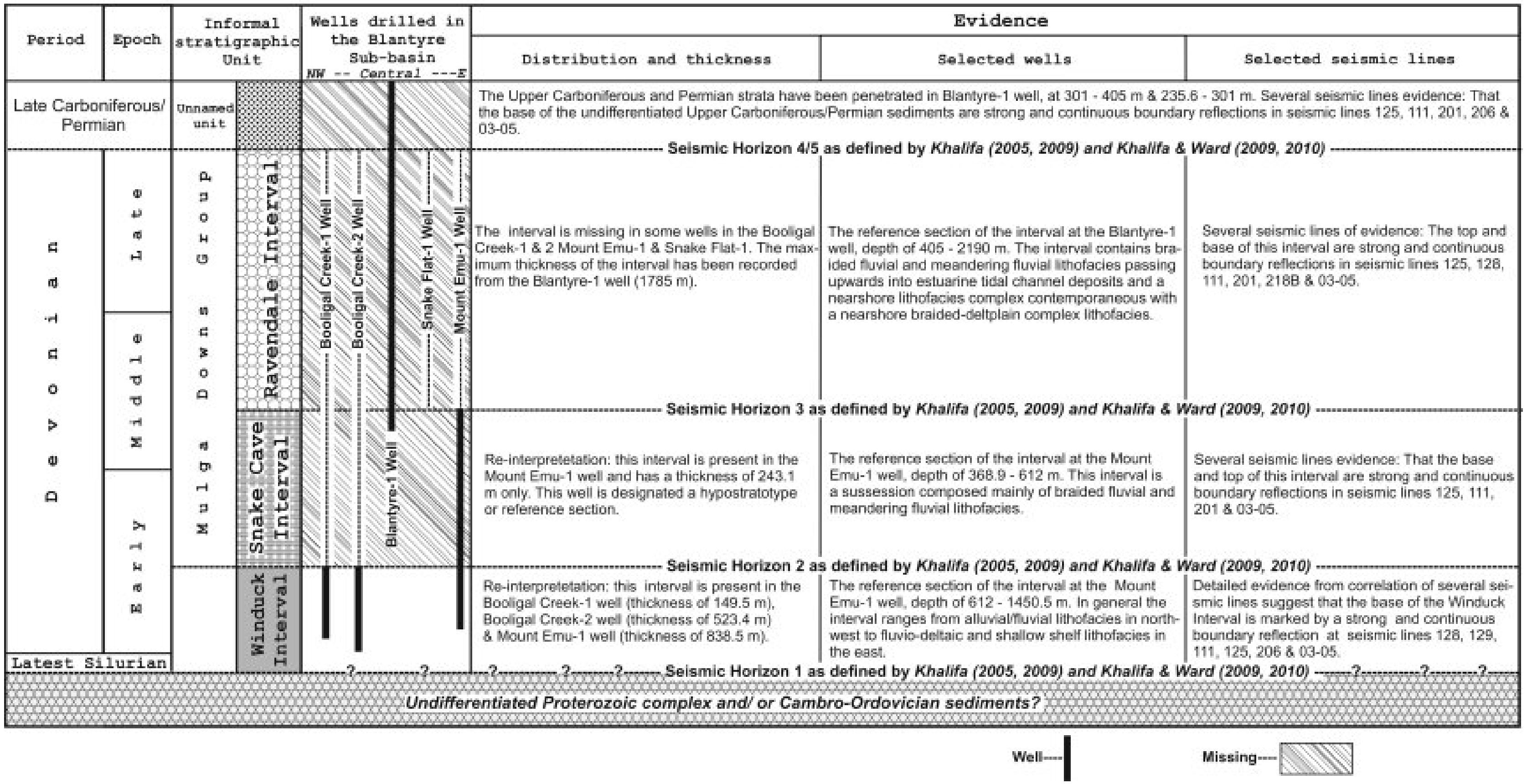

Figure 2. Generalised lithostratigraphic subdivision of the Devonian sequence (Winduck, Snake Cave and Ravendale Intervals), and correlation in the Blantyre Sub-basin. Regional seismic markers from Khalifa (2005, 2009) and Khalifa & Ward (2009, 2010) are correlated with the three informally named 'Intervals' described by Bembrick (1997a, b).

This early marine deposition was succeeded by more restricted marine and evaporite deposition in a regressive sea, and by continental clastics, during the Middle and Late Devonian and possibly into the Early Carboniferous. Seismic data suggest that the total thickness of strata in the basin may be as much as 8500 m (Passmore & Sexton 1984).

The Adavale Basin and associated troughs were discussed in detail by Paten (1977), Moss & Wake-Dyster (1983), Passmore & Sexton (1984); Evans et al. (1990); De Boer (1996), Geological Survey of Queensland (2005, 2006) and Campbell & King 2009. Paten (1977) provided detailed information on the Devonian stratigraphy and suggested revisions to lithostratigraphic relationships and nomenclatures used by previous workers. The Devonian lithostratigraphy has been divided in into several units of the Gumbardo Formation consisting mainly of continental volcanic sediments with red bed unit. The Eastwood Beds and the Log Creek Formation are divisions of a sequence of sandstones and carbonates. The Bury Limestone and Cooladdi Dolomite are divisions of a sequence of carbonates. The Lissoy Sandstone is generally siliciclastic sediments overlain by the Cooladdi Dolomite. The Etonvale Formation contains a sandstone member, a Boree salt member, an evaporitic carbonate and a shale/siltstone member and the Buckabie Formation consists of continental redbeds of sandstone, shale and siltstone (Figure 4).

The Devonian sequences have been affected by two major tectonic and depositional events (Moss & Wake-Dyster 1983; Passmore & Sexton 1984). In the mid- Devonian the sequence was uplifted during the Tabberaberran Orogeny. Minor erosion took place prior to a marine transgression in which the Cooladdi Dolomite was deposited widely through the Adavale Basin. In the mid-Carboniferous the entire Devonian sequence was folded and faulted during the Kanimblan Orogeny. The Devonian sequences were stripped from basement highs during a major period of erosion which peneplaned the region separating the Adavale Basin from surrounding depressed areas also containing substantial thicknesses of Devonian sediments. Devonian sequences have been penetrated in exploration wells in the Cooladdi, Warrabin and Barcoo Troughs; the existence of Devonian sequences in the Quilpie and Westgate Troughs is inferred from geophysical information.

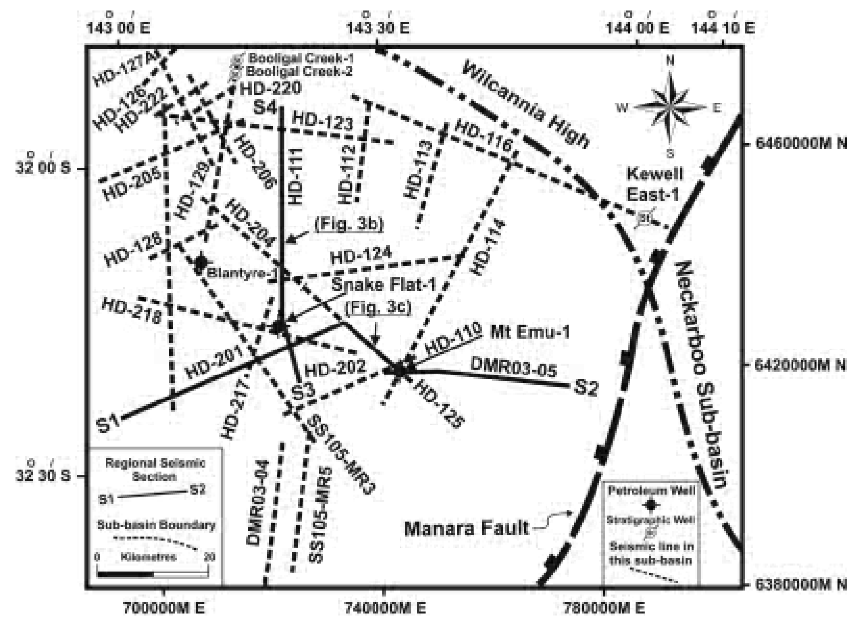

Figure 3 (a). Index map of location of the regional seismic section S1-S2 and S3-S4 in the Blantyre Sub-basin in the central part of the Darling Basin.

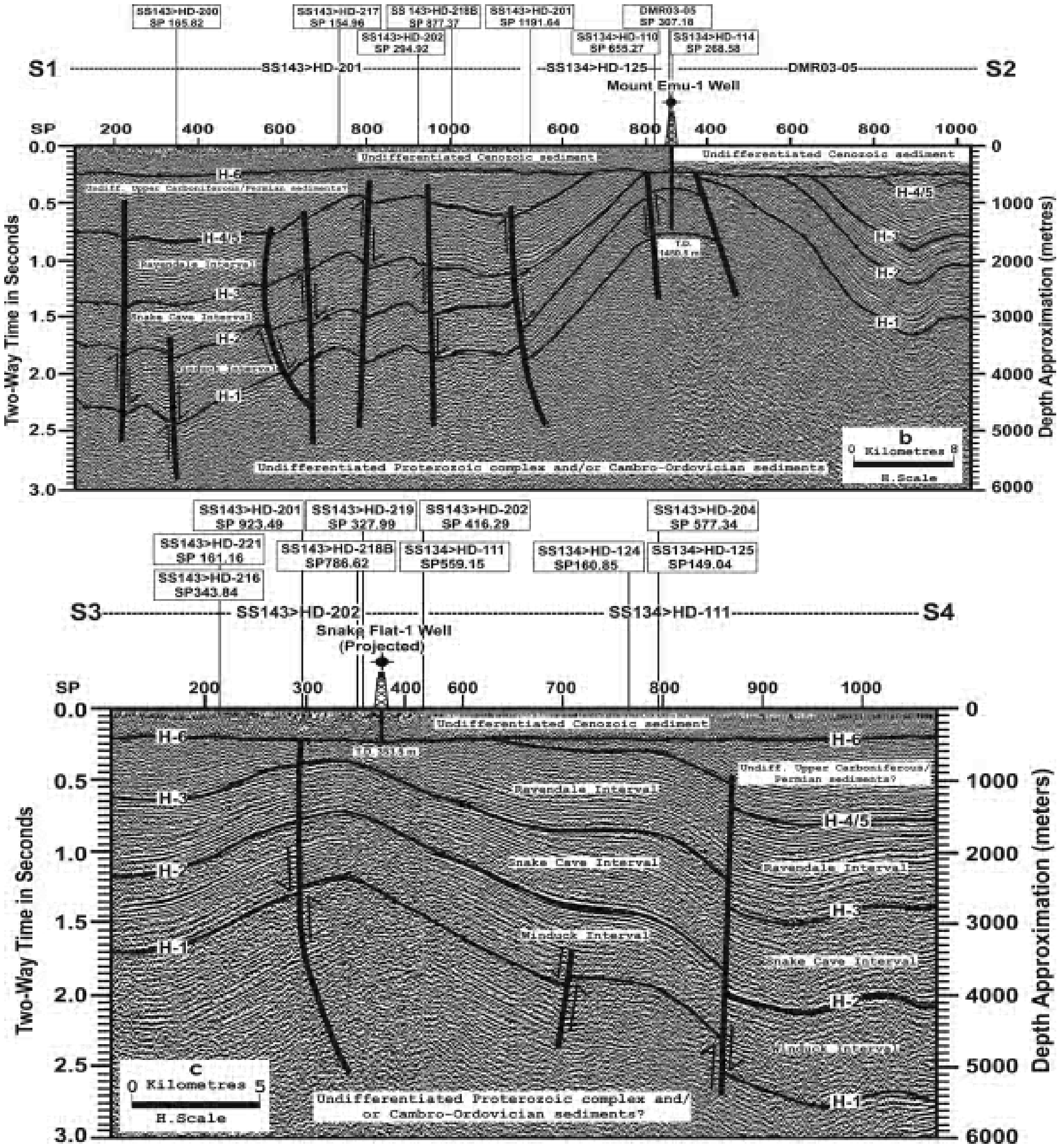

Figure 3 (b). Interpreted regional seismic section S1-S2, showing the geometry of the lithostratigraphic sequences within the Blantyre Sub-basin. The section is based on well data and seismic lines SS143>HD-201, SS134>HD-125 and DMR03-05. (c) Interpreted regional seismic section S3-S4, showing the geometry of the lithostratigraphic sequences within the Blantyre Sub-basin. The section is based on well data and seismic lines SS143>HD-202 and SS134>HD-111. See location of regional seismic section S1-S2 and S3-S4 is shown in Figure 3a.

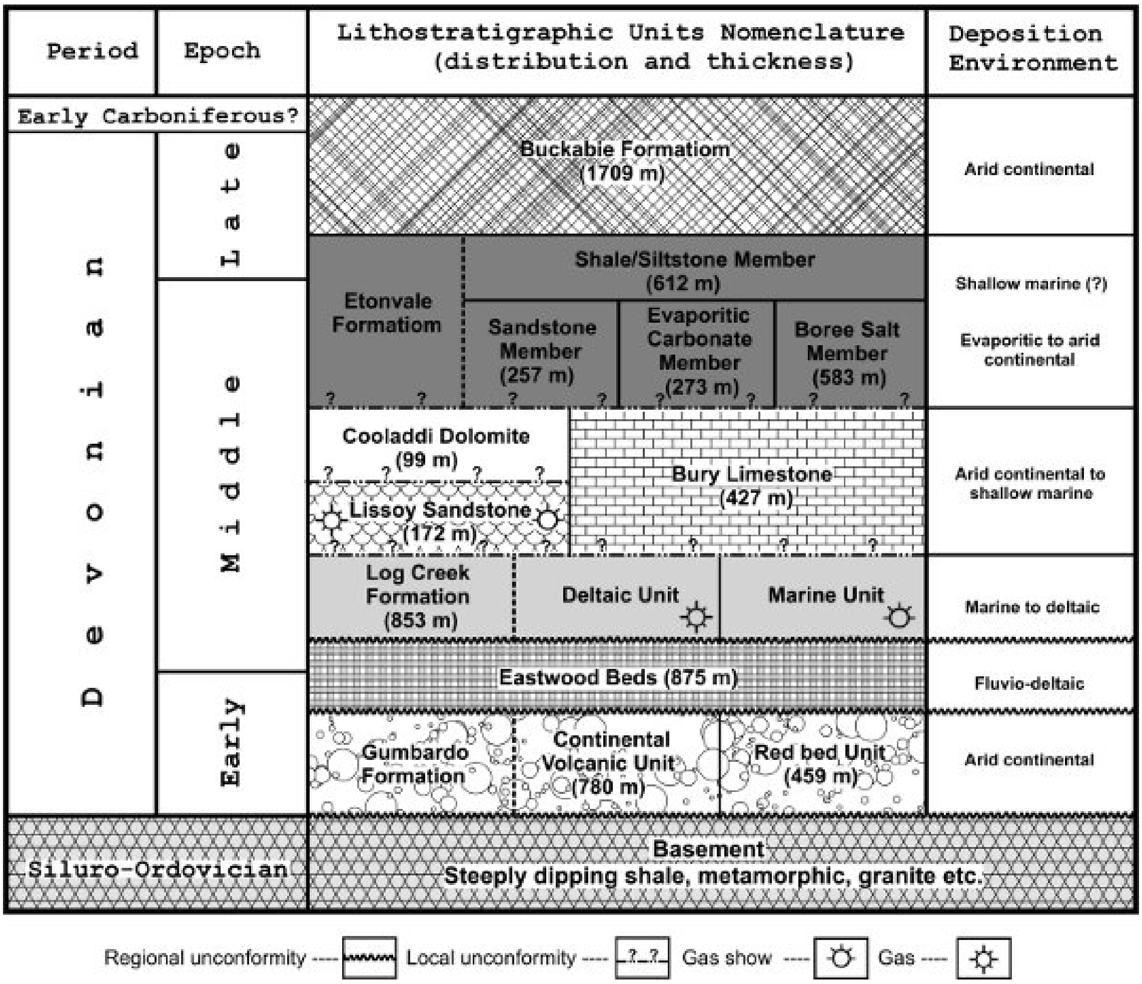

Figure 4. Major lithostratigraphic units of the Devonian sequence in the Adavale Basin and thicknesses of the units drilled (modified from Paten 1977; Wake-Dyster 1983 Passmore & Sexton 1984; De Boer 1996; Campbell & King 2009).

OBSERVATIONS AND DISCUSSION

Lithostratigraphy and Correlations

The Blantyre Sub-basin lithostratigraphy was comprehensively reviewed by Khalifa (2005, 2006a, 2009) and Khalifa & Ward (2009) so this section is simply a summary of the data significant to the Blantyre Sub-basin. The results resulted in a new lithostratigraphic correlation of the Winduck, Snake Cave and Ravendale Intervals for the Blantyre Sub-basin (Khalifa & Ward, 2009) (Figure 5). The Adavale Basin stratigraphic succession has recently been summarised by Paten (1977), Moss & Wake- Dyster (1983), Passmore & Sexton (1984) and De Boer (1996), shown in Figure 4.

As part of the preparation for this paper, a palaeogeographic study compared the Devonian sequence of the Blantyre Sub-basin with that of the better-understood Adavale Basin, in Queensland to the north (Figure 1). After a review of the available published and unpublished literature, a comparison was drawn up from the work of Bembrick, 1997a, b; Alder et al. 1998; Cooney & Mantaring 2007; Khalifa 2005, 2009; Khalifa & Ward 2009, 2010 and extended to show the relation of the Adavale stratigraphy to the results of the present study (Figure 5). The Adavale Basin has up to 8000 metres of Devonian sediments (Moss & Wake-Dyster 1983; Passmore & Sexton 1984; Evans et al. 1990; Geological Survey of Queensland 2005, 2006; Campbell & King 2009) and a short summary of the comparative stratigraphic sequence and lithostratigraphy, from bottom to top, is given below:

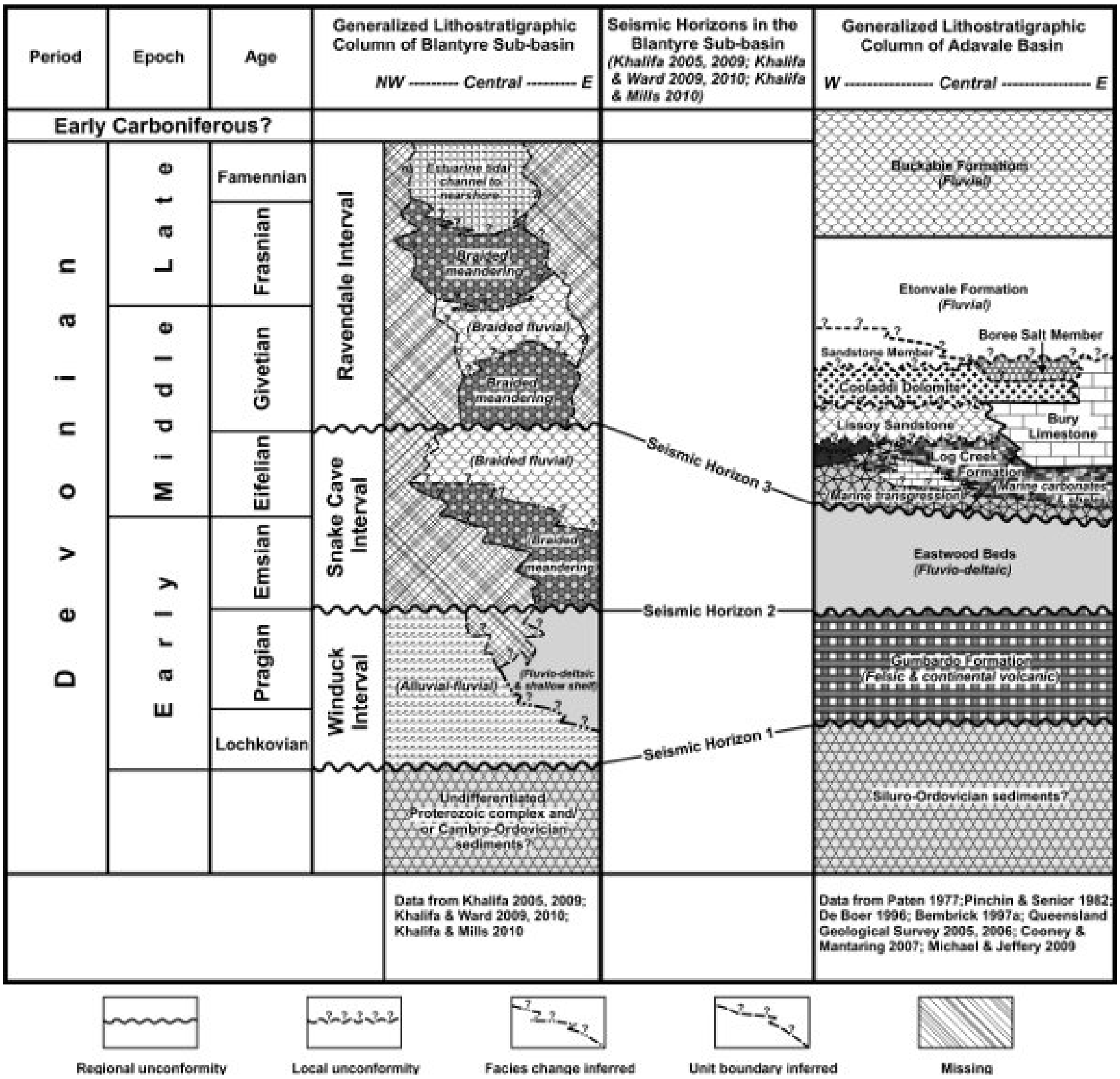

Figure 5. Lithostratigraphic correlation of the Devonian sequence and its equivalents in the Blantyre Sub-basin with that of the Adavale Basin as delineated in the present-day.

Winduck Interval Equivalent – Gumbardo Formation Description and Stratigraphic Correlation

Horizon 1 marks the base of the Winduck Interval identified within the main Blantyre Sub-basin, on the results of regional mapping by Khalifa (2005, 2009: Figures 8-9). The base of this interval is a laterally continuous high-amplitude reflection throughout the Blantyre Sub-basin (Figures 3a, b). It is probably equivalent to the horizon used by Bembrick (1997a, b), Alder et al. (1998) and Cooney & Mantaring (2007), and also to the 'Horizon A' seismic marker as defined by Evans (1977). Horizon 1 is widespread throughout the Blantyre Sub-basin. Its depth ranges between 0.2 to 2.7 s TWT (two-way travel time), being shallowest near the northern margin and deepest in the faulted central part of the Blantyre Sub-basin (Khalifa 2005, 2009; Khalifa & Ward 2009).

A boundary between the Winduck and the Snake Cave Intervals (Horizon 2) can be seen in data from the Mount Emu-1 well. The synthetic seismogram (Khalifa & Ward 2009: see data in table 2 at Geological Society of Australia or National Library of Australia) shows only a relatively weak event at the depth taken as the boundary from the well log. Khalifa & Ward (2009) interpreted the seismic line SS134>HD-125 as showing a stronger reflector 0.36 seconds TWT (612 m) shallower than this horizon, and this was taken as the boundary for the current seismic interpretation.

The Winduck Interval occurs in the Booligal Creek-1 (260–409.5 m) and Booligal Creek-2 (238?-761.4 m) wells, on the northwestern flank of the Blantyre Sub- basin (Khalifa and Ward 2009: Figure 8 and data table 1). This interval is represented in these wells by core samples that are quite similar lithologically, composed mainly of brown to light brown, reddish brown and white sandstones that are medium- to coarse- grained. The grains are commonly micaceous, with intercalations of siltstone and some shale that are variable in thickness. The sandstones and siltstones display small-scale cross bedding and horizontal-laminations (Jessop & Cowan-Lunn 1996; Khalifa 2005; Khalifa & Ward 2009; Khalifa & Mills, in prep).

The Winduck Interval of Early Devonian (Lochkovian and Pragian) sedimentation in the Blantyre Sub-basin has complete equivalent in the Adavale Basin where the initiation of deposition began in the Early Emsian with the Gumbardo Formation (cf. Bembrick 1997a; Alder et al. 1998; Cooney & Mantaring 2007). This formation consists of felsic and continental volcanic and rests unconformably upon basement (Paten 1977; Moss & Wake-Dyster 1983; Passmore & Sexton 1984; Evans et al. 1990). The Gumbardo Formation may represent a correlative of the upper part of the Winduck Interval (Figure 5). The Gumbardo Formation is below drilled depths in the east of the Adavale Basin (Auchincloss, 1976; cited in Evans et al. 1990: Figure 6).

Khalifa (2009) has described the strata of the Winduck Interval, as defined from seismic line DMR03-05, as having an estimated thickness in the Blantyre Sub-basin of approximately 1,400 m (Khalifa 2009: Figure 8). At the central part of the Blantyre Sub-basin in the Mount Emu-1 well, the interval is 838.5 m thick and consists of interbedded sandstone and shale, overlying relatively pure sandstone (Khalifa 2005; Khalifa & Ward 2009: Figure 5).

Snake Cave Interval Equivalent – Eastwood Beds Description and Stratigraphic Correlation

Horizon 2 is taken for this paper as the base of the Snake Cave Interval as defined by Khalifa & Ward (2010: Figures 7, 11 & 14). This horizon shows a strong and continuous reflection across the Blantyre Sub-basin (Figures 3a, b), and is taken as the Winduck/Snake Cave boundary. The interpretation of synthetic seismograms suggests that the contact between the base of the Snake Cave Interval and the top of the Winduck Interval is marked by a sharp increase in the Mount Emu-1 well (Khalifa & Ward 2009: data in table 2 at Geological Society of Australia or National Library of Australia). It is probably equivalent to the horizon used as a similar marker by Bembrick (1997a, b), Alder et al. (1998) and Cooney & Mantaring (2007), equivalent to the 'Horizon B' seismic marker as defined by Evans (1977).

Horizon 2, recognised in all of the regional seismic sections within the Blantyre Sub-basin, ranges in depth between 0.02 and 2.2 s TWT (two-way time), being shallowest near the northern margin of the sub-basin and deepest in the faulted region in the central part of the sub-basin (Khalifa & Ward 2009: Figures 10–12).

A representative of seismic Horizon 2, as the base of the Snake Cave Interval in the Blantyre Sub-basin, appears also to be present at approximately the same stratigraphic level in the Adavale Basin. Khalifa & Ward (2009) suggested equivalence for this horizon and it is clear that the presence of a local angular unconformity between the Snake Cave and the Ravendale Intervals, as indicated by Horizon 2 in regional seismic section A2-B2 in the Blantyre Sub-basin (Khalifa & Ward 2009, Figure 11), is repeated in the Adavale sequence.

Of the studies of the strata of the Snake Cave Interval in the Blantyre Sub-basin, which have already been published, that by Khalifa (2009) and Khalifa & Ward (2009) has been devised by combining information from seismic lines and well logs. In the wells, the maximum thickness of the Snake Cave Interval (243.1 m) has been recorded in the Mount Emu-1 well, and the minimum thickness around 100 m in the Blantyre-1 well. However, the observed thickness in seismic sections reaches an estimated 1,600 m in the western Blantyre Sub-basin (see Khalifa 2009, seismic line SS143>HD-218B Figure 9).

The Snake Cave Interval appears to be a time-equivalent to the complete Eastwood Beds in the Adavale Basin. Figures 4 & 5 shows the Log Creek Formation, overlying the Eastwood Beds. The Eastwood Beds has been encountered only at the northern end of the basin (see Evans et al. 1990, cross-section Figure 9, pp. 93). The Eastwood Beds were probably deposited in a fluvio-deltaic environment (Paten 1977; Passmore & Sexton 1984 cited in Evans et al. 1990). However, the Snake Cave Interval in the Blantyre Sub-basin is a succession mainly composed of braided and meandering fluvial lithofacies as documented by Khalifa (2005, 2006b) and Khalifa & Ward (2010, Figures 4, 8, 12a, 15 & 16).

However, at the close of Eastwood Beds deposition, uplift and erosion in the Adavale Basin occurred, followed by a marine transgression above a mid-Eifelian hiatus. This Eifelian transgression in the Adavale Basin was interrupted in its westward progress by a brief regressive pulse, and transgression was not completed until the rocks of Early Givetian age were deposited (Figure 5).

Ravendale Interval Equivalent – Several Lithostratigraphic Units Description and stratigraphic correlation

Seismic Horizon 3, corresponding to the Snake Cave/Ravendale boundary, has been traced by Khalifa (2005) and Khalifa & Ward (2010, Figures 7, 11 & 14) throughout the Blantyre Sub-basin. It is probably equivalent to the horizon used as a similar marker by Bembrick (1997a, b), Alder et al. (1998) and Cooney & Mantaring (2007), equivalent to the 'Horizon C' seismic marker as defined by Evans (1977). As shown in Figure 3a, b; Horizon 3 is defined throughout the Blantyre Sub-basin.

Khalifa (2005) and Khalifa & Ward (2009) mapped Horizon 3 as widespread throughout the Blantyre Sub-basin, at a depth ranging from 0.25 to 1.5 s TWT (two-way time). Horizon 3 marks the base of the Ravendale Interval and is shallowest in the southeastern and northern parts of the sub-basin and deepest in the faulted region in the central part of the sub-basin (Khalifa & Ward 2009, Figure 10).

The Ravendale Interval is widespread in the Blantyre Sub-basin, but locally is hard to distinguish from the overlying undifferentiated Upper Carboniferous-Permian sediments. Khalifa (2005, 2006a, 2009) recorded that the strata of the Ravendale Interval reach a maximum thickness of approximately 1200 m (0.3 s TWT) in the western Blantyre Sub-basin (Khalifa 2009, Figure 9). However, the base of the Ravendale Interval is missing in part of the Blantyre Sub-basin, especially in the northeast, due to erosion after deposition and uplift (see Khalifa 2009, regional seismic section F3-F4 on Figure 8).

The sediments of the Ravendale Interval were deposited under a braided fluvial and meandering fluvial lithofacies passing upwards into estuarine tidal channel deposits and a nearshore lithofacies described by Khalifa & Ward (2010, Figures 10, 12b & 17).

Rocks of Late Devonian age are widespread throughout the Adavale Basin. These are mapped as several different lithostratigraphic units, including the Log Creek Formation sequence (including the deltaic unit and marine unit), Lissoy Sandstone, Bury Limestone, Cooladdi Dolomite, Etonvale Formation (divided into four members: Boree salt, sandstone, shale/siltstone and evaporitic carbonate members) and Buckabie Formation (Figures 4-5). The whole sequence is probably equivalent to the Ravendale Interval in the Blantyre Sub-basin. The Tabberabberan event within the Middle-Late Devonian, represented by Seismic Horizon 3 in the Blantyre Sub-basin, appears to be present at approximately the same stratigraphic level in the Adavale Basin.

The Ravendale-equivalent sequence in the Adavale Basin includes an extensive carbonate succession with limestones and dolomites. Paten (1977 cited in Evans et al. 1990, Figure 11) suggested that the limestone/shale facies of the Bury Limestone in the south and south-eastern parts of Adavale Basin was deposited within an open sea. In the western part of the basin, however, this sequence is represented by the Cooladdi Dolomite, which was formed in a more landward zone with evaporitic lagoons and restricted water circulation. The nature of these facies of the Log Creek Formation indicates open sea towards the east and southeast during the period of maximum marine transgression in the Adavale Basin (Figure 5).

This marine section, however, appears to be younger than the possible shallow marine deposits interpreted in the present study within the Ravendale Interval. Clastic sequences, such as the Lissoy Sandstone (Figure 5), were also deposited in delta complexes within the Adavale Basin, with distribution varying according to the interplay of eustatic changes in sea level (Shaw 1995). No equivalents to the Bury Limestone, Cooladdi Dolomite and Lissoy Sandstone appear to be present in the lower part of the Ravendale Interval in the Blantyre Sub-basin (see also Bembrick 1997a).

The Etonvale Formation, overlying the Bury Limestone and Cooladdi Dolomite, contains three different lithofacies: dominantly sandstone, shale, and salt (Galloway 1970). The Boree Salt Member is confined to the east of the Adavale Basin (Moss & Wake-Dyster 1983, Table 1), resting upon the Bury Limestone. The remainder is regarded as representing fluvial deposits.

The Buckabie Formation may represent a correlative to the upper part of the Ravendale Interval (Figure 5). The Buckabie Formation has been variously regarded as Late Devonian and possibly Early Carboniferous (Paten 1977; Wake-Dyster 1983; Passmore & Sexton 1984; Evans et al. 1990). The Buckabie Formation consists of interbedded red sandstone and shale, and was probably deposited in a non-marine, fluvio-lacustrine environment (Paten 1977; Wake-Dyster 1983). The Ravendale Interval in the Blantyre Sub-basin, however, has been divided in the present study into three different lithofacies, represented, from oldest to youngest, by meandering fluvial, braided fluvial, and estuarine tidal channel/nearshore transgressive marine deposits (see Khalifa & Ward 2010, Figure 17). Marine sediments are possibly represented near the top of the Etonvale Formation in the Adavale Basin (Paten 1977; Wake-Dyster 1983; Passmore & Sexton 1984; Evans et al. 1990), marking a marine transgression before the regression that formed the Buckabie Formation. It is possible that this marine transgression is also represented in the shallow marine lithofacies of the Ravendale Interval in the Blantyre well (Khalifa 2005, 2006b; Khalifa & Ward 2010, Figure 12b).

CONCLUSIONS AND SUMMARY

1) The stratigraphy and correlation of lithostratigraphic sequences including the Winduck, Snake Cave and Ravendale Intervals are consid-

ered as separated by regional seismic sequence boundaries mapped as horizons 1, 2 and 3 in the Blantyre Sub-basin based on a combination of geophysical and geological data, originally described by Khalifa (2005, 2006a, 2009) and Khalifa & Ward (2009). The work reviews the subsurface distribution of the latest Silurian to Devonian sequence throughout the Blantyre Sub-basin.

2) Figure 5 provides a lithostratigraphic diagram of the Devonian sequence, showing the distribution of the different units. The Winduck Interval is latest Silurian (Lochkovian) to Early Devonian (Pragian) in the Blantyre Sub-basin and has no equivalent in the Adavale Basin, deposition being initiated there in the Early Emsian with the Gumbardo Formation. The Snake Cave Interval is of Early Devonian (Emsian) to Middle Devonian (Eifelian) and appears to be a time-equivalent to the sequence encompassing Eastwood Beds in the Adavale Basin. However, rocks of Late Devonian age are widespread throughout the Adavale Basin and are mapped as several different lithostratigraphic units, including the Log Creek Formation, Lissoy Sandstone, Bury Limestone, Cooladdi Dolomite, Etonvale Formation and Buckabie Formation. The whole sequence is probably equivalent to the Ravendale Interval in the Blantyre Sub- basin.

3) Future work could undertake a more detailed regional seismic stratigraphic and well log analysis of the relationship of the Blantyre Sub-basin to the Adavale Basin and other eastern Australian basins or sub-basins of Devonian age and examine the relation of these areas to the tectonostratigraphic sequence development of eastern Australia.

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