COAL INVESTIGATIONS

STUDIES IN THE EAST KOOTENAY COALFIELDS

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INTRODUCTION

During the early part of the 1975 field season, a geological survey was conducted over the Upper Elk Valley to the north of Cadorna Creek. The purpose of this program was to understand the geology in order to determine the mining potential of the northern portion of the Elk Valley Coalfield. Problems encountered in correlating individual coal seams prompted the second study; the search for a paleontologically based method of seam correlation similar to that used throughout the paralic coalfields of Western Europe. The following account describes the results of the mapping, and indicates the progress made in correlation.

A. UPPER ELK VALLEY

Coal-bearing rocks of the Kootenay Formation occupy a narrow tract of ground generally less than 3 kilometres wide in the Upper Elk Valley (Fig. 17). Exposure is not good, and the basal contact of the formation on the east side of the valley is nowhere exposed. Paleozoic carbonates riding on the Borgeaux thrust hide the western boundary of the coal measures, and form a mountain barrier on the west side of the valley.

A basal sandstone, the Moose Mountain member, is exposed on the east flank of Tobermory Hill, where it is at least 200 metres thick. West of Tobermory Hill, the thickness of the coal-bearing member is increased by the presence of a large, regional, northwesterly trending syncline. This structure, the Alexander Creek syncline (known elsewhere as the Fording syncline), dominates the geology of the Elk Valley Coalfield south to beyond Crowsnest Pass, a distance of about 100 kilometres. Large asymmetric folds in the limbs of the syncline are seen to repeat some seams (section E–F, Fig. 17).

Individual seams cannot be traced for great distances along strike, and therefore correlation of stratigraphic sections not continuously exposed is virtually impossible. Three fossiliferous localities yielded lamellibranchs (bivalves) and ostracods, but at the present state of our knowledge, these cannot be used in correlation.

The coal seams west of Elk Valley road are both thin (less than 2 metres), and structurally disturbed by faulting and minor folding related to the Alexander Creek

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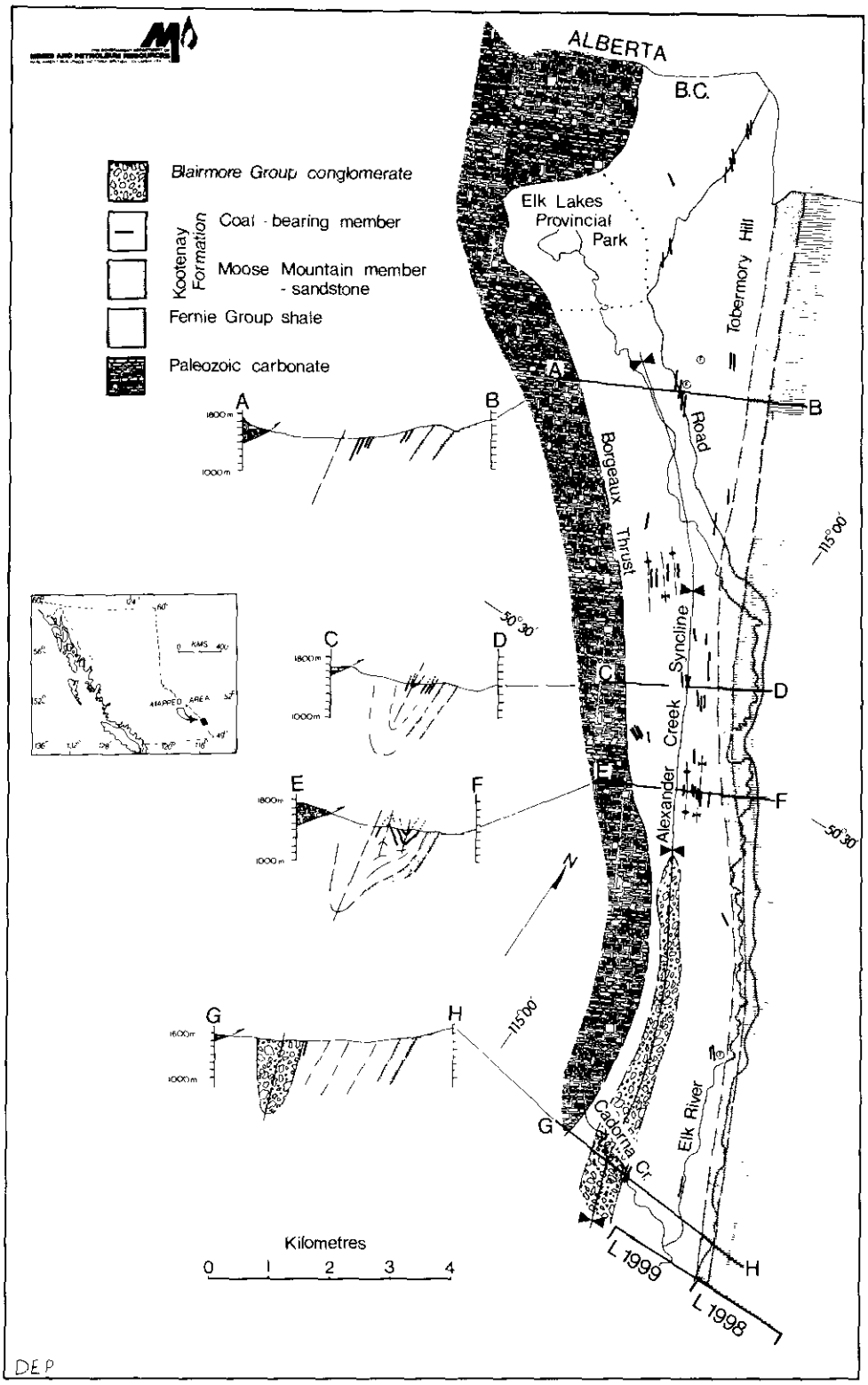

Figure 17. Generalized geology, Upper Elk Valley.

syncline, and consequently they do not offer an attractive open-pit mining situation. East of Elk Valley road on Tobermory Hill, at least seven seams are present, and two of these (on the east side of the hill, immediately north of section line A–B) have an aggregate thickness of 7 metres. Although these seams occupy a dip-slope situation, albeit at 40 degrees to 50 degrees, nowhere can a complete succession be observed, and total coal thickness is unknown. Moreover, Tobermory Hill is close to the Elk Lakes Provincial Park. That notwithstanding, the potential of Tobermory Hill can only be evaluated by several cored drill holes designed to test the total thickness of coal above the basal sandstone.

B. CORRELATION OF COAL SEAMS

Correlation of coal seams by paleontological methods has not been undertaken by workers in the Kootenay Formation, despite the fact such correlations, between and within similar paralic coalfields in Europe are entirely dependant on these methods. In the South Wales Coalfield (Woodland and Evans, 1964) and the East Pennine Coalfield (Smith, Rhys, and Eden, 1967) of Great Britain, for example, approximately 1 000 metres of coal-bearing succession can be correlated by reference to *marine bands* which occur at 11 different stratigraphic horizons. These marine bands are recognized by their contained marine fossil fauna, and are generally found in the shale roofs to coal seams. The marine bands vary in thickness from as little as 10 centimetres to more than several metres.

The coal measures of Great Britain have also been 'zoned' using non-marine lamellibranchs or 'mussels' that also occur in shales above coal seams. Zoning offers to the experienced eye a method of determining the approximate position in a sequence, that is, lower, middle, or upper coal measures, but cannot be used to establish time-lines.

Present methods of correlation in the East Kootenay Coalfield rely heavily on the interpretation of geophysical logs and comparison of proximate analyses for individual seams. Between closely spaced drill holes in structurally uncomplicated areas these methods are successful. However, correlations through thrust panels or across distances of more than 2 kilometres cannot be relied upon.

The usefulness of fossils in correlating coal seams is no less important at strip-mining operations, but has potentially greater economic value in planning underground operations. The knowledge that coal mining in the East Kootenays would increasingly be using underground methods, particularly in the Fernie basin, encouraged us to attempt such a method of correlation.

RESULTS

At outcrop, shale roofs to coal seams crumble rapidly upon exposure to the elements, and provide a poor place for collecting fossils. Far more successful is an integrated approach

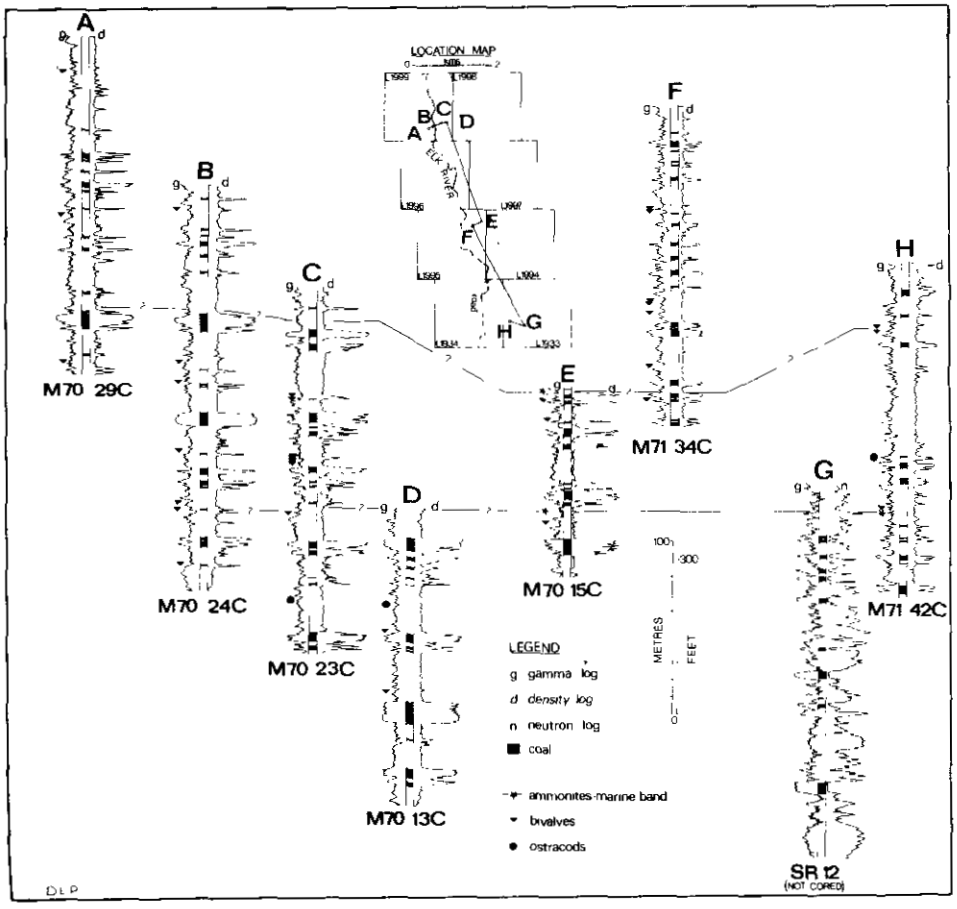

Figure 18. Correlation of coal seams and marine bands, Upper Elk Valley.

of fossil collecting and diamond-drill core logging, where at least the exact stratigraphic position of a fauna is known.

The Elco property immediately south of Cadorna Creek (*see* Lot 1999 and Lot 1998 on Figs. 17 and 18 for location) was extensively drilled by the Emkay-Scurry partnership in 1970 and 1971, and we were given access to the stored core. Two long holes on Kaiser Resources' ground south of the Northern Dominion Coal Block were also examined.

At Elco we located 99 separate faunal horizons in 3 978 metres of drill core examined. This implies that, statistically at least animal remains occur every 40 metres.

On Kaiser's ground 13 faunal horizons were located in 1 440 metres, or every 110 metres.

Some of the faunal horizons are represented by one fossil, whereas several other horizons are spread over 2 metres. Within the fauna there is considerable variety; lame libranchs ('mussels') are dominant, and ostracods are almost as common; gastropods are not infrequent; ammonites are rare. A selection of the fauna is currently being examined by paleontologists of the Geological Survey of Canada in Ottawa.

Figure 18 indicates the positions of the two recognized marine bands that we have located to date. Hole M70–15C was not examined until late September, and we have not been able to check the calculated positions of these marine bands in holes M70–23C and M70–24C, at the north end of the Elco property.

The lower marine band occurs approximately 300 metres above the top of the Moose Mountain member, that at Coal Creek, Fernie, is of Upper Jurassic (Portlandian) age. Since the base of the Kootenay Formation is probably diachronous, becoming younger northward, the five ammonites found on the Elco property are probably Early Cretaceous in age.

Marine forms were not found in the fauna obtained from the Kaiser Resources' drill holes.

In view of the fact that marine embayments do not generally occur over small areas, we are hopeful that the marine bands described above can be traced south to Fording's property, and beyond. However, if the Kootenay Formation is as diachronous as we believe, it is conceivable that the upper part of the formation in the Fernie Basin may actually occur beneath the level of the two recognized marine bands.

Finally, mention should be made of the oil shales that are not uncommon in the roofs of some coal seams. Unlike ordinary shales that give a pale yellow streak, oil shales characteristically possess a greasy brown streak. Oil assays (petrol ether extraction) to date have been disappointing; no sample possessed less than 0.10 per cent oil, but none assayed greater than 0.20 per cent oil.

REFERENCES

Smith, E. G., Rhys, G. H., and Eden, R. A. (1967): Geology of the Country around Chesterfield, Matlock, and Mansfield, *Mem. Geol. Surv. Gt. Britain.*

Woodland, A. W. and Evans, W. B. (1964): The Geology of the South Wales Coalfield, Pt. IV, The Country around Pontypridd and Maesteg, 3rd edit., *Mem. Geol. Surv. Gt. Britain.*