PARRY ISLANDS AND CORNWALLIS FOLD BELTS IN THE BATHURST ISLAND REGION, NUNAVUT

J.C. HARRISON¹

Parry Islands and Cornwallis fold belts in the Bathurst Island region, Nunavut

Geological Survey of Canada, Ottawa, Ontario

Bathurst Island archipelago includes Bathurst Island proper and six other significant islands to north and west. The area is known for its former oil production from the Bent Horn oil field 2002). Qausuittuq National Park has recently been created on northern Bathurst Island and the Governor General Islands to the west.

shelf (Cambrian to Devonian), the Ellesmerian foreland clastic wedge (Middle-Upper Devonian), and outliers of the Sverdrup Basin (Carboniferous-Cretaceous). Total thickness of the Cambrian to Devonian succession is 7.6 to 8.8 km in the Bathurst Island region but is locally more than 14 km on adjacent islands. Oldest identified strata are evaporites of the Middle Ordovician Bay Fiord Formation. These form a ductile detachment that at a depth of 4100 to 5500 m everywhere deep water strata associated with Silurian to Lower Devonian Boothia Uplift and Cornwallis

Westward facies changes are numerous and readily identified on air photographs. These include lower Bathurst Island beds (Ludlow to Lochkovian turbidites) grading to Devon Island Formation, Goose Fiord Formation (Lochkovian to Pragian carbonates) grading to medial Bathurst Island beds, Stuart Bay beds (Pragian-Emsian turbidites) grading to upper Bathurst Island beds, Prince Alfred Formation (Pragian-Emsian conglomerate and redbeds) grading to Stuart Bay beds, and Disappointment Bay Formation (carbonates; Emsian) grading to upper Stuart Bay Beds. The end of deformation through Cornwallis Fold Belt is marked by widespread deposition of shelf carbonates (Blue Fiord beds) that grade westward to clinoformed mudrocks of the Eids beds (late Emsian-early Eifelian). The Blue Fiord beds are the reservoir for oil at Bent Horn in subsurface Cameron Island and the lower Eids is a potential source rock. Upliftrelated deposition is succeeded in the later Devonian by shelf-deltaic and fluvial sandstones and other clastic rocks.

Named structures of Cornwallis Fold Belt include the Driftwood Bay structure which is an eastward transported thrust panel featuring evidence of unroofing during deposition of Bathurst Island and Stuart Bay beds and Prince Alfred Formation. To the west are the northerly-trending Queens Channel and Scoresby Hills anticlines with a similar structural style and unroofing history. Prominent on Scoresby Hills Anticline is an angular unconformity below off-lapping Pragian and Emsian strata. Also included with Cornwallis Fold Belt are westerly-transported thrust panels imaged and inferred on seismic profile 1497 through central Bathurst Island. In plan view these are kinematically linked to presumed easterly- and northeasterly-striking wrench faults that are reactivated as thrusts during the development of Parry Islands Fold Belt.

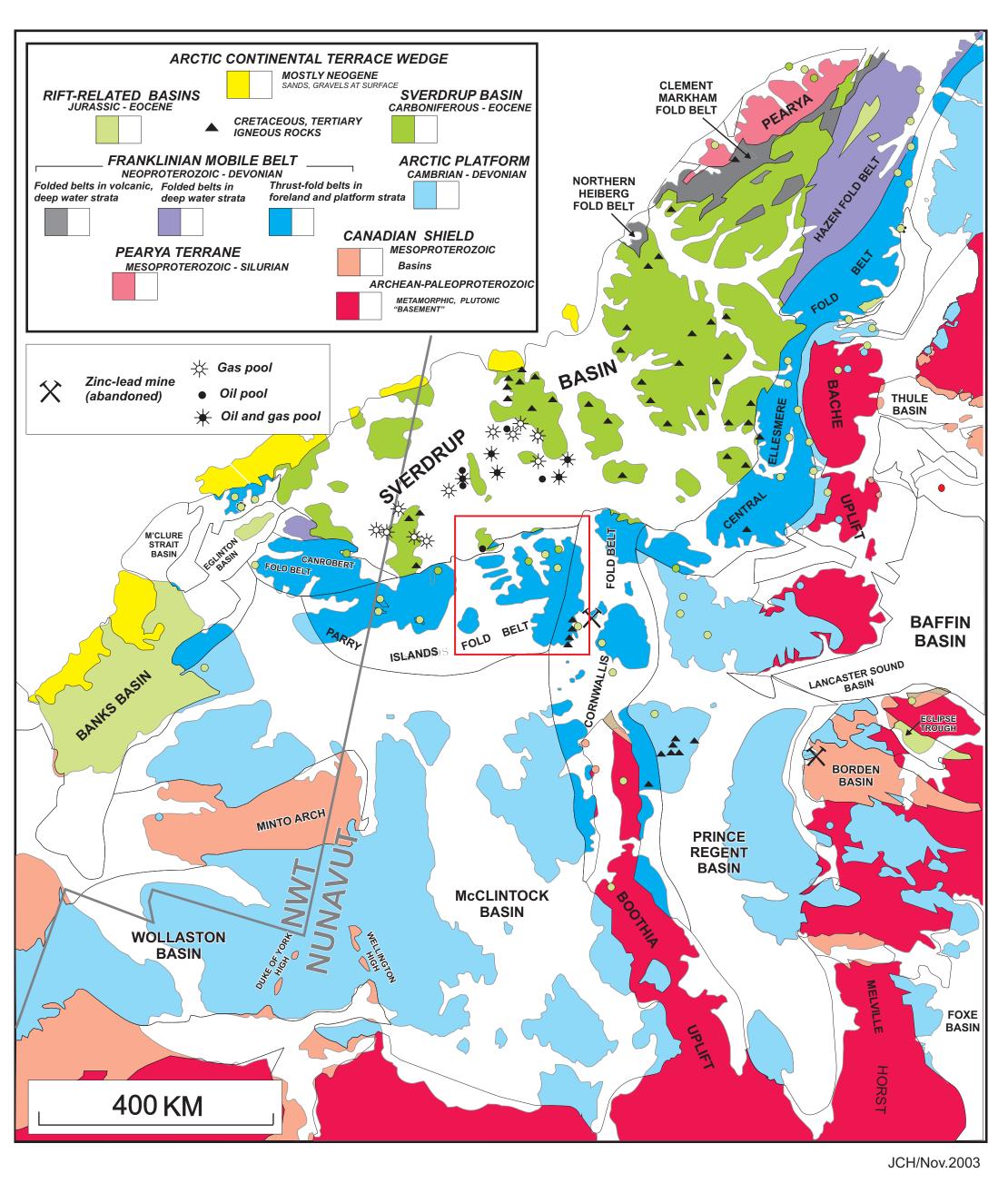
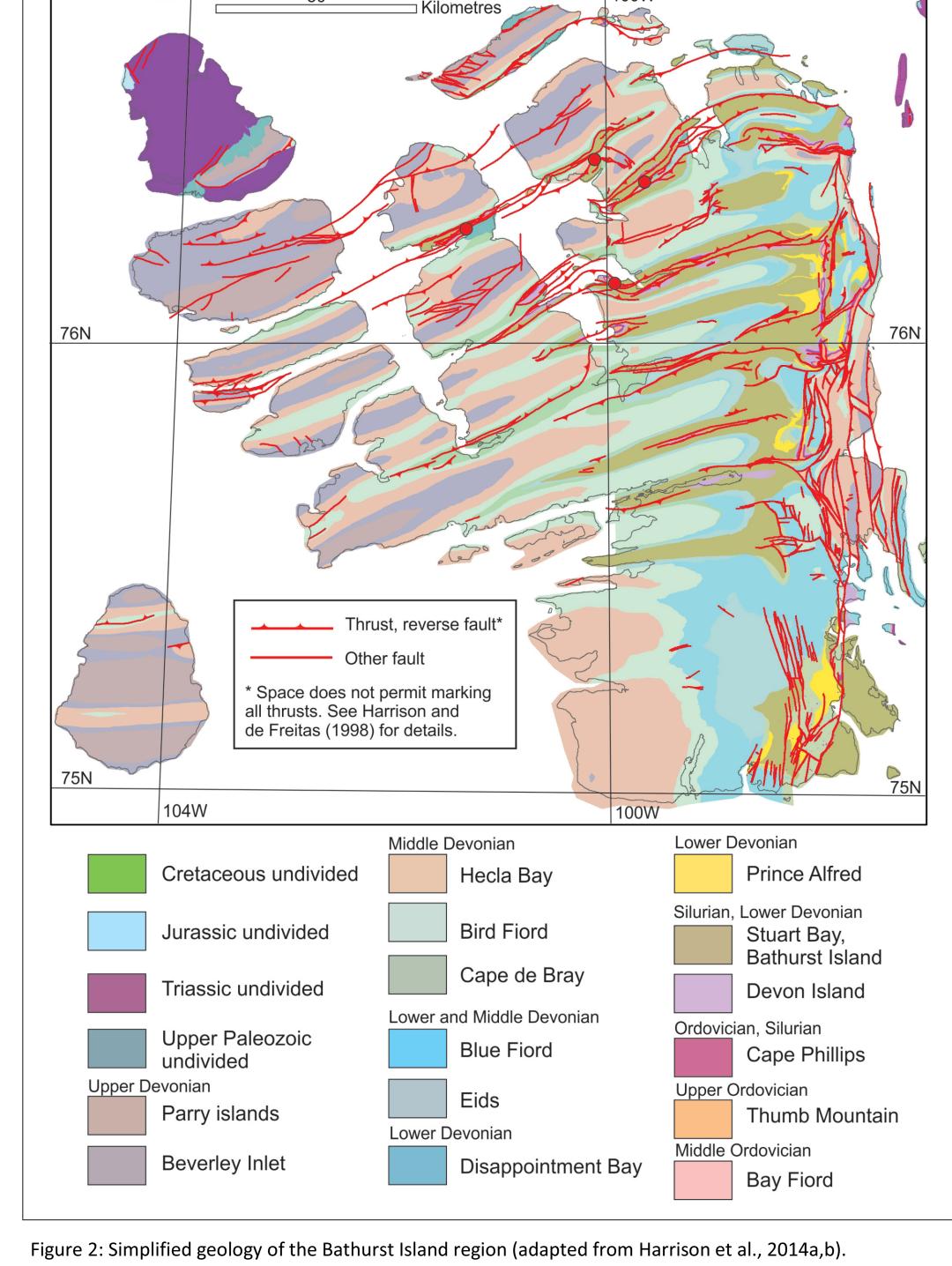


Figure 1: Simplified geology of the Canadian Arctic Islands. Coloured dots are notable outliers.



Red lines are faults. Red dots are evaporite diapirs.

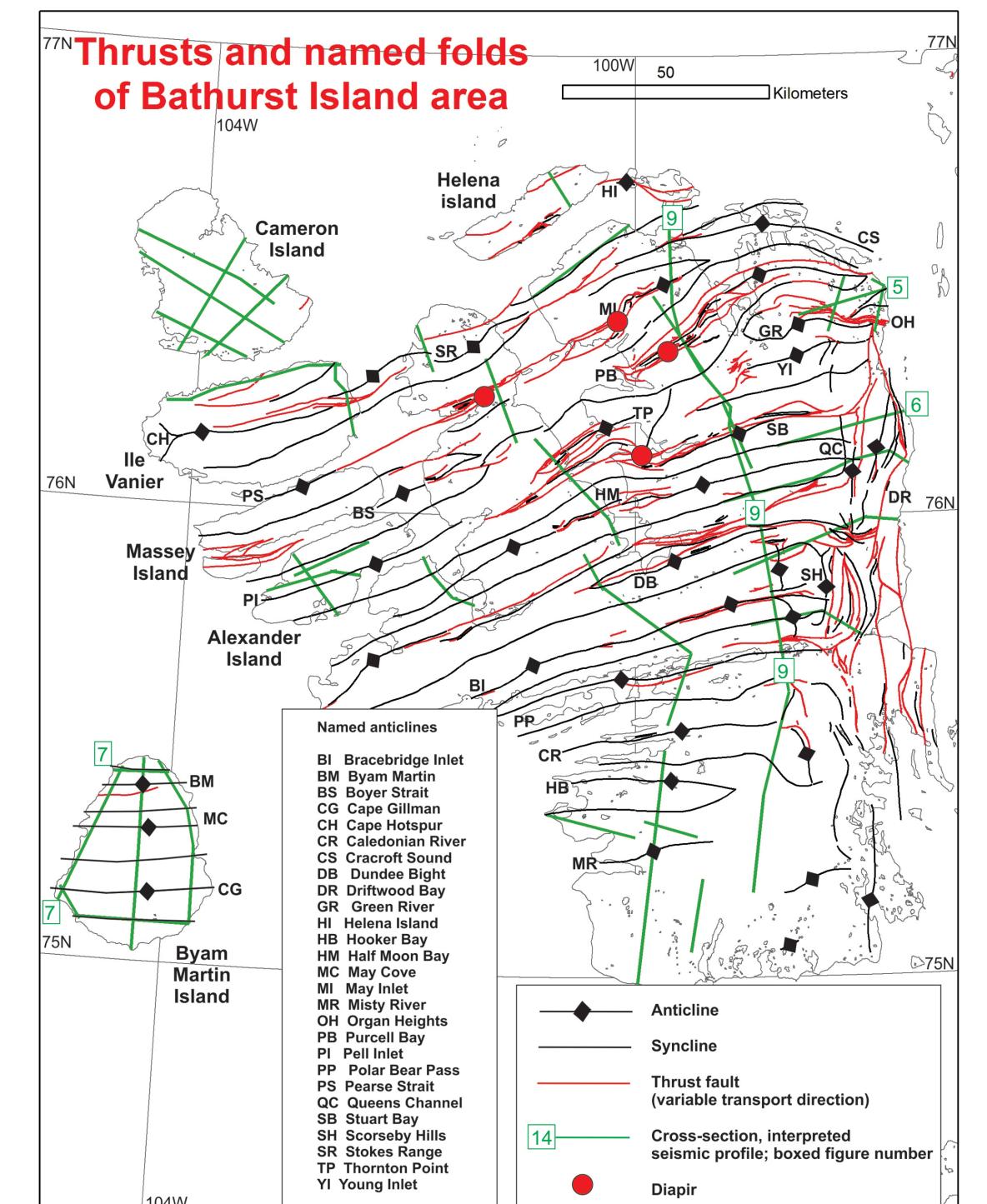
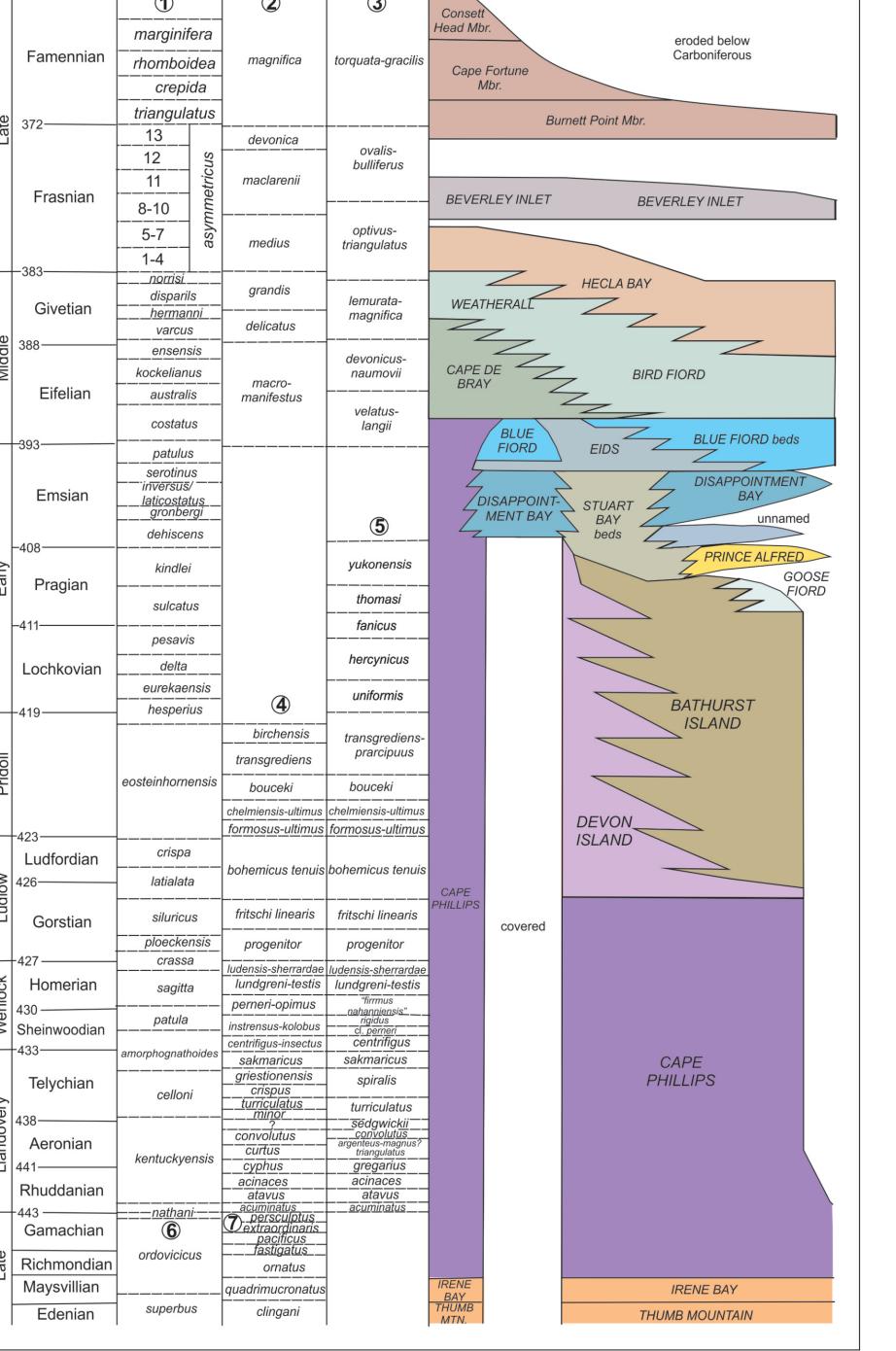


Figure 3: Thrust faults and named folds of Bathurst and adjacent islands.



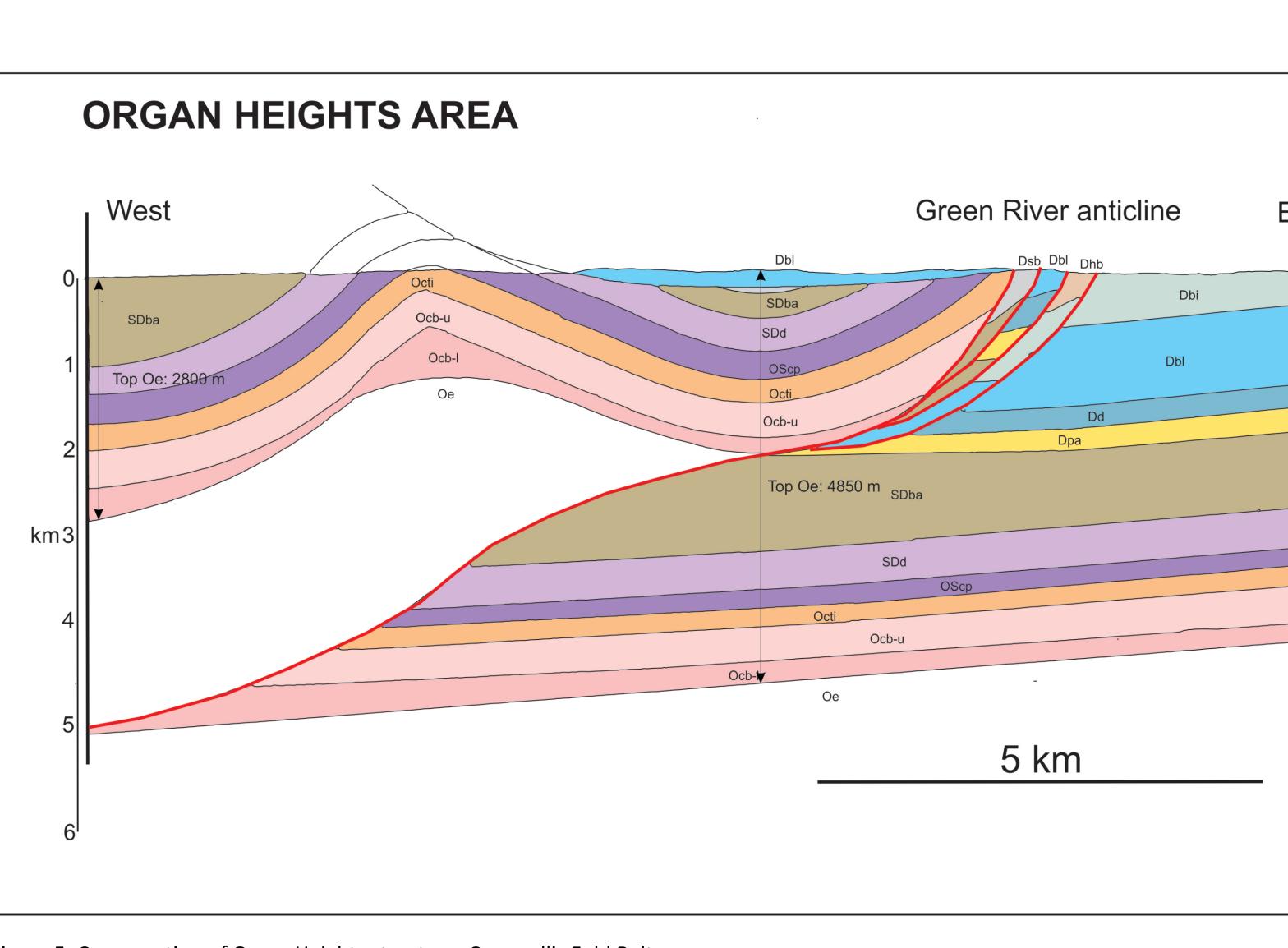
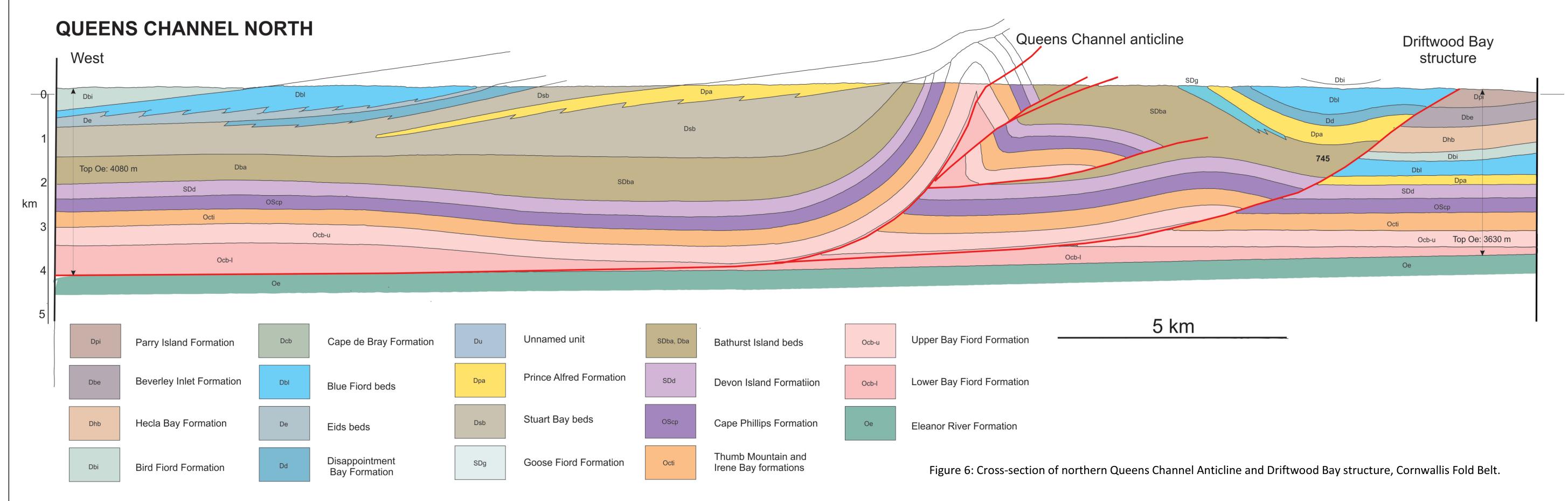
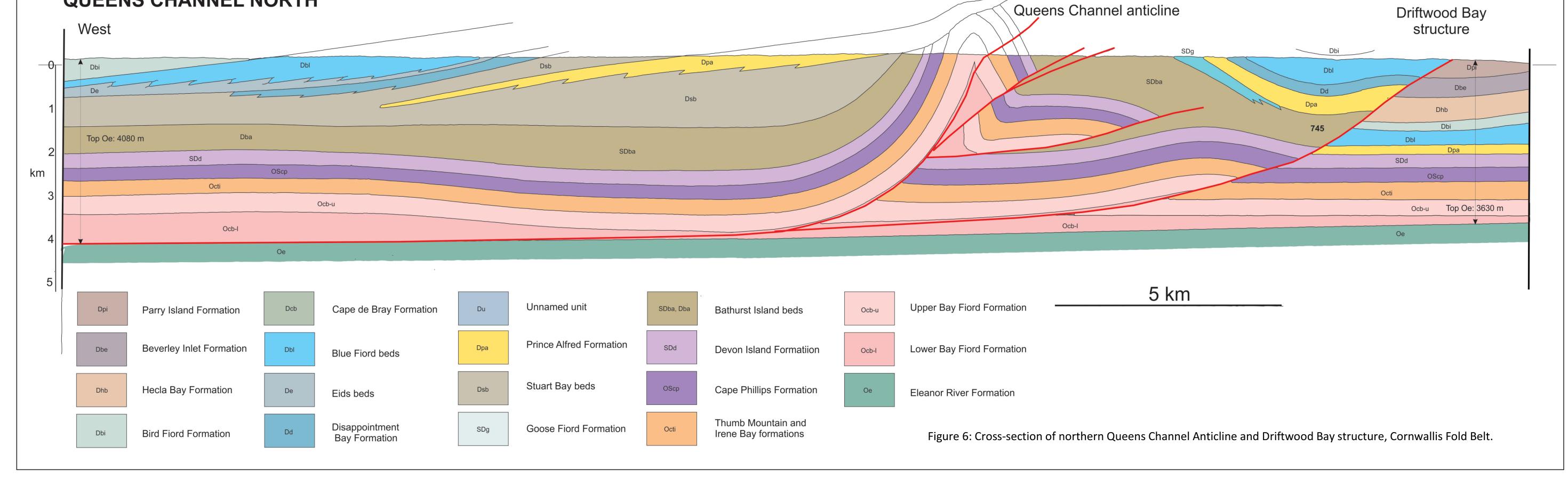
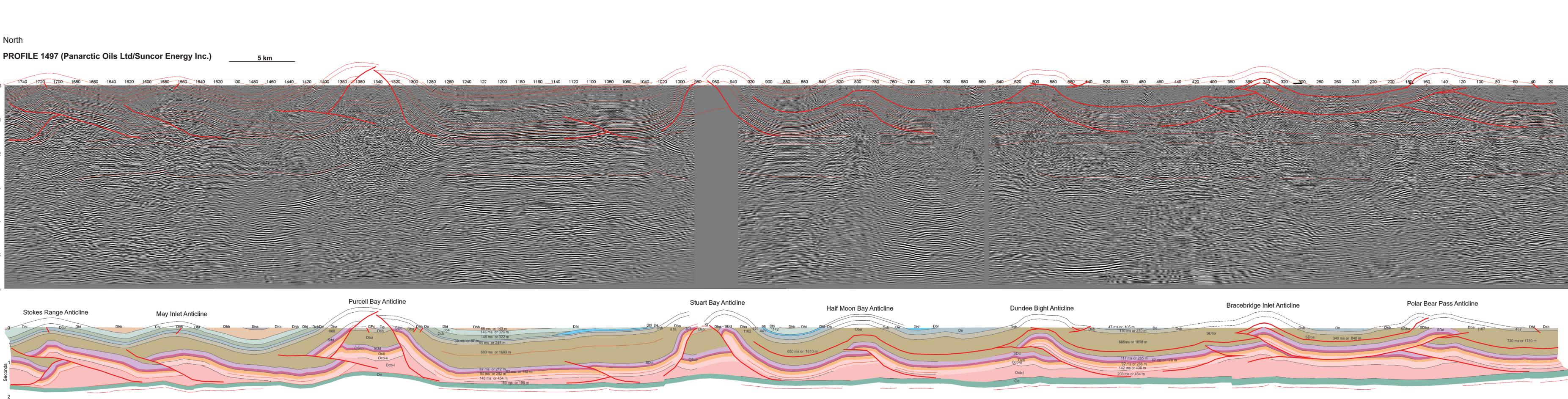


Figure 5: Cross-section of Organ Heights structure, Cornwallis Fold Belt.

Figure 4: Correlation chart of Upper Ordovician to Devonian formations of Bathurst Island region. The line of section runs from eastern Bathurst Island (at right) to Cameron Island and northeastern Melville Island. Biostratigraphic columns, reproduced from Figure 4.2 of de Freitas and Mayr (1998) include 1: conodont zones, 2, 3: Arctic palynomorph zones; 4: Arctic graptolite zones; 5: northwestern Canada graptolite zones; 6: North Atlantic conodont zones; 7: Arctic Ordovician







¹Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8

For more information, please contact (christopher.harrison@canada.ca).

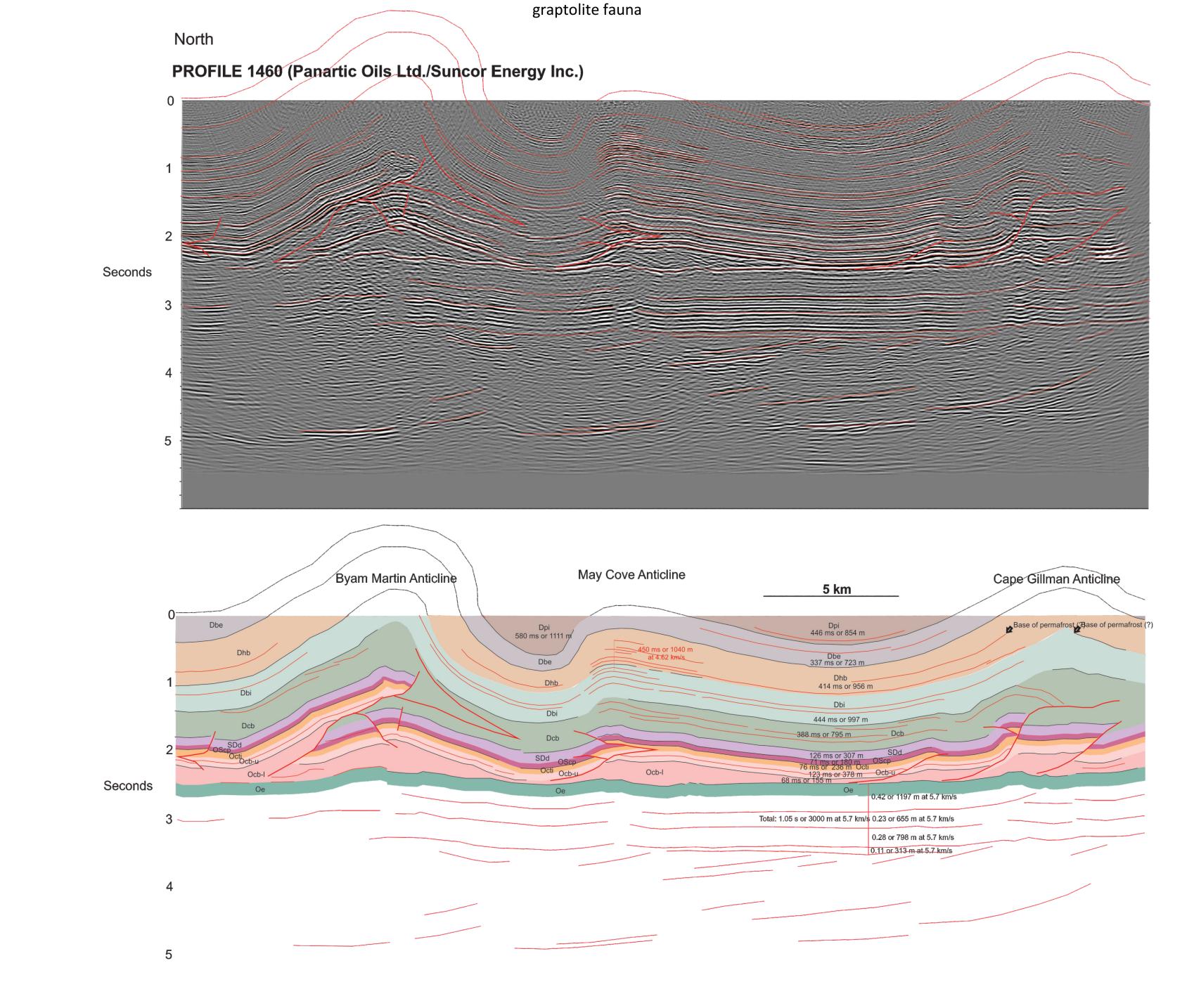
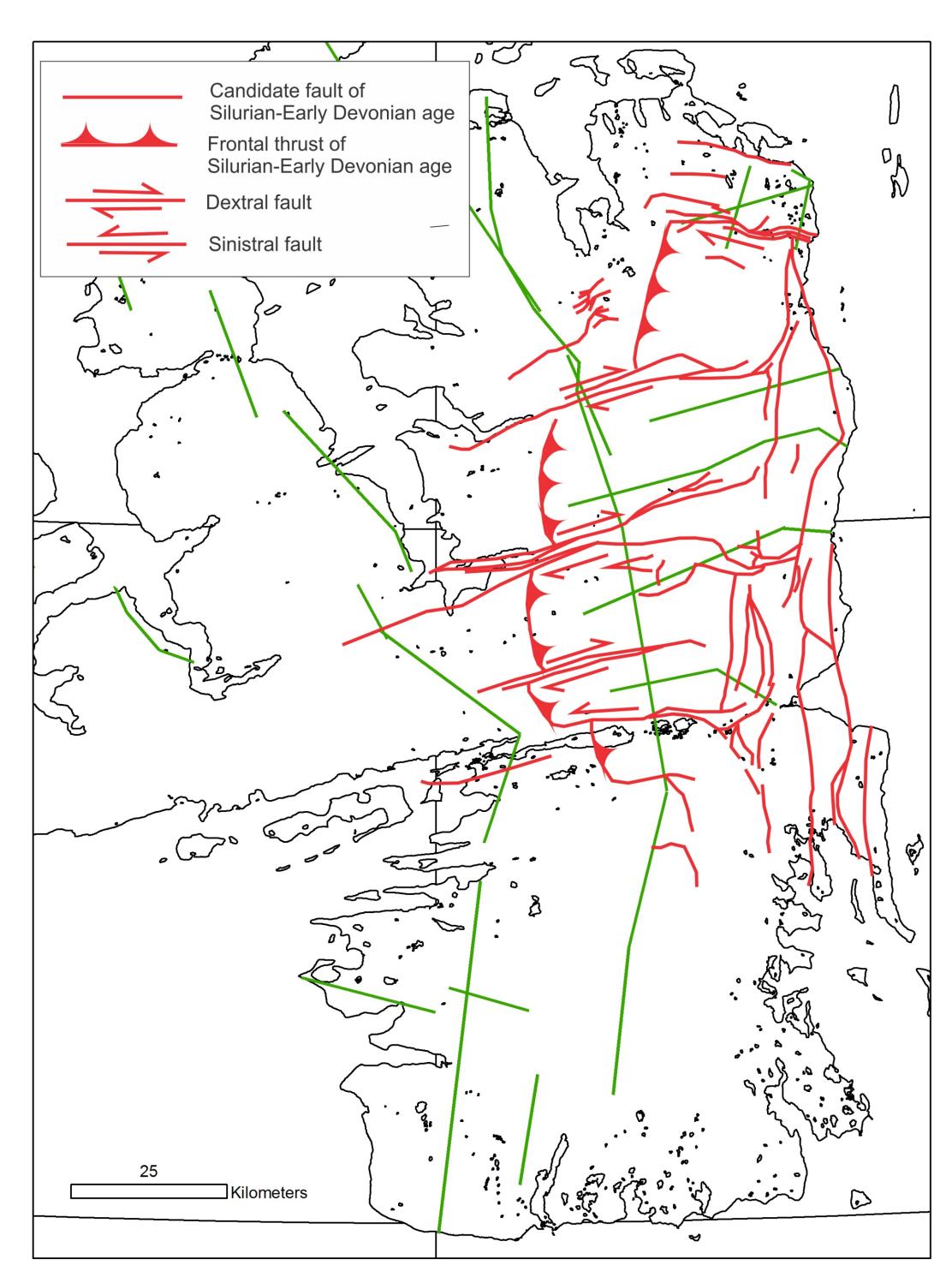


Figure 7: Seismic profile 1460 (Panarctic Oils Ltd./Suncor Energy Inc.) on Byam Martin Island, Parry

Islands Fold Belt. Note the seismic bright spots over May Cove Anticline (hydrocarbons?).

Figure 9: Seismic profile 1497 (Panarctic Oils Ltd./Suncor Energy Inc.) and interpretation at the intersection of Cornwallis Fold Belt and Parry Islands Fold Belt. Note the thickness variations in the syntectonic Bathurst Island beds. An outlier of Carboniferous-Permian Canyon Fiord Formation (CPc) occurs in the axis of Purcell Bay Anticline, and an outlier of Cretaceous Isachsen Formation (Ki) lies close to the line of section through the hinge of Stuart Bay Anticline.



interpreted in the Bathurst Island beds and older strata on seismic profile 1497 (Fig. 9).

carbonate platforms and the Boothia Uplift synorogenic succession. in, The geology of Devon Island north of 76°, Canadian Arctic Archipelago; Mayr, U. (ed.), de Freitas, T. (ed.), Beauchamp, B. (ed.), Eisbacher, G. (ed.), Geological Survey of Canada, Bulletin 526, p. 57-154, DOI:10.4095/209767 Harrison, J. C. and de Freitas, T.A. 1998. Bedrock geology, Bathurst Island Group (NTS 68G, 68H, 69A, 69B; small parts of 78H and 79A), District of Franklin (Nunavut), Northwest Territories. Geological Survey of Canada, Open File 3577, DOI:10.4095/209408 Harrison, J.C., Lynds, T. and Ford, A. 2014a. Geology, tectonic assemblage map of the Byam Martin Channel area, Melville and surrounding islands, Nunavut-Northwest Territories. Canadian Geoscience Map 32, scale 1:500,000; DOI: 10.4095/292829 Harrison, J.C., Thorsteinsson, R., Mayr, U., Lynds, T., Ford, A. and Turner, E.C. 2014b. Geology, tectonic assemblage map of Wellington Channel, Cornwallis and western Devon Islands, Nunavut. Canadian Geoscience Map 33, scale 1:500,000; DOI: 10.4095/292831 Acknowledgements We would like to thank Suncor Energy Inc. for permission to reproduce the seismic profiles on this poster, and Dr. Marc St-Onge for his critical review comments.

Publications in this series have not been edited; they are released as submitted by the author. © Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources, 2016 For information regarding reproduction rights, contact Natural Resources Canada at nrcan.copyrightdroitdauteur.rncan@canada.ca. This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).

Recommended citation

Harrison, J.C., 2016. Parry Islands and Cornwallis fold belts in the Bathurst Island region,
Nunavut; Geological Survey of Canada, Scientific Presentation 48, 1 poster.
doi:10.4095/299549

Presented at the Yellowknife Geoscience Forum Date presented: November 2016

