

CONODONT COLOR VARIATION IN THE LOWER/MIDDLE ORDOVICIAN STRATA OF WESTERN NEWFOUNDLAND

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INTRODUCTION

Epstein *et al.* (1977) have demonstrated that conodont color is affected by depth and duration of burial and the geothermal gradient. The conodonts change from translucent clear to amber, brown to black, to white and clear, and the colors have been referred to indices labelled CAI (Color Alteration Index) 1 to 8. The CAI values allow an evaluation of relative thermal maturation of host rocks and give an indication of the temperatures that have affected them.

CAI values have economic significance because they can be compared with other organic maturity indices such as vitrinite reflectance and palynomorph translucency (Epstein *et al.*, 1977). CAI values allow the evaluation of oil potential of carbonate terranes in which organic material normally is sparse. Epstein *et al.* (1977) showed that CAI values within 1 to 2 are characteristic of oil-producing areas, CAI values up to 4 typify gas-producing areas, whereas CAI values higher than 4 are typical of nonproductive areas.

WESTERN NEWFOUNDLAND CONODONTS

Conodont collections from western Newfoundland show considerable color variation from pale amber to black, and the data available from Ordovician strata allow for a preliminary investigation of thermal trends. The map (Figure 1) indicates the distribution of CAI values recognized in western Newfoundland, based on numerous conodont collections retrieved from single sample localities and from thick lithostratigraphic sections.

The color of conodonts can be affected by superficial staining or infilling of the basal cavity with organic material. Therefore, several samples were examined in each section; only one sample was examined in single, widely spread collections. Color also varies with the structure and robustness of the elements, thus comparison was based on forms that are abundant in the majority of sections, principally elements of *Parapanderodus*, *Periodon*, *Diaphorodus* and *Oepikodus*.

The CAI values (Figure 1) reveal amber coloration (CAI 1 to 1½) in the Port au Port-Cow Head area and the region north of Cow Head. There is increasing thermal maturation northward to Cape Norman and eastward to Hare Bay and Canada Bay. Here the lower Paleozoic succession is moderately deformed and is marginal to the Taconic Hare Bay Allochthon. Black coloration of elements occurs at Serpentine Lake and in the Corner Brook and Bonne Bay regions. This area is also deformed and metamorphosed and is marginal to the Humber Arm Allochthon. Black coloring occurs east of Cape Norman in Pistolet Bay, Hare Bay and

Canada Bay. CAI values of 5 to 6 are recorded from Ordovician limestones in White Bay and from limestones within the White Arm Window of the Hare Bay Allochthon. The black coloration of elements (some have a gray tint) in these areas, suggest maximum temperatures in excess of 300°C. In central Newfoundland, the CAI values are 5 and higher (Stouge 1980, 1984).

Figure 1 indicates that the best potential for oil or gas production is in the Port au Port-Cow Head area, and in the region north of Cow Head to about 100 km south of Cape Norman. A narrow belt southward from Cape Norman defines the limit for potential gas production. East of this belt, defined by the CAI 4 isotherm, higher CAI values occur.

The trend of increasing high values conforms with the trend of the allochthonous rocks (Stouge, 1984) in Pistolet Bay and Hare Bay-Canada Bay. In Bonne Bay, the change from low values to high is sharp (Figure 1). The increase of CAI values toward Cape Norman is inverted in relation to the stratigraphy, because the Boat Harbour Formation has lower values than the younger Catoche Formation. This is probably a reflection of the increasing deformational intensity eastward in this area. The high CAI values of rocks in the Humber Arm region likely reflects similar increasing eastward deformation and also burial beneath the Bay of Islands ophiolite.

REFERENCES

- Epstein, A.G., Epstein, J.B. and Harris, L.D.
1977: Conodont color alteration - an index to organic metamorphism. United States Geological Survey, Professional Paper 995, 27 pages.
- Stouge, S.
1980: Lower and Middle Ordovician conodonts from central Newfoundland and their correlatives in western Newfoundland. In Current Research. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 80-1, pages 134-142.
- 1982: Preliminary conodont biostratigraphy and correlation of Lower to Middle Ordovician carbonates from the St. George Group, Great Northern Peninsula, Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 82-3, 59 pages.
- 1984: Conodonts of the Middle Ordovician Table Head Formation, western Newfoundland. Fossils & Strata, Volume 16, 145 pages.

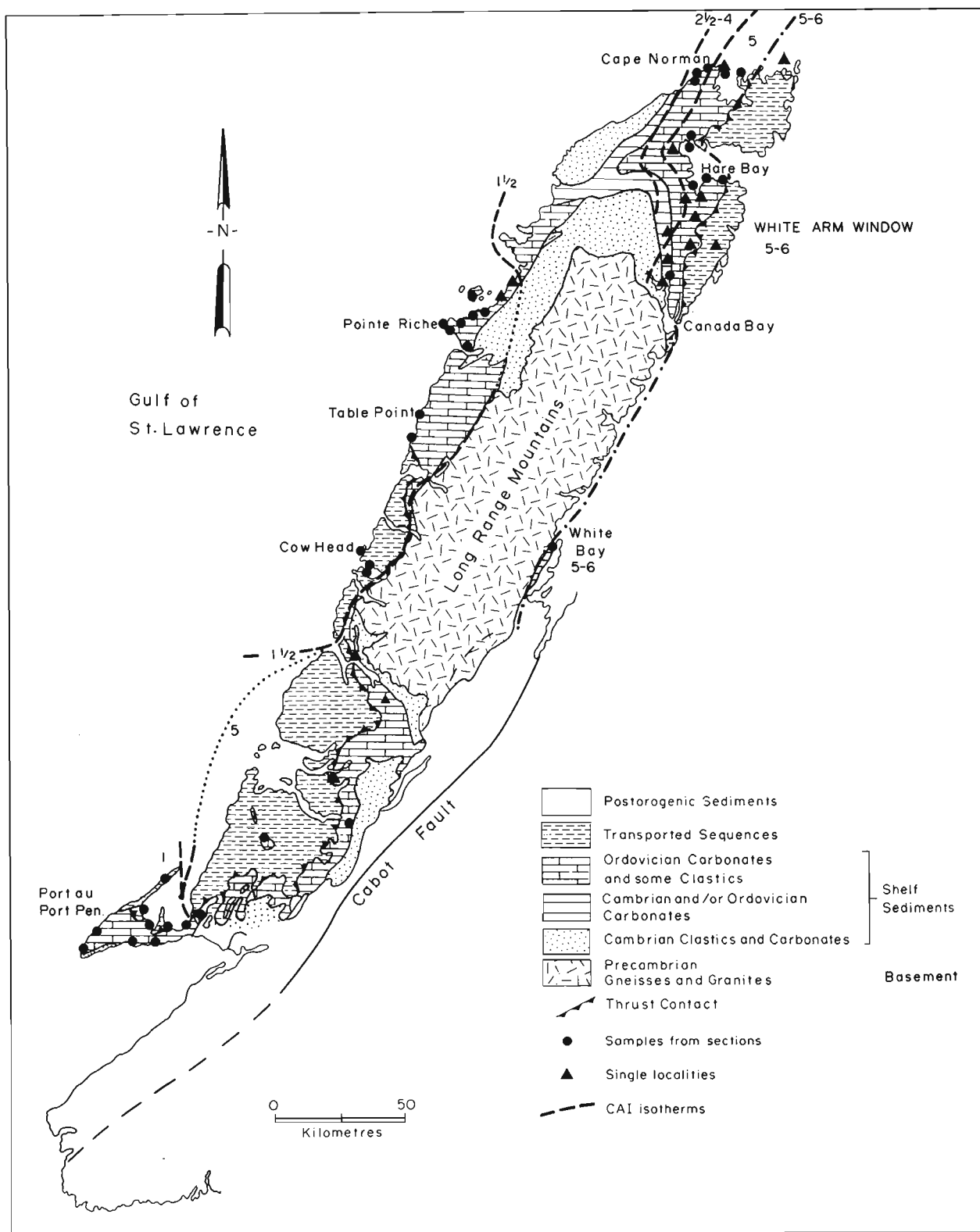


Figure 1: Conodont Color Alteration Index (CAI) isotherm map for western Newfoundland (data from Stouge, 1980, 1982, 1984 and unpublished).