

**THERMAL AND HYDROTHERMAL ALTERATION OF CONODONTS FROM TARGET BEDROCK AND IMPACT BRECCIAS FROM THE HAUGHTON IMPACT STRUCTURE, DEVON ISLAND, NUNAVUT, CANADA.** C. E. Mason<sup>1</sup>, J. E. Repetski<sup>2</sup>, W. C. Smith<sup>1</sup>, P. Lindgren<sup>3</sup>, J. Parnell<sup>3</sup>, P. Lee<sup>4,5,6</sup>,

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**Introduction:** Samples of carbonate bedrock and clasts from melt breccia within and near the Haughton impact structure (Tertiary), Devon Island, Canada (75.2 deg. N. Lat.; 89.4 deg. W. Long.) yield conodonts that provide new data on the age and thermal history of the impacted rocks. Most of the target bedrock samples produced conodonts that are indicative of and restricted to Late Ordovician age; for some, a Silurian age cannot be discounted. The age range thus is consistent with the Allen Bay Formation (Late Ordovician-Early Silurian) as mapped in the area. Most of the samples of clasts from breccias also fall within this age range; however, some contain faunas of late Early to early Middle Ordovician age, consistent with the ages of some of the underlying units, such as the Eleanor River Formation, displaced as ejecta and as parts of the central uplift [1].

**Overview of thermal and hydrothermal alteration of conodonts:** Conodont color alteration index (CAI) values in the regional bedrock are about 1.5 (Fig. 1.), indicating minimum post-depositional, long-term heating in the approximate range of 50-90 de-



**Fig. 1.** Upper Ordovician conodonts from the Allen Bay Formation with CAI's ranging from 1+ to 1.5

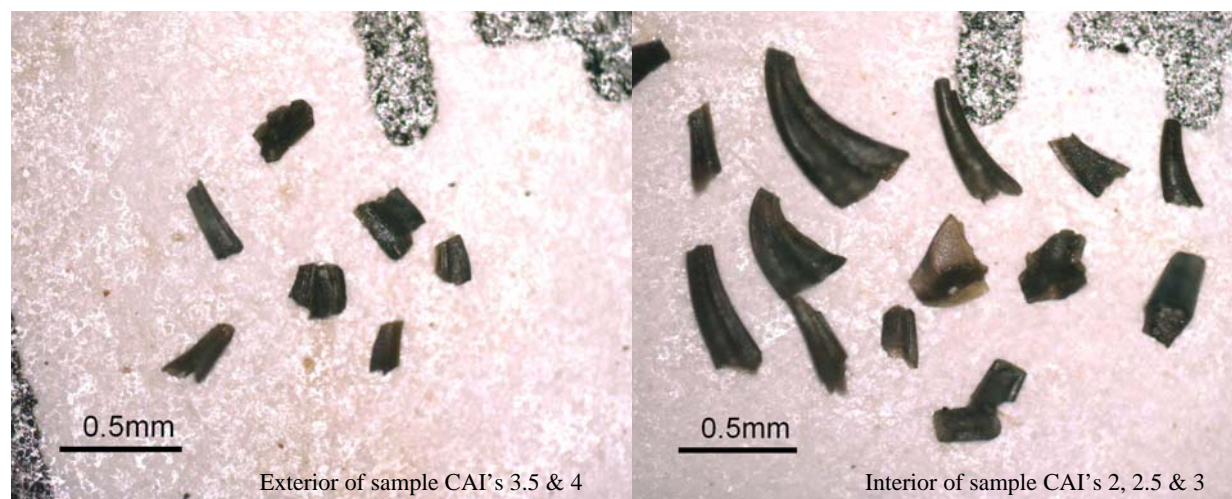
grees C [2]. Other samples, however, contain conodont elements having higher CAI values, up to 4 (Fig. 2.), indicating exposure to temperatures in excess of about 200 degrees C (long-term) or quite higher temperatures (short-term). Some of these samples also contain

co-occurring conodonts having several different CAI values, and many of the elements in these samples display surface and textural features such as darkening, bleaching, and etching. These features, and the co-occurrence of multiple CAI values within single samples, are among the characteristic indicators of exposure to hydrothermal activity, in this case presumably associated with the impact [3]. Conodonts may provide additional constraints on some of the thermal history



**Fig. 2.** Conodont elements from a clast of the Eleanor River Formation; Age: Late Early Ordovician; CAI value = 4; elements also exhibit hydrothermal bleaching and surface effects.

parameters of this event. For example, several larger carbonate clasts (on the order of ~25cm x 20cm x 10cm) were split into outer and inner fractions, and these outer and central parts of the clasts were processed separately. CAI values of conodonts in the outer fractions range from 2 to 4.5, whereas most elements from the inner part of the clasts range from 2 to 2.5 (although in one intensely shock-fractured sample some elements are 4 to 4.5 even in the inner part), suggesting the possible insulation effect of the poor heat conductivity of the rock (Fig. 3.). Splits of these two fractions in one of the clasts using biological marker maturity parameters (pregnane/sterane and tricyclic terpane/hopane) also showed this apparent insulation effect [4].



**Fig. 3.** Heat Differential within an individual melt breccia clast.

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