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CONODONT FAUNAS FROM THE CATCHERS POND AND CUTWELL GROUPS, CENTRAL NEWFOUNDLAND

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ABSTRACT

Conodonts have been extracted from carbonates of the Catchers Pond and Cutwell groups, of Central Newfoundland. The Catchers Pond Group conodonts are found to range through a longer time period than previously reported, and are from early to middle Arenig in age.

Fossils have been reported previously from the Cutwell Group of late Arenig–early Llanvirn age. The new data indicate that the age of the conodonts is late Arenig to Llanvirn, and even possibly as young as basal Llandeilo.

The similar Colour Alteration Index (CAI), conodont assemblage and zircon U–Pb age from the Cutwell Group suggest that it is a correlative of the Buchans Group.

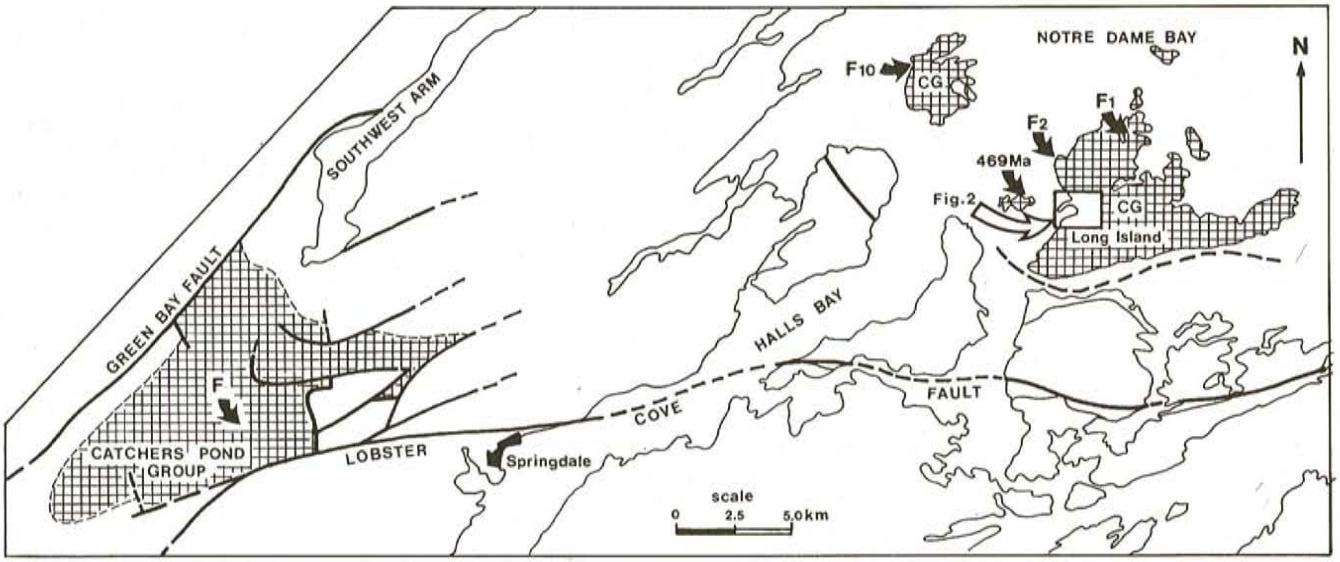

Figure 1. *Distribution of the Catchers Pond Group and the Cutwell Group in central Newfoundland. CG–Cutwell Group, Long Island and Little Bay Island; F–conodont sample localities.*

INTRODUCTION

Three samples from a limestone bed of the Catchers Pond Group were processed for conodonts, in order to confirm the early Arenig age of the fauna reported by Bergström *et al.* (1974) and to establish the facing direction of the bed.

The Cutwell Group (Figure 1) is structurally complex and much of the section is considered to be repeated thrusting (Szybinski, 1988, *this volume*). Fifty samples from various carbonate lithologies were collected in order to correlate the different thrust sheets. At the same time, an attempt was made to compare the fauna from these samples with those reported by Meyer *et al.* (1988) and Stouge (1980).

The extensive fauna that was retrieved from both groups, together with the large, and as yet only partially described macrofauna (Strong and Kean, 1972), not only made correlation between thrust slices possible, but also enabled the environment of deposition to be reconstructed.

THE CONODONT FAUNAS

Catchers Pond Group

Three large samples of highly recrystalized and altered limestone from the east–west-trending bed in the middle of this mainly volcanic group (Figure 1) were processed for conodonts. The extracted conodonts were extremely small in size, well preserved and with a very high Colour Alteration Index (CAI) of 6.5 to 7. The good preservation of the conodonts and their high CAI suggest that the alteration of this limestone bed is mostly due to an increase in temperature to at least 490° C (Rejebian *et al.*, 1987).

Two samples from the southern part of the limestone bed contain an assemblage dominated by *Paracordylodus gracilis* Lindström, *Prioniodus cf. P. elegans* Pander, and simple cones. The other sample from the northern part of the bed contained not only a similar simple cone fauna and *Prioniodus cf. P. elegans* Pander, but also *Oepikodus evae* Lindström, indicating that the age of the fauna ranges from the early Arenig *Prioniodus elegans* Zone to the *Oepikodus evae* Zone of the middle Arenig.

The *Prioniodus* sp. that is found in the Catchers Pond Group shows some differences from the typical *P. elegans*, which is found in the Cow Head Group of western Newfoundland, although it is a closely related species. The same species, *P. elegans*, found in the Catchers Pond Group, is also found in the Middle Arm Point Formation of the Humber Arm Supergroup (K. Roy, personal communication, 1989). A similar evolutionary trend is also seen in the Prioniodontacean conodonts of the Emmanuel Formation of western Australia (McTavish, 1973).

Cutwell Group

To correlate the thrust sheets of the Cutwell Group, fifty samples were collected and processed for conodonts from bedded limestones, calcareous concretions in black shales, limestone blocks in tuff breccias and blocks in limestone debris-flows, from localities shown on Figures 1 and 2.

The oldest conodonts have been extracted from blocks of limestone breccia from Limestone Island–a small rock offshore Little Bay Island (locality F10, Figure 1). This fauna, which includes a primitive *Periodon aculeatus* (Hadding) associated with *Paroistodus* cf. *P. originalis* (Sergeeva), is dominated by simple cone species and is probably late Arenig in age.

Samples from the bedded limestone at the base of the quarry on the Lushes Bight to Beaumont road (locality F4, Figure 2), blocks from limestone debris-flows from the same quarry and limestone from localities F7 and F8 (Figure 2), contain a fauna from the lower part of the *Eoplacognathus? variabilis–Microzarkodina ozarkodella* subzone of the *E.? variabilis* Zone (Table 1).

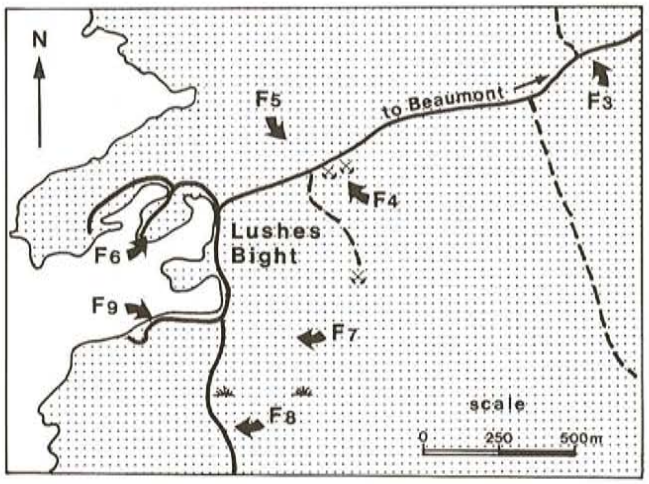

Figure 2. *Conodont sample localities in the vicinity of Lushes Bight, Long Island.*

The rest of the samples, except those from localities F1 (Figure 1) and F5 and F6 (Figure 2), come from the lower part of the *Histiodella kristina* Zone (Stouge, 1984), which is the lower part of the *Eoplacognathus suecicus* Zone. The fauna typically includes *Histiodella holodentata* Ethington and Clark, and *H. kristina* Stouge, *Cordylodus? horridus* Barnes and Poplawski, *Ansella jemtlandica* (Löfgren) and various simple cones.

Samples from localities F5 and F6 (Figure 2), and possibly F1 (Figure 1), contain the youngest fauna from the upper part of the *E. suecicus* Zone. This assemblage includes *Protoprioniodus* cf. *P. simplissimus* McTavish, *Eoplacognathus suecicus* Bergström and *Protopanderodus* cf. *P. giganteus* (Sweet and Bergström).

In some of these samples, namely those from localities F4, F6, F7 and F9 (Figure 2), a rich microfauna of inarticulate brachiopods is found in association with the conodonts. An extensive macrofauna has also been collected from different localities within the Cutwell Group. On Little Bay Island (locality F10, Figure 1) blocks of limestone contain not only conodonts but also a rich fauna of sponges, cephalopods and (?)algae. Blocks from the quarry, locality F4, and locality F5 (Figure 2) contain cephalopds, sponges and crinoid ossicles. The outcrop at locality F7 (Figure 2), is formed of a crinoidal bioclastic limestone.

Some of the conodont faunas of the Cutwell Group were obtained from the same sequences where graptolites have been described (Williams, *this volume*). These have been shown to be from the *I. victoriae maximus* and the *G. dentatus* zones of the upper Arenig and lower Lanvirn. The youngest samples contain conodonts, which in Scandinavia, are found in the Middle Ordovician *D. murchisoni* graptolite Zone.

The conodont fauna from the Cutwell Group are similar to faunas described from North America by Stouge (1984),

Table 1. Correlation of European and Table Head conodont zones with British and Newfoundland graptolite zones; ages of samples from the Catchers Pond and Cutwell groups are shown.

SYSTEM		Series (British)	British / Newfoundland Graptolite Zones	European Conodont Zones	European Conodont Subzones	Table Head Conodont Zones		Catchers Pond	Cutwell
ORDOVICIAN	MIDDLE	Lland	*G. teriusculus*	*P.serra*	*E.foliaceus*				
		Llanvirn	*D. murchisoni*	*E.suecicus*	*E.suecicus–P.sulcatus*	*H.kristina*	*Cornuodus longibasis–*		×
					E.suecicus–S.gracilis		*Walliserodus ethingtoni*		×
			G. dentatus	*E.? variabilis*	*E.?variabilis–M.ozarkodella*	*Histiodella holodentata*	*Parapanderodus arcuatus–?Erraticodon balticus*		×
					E.?variabilis–M.flabellum parva		*Trigonodus carinatus–Eoneoprioniodus n.sp 1*		
			U.austrodentatus	*M.flabellum parva*					×
	LOWER	Arenig	*I.v.maximus*	*P. originalis*		Not zoned			
			I.v.victoriae	*B. navis*					
			I.v.lunatus	*O. evae*					
			D.bifidus	*P.elegans*				×	×
			P.friuticosus					×	

Barnes and Poplawski (1973), Harris *et al.* (1979), and from Scandinavia by Löfgren (1978) and Lindström (1971, 1984). The Cutwell Group, however, contains conodonts that have not been previously described or that vary only slightly from the original description of the species. It is possible that these taxa are either older or younger than those described from environments on the craton of North America or in Scandinavia. This is a characteristic of faunas from island-arcs (Dzik, 1982; Lindström, 1984; Neuman, 1984).

The age of the conodont fauna from a shale sequence on Oil Island also has been constrained by a 469 $^{+5}_{-3}$ M a U–Pb zircon age of felsic tuff overlying conodont-bearing shales (Dunning and Krogh, 1988), which is approximately the Arenig/Llanvirn boundary on the van Eysinga (1975) time table.

CONCLUSIONS

The difference in age of the samples from the Catchers Pond Group has shown that the limestone bed is younger toward the north and time of its deposition spans the early to middle Arenig.

The oldest conodonts from the Cutwell Group probably represent the boundary of the *Microzarkodina flabellum parva* Zone and the *Eoplacognathus? variabilis* Zone. The main body of the fauna is from the top of the *E.? variabilis* Zone to the lower part of the *Eoplacognathus suecicus* Zone. The youngest fauna comes from the *E. suecicus–P. sulcatus* subzone, the upper part of the *E. suecicus* Zone. This spans the late Arenig to at least the late Llanvirn, and possibly to the base of the Llandeilo.

The conodonts from the Cutwell Group show that there is a slight difference in age of the different thrust slices, which also corresponds with the results from the graptolites (Williams, *this volume*). It is not clear at the moment whether any of the rocks of the Cutwell Group are as young as the base of the Llandeilo. It is possible that these taxa appear earlier in this island-arc environment than elsewhere. Both early and late appearances have been described for brachiopod genera from Iapetus by Neuman (1984). Some taxa also appear earlier in the Upper Ordovician Tasman island-arc (B.D. Webby, personal communication, 1988).

The 469 $^{+5}_{-3}$ Ma U–Pb zircon age obtained for the felsic volcanic rocks of the Cutwell Group is coeval with 473 $^{+3}_{-2}$ Ma U–Pb zircon age reported for felsic volcanics of the Buchans Group (Dunning and Krogh, 1988). The conodont assemblage extracted from limestone blocks of the Buchans Group (Nowlan and Thurlow, 1984, 1987) is also similar to that of the main part of the Cutwell Group. As well, conodonts from both groups display a similar CAI of 4 to 4.5, which suggests that they have been heated to 300° C (Epstein *et al.*, 1977; Rejebian *et al.*, 1987). The similarities in U–Pb zircon

age, conodont assemblage and CAI strongly suggest that the Cutwell and Buchans groups are close correlatives (O'Brien and Szybinski, 1988).

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