

**GEOLOGICAL SURVEY OF CANADA
OPEN FILE 1917**

**PRE-CONFEDERATION
HISTORICAL SEISMICITY OF NOVA SCOTIA
WITH AN EXAMINATION OF SELECTED
LATER EVENTS**

VOLUME 1

Text and Appendixes 1-7

by

ALAN RUFFMAN and JEAN PETERSON

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1988

INDEX

VOLUME 1

Page No.

ABSTRACT	1
INTRODUCTION	3
POPULATION AND LITERACY	5
NEWSPAPERS SEARCHED IN LONG RUNS	10
EVENT-SPECIFIC SEARCHES	14
OTHER SOURCES LOCATED	17
LOCAL TIME VS GREENWICH MEAN TIME	18
NEWSPAPER AND FELT LOCATIONS INDEX MAP OF NOVA SCOTIA	18
NEW EARTHQUAKES FOUND IN NOVA SCOTIA	21
NEWLY-DOCUMENTED, PREVIOUSLY-KNOWN NOVA SCOTIA EVENTS	22
NEW EARTHQUAKES FOUND OUTSIDE NOVA SCOTIA	23
EARTHQUAKES DOCUMENTED IN GREATER DETAIL OUTSIDE NOVA SCOTIA	24
EARTHQUAKES ASSOCIATED WITH METEORITES	25
GHOST EVENTS	25
NEW TSUNAMI FOUND IN THE STUDY	26
CHANGES TO THE CANADIAN EARTHQUAKE EPICENTRE FILE	27
CONCLUSIONS	28
RECOMMENDATIONS	29
ACKNOWLEDGEMENTS	30
REFERENCES	34
TABLES	44
APPENDICES 1 TO 7	68
MAP ENCLOSURE	In Pocket at end of Volume 1
	<u>VOLUME 2</u>
APPENDIX 8	378

INDEX (CONTINUED)

VOLUME 1

LIST OF FIGURES

		<u>Page No.</u>
<u>FIGURE 1</u>	INDEX MAP TO STUDY AREA SHOWN IN DETAIL ON ENCLOSURE 1	4
<u>FIGURE 2</u>	TAKEN FROM FIGURE 2 AND TABLE 2 OF BIRD (1955) SHOWING THE POPULATION OF MARITIME CANADA FOR 1748	6
<u>FIGURE 3</u>	TAKEN FROM FIGURE 4 OF BIRD (1955) SHOWING THE POPULATION OF MARITIME CANADA IN 1786. GANONG AND HOLLINGSWORTH REFERENCES USED BY BIRD	8
<u>FIGURE 4</u>	DIAGRAM ILLUSTRATING THE RUNS OF NEWSPAPERS SEARCHED DURING THE STUDY	13

LIST OF TABLES

<u>TABLE 1</u>	A) LIST OF EARTHQUAKES FROM THE CANADIAN EARTHQUAKE EPICENTRE FILE (CEEF), WHICH EITHER OCCURRED IN THE AREA OF NOVA SCOTIA, IN THE AREA OF THE BAY OF FUNDY AND SOUTHERN NEW BRUNSWICK, OR IN THE AREA OF THE LAURENTIAN SLOPE OFF SOUTHERN NEWFOUNDLAND, AND WHICH WERE KNOWN PRIOR TO THIS STUDY BEGINNING	45
	B) LIST OF OTHER EARTHQUAKES IN THE UNITED STATES OR FARTHER AFIELD IN EASTERN CANADA WHICH WERE KNOWN, PRIOR TO THIS STUDY BEGINNING, TO HAVE BEEN FELT IN NOVA SCOTIA	51
	C) LIST OF TSUNAMI WHICH IMPINGED ON THE ATLANTIC COAST OF CANADA AND WHICH WERE KNOWN PRIOR TO THIS STUDY BEGINNING	52
<u>TABLE 2</u>	CHRONOLOGICAL LIST OF EIGHTY FIVE EVENT-SPECIFIC REPORTS FOUND IN APPENDIX 5	53
<u>TABLE 3</u>	CHRONOLOGICAL LIST OF NEW PREVIOUSLY-UNDOCUMENTED, EARTHQUAKES IN NOVA SCOTIA, FOUND DURING THIS STUDY	58

INDEX (CONTINUED)

VOLUME 1

LIST OF TABLES (CONTINUED)

Page No.

<u>TABLE 4</u>	CHRONOLOGICAL LIST OF NEWLY-DOCUMENTED, PREVIOUSLY-KNOWN, EARTHQUAKES IN NOVA SCOTIA, OR FELT IN NOVA SCOTIA, TO WHICH THIS STUDY WAS ABLE TO ADD SIGNIFICANT NEW INFORMATION	59
<u>TABLE 5</u>	CHRONOLOGICAL LIST OF APPARENTLY NEW, PREVIOUSLY-UNDOCUMENTED, EARTHQUAKES IN NEW BRUNSWICK, QUEBEC, ONTARIO, NORTHEAST UNITED STATES, ST. PIERRE ET MIQUELON AND GREENLAND, FOUND DURING THIS STUDY	60
<u>TABLE 6</u>	CHRONOLOGICAL LIST OF NEWLY-DOCUMENTED, PREVIOUSLY-KNOWN, EARTHQUAKES IN NEW BRUNSWICK, QUEBEC, ONTARIO, AND NORTHEAST UNITED STATES TO WHICH THIS STUDY WAS ABLE TO ADD SIGNIFICANT NEW INFORMATION	62
<u>TABLE 7</u>	CHRONOLOGICAL LIST OF NEW, PREVIOUSLY-UNDOCUMENTED, TSUNAMI EXPERIENCED IN NOVA SCOTIA, NEWFOUNDLAND, ONTARIO AND GREENLAND, FOUND DURING THIS STUDY	63
<u>TABLE 8</u>	CHRONOLOGICAL LIST OF GHOST EVENTS OR POSSIBLE GHOST EVENTS DOCUMENTED IN THIS STUDY	64
<u>TABLE 9</u>	CHRONOLOGICAL LIST OF EARTHQUAKE EVENTS THAT WERE, OR MAY HAVE BEEN, ASSOCIATED WITH METEORITE IMPACTS	65
<u>TABLE 10</u>	CHRONOLOGICAL LIST OF PREVIOUSLY-KNOWN EARTHQUAKES, IN NOVA SCOTIA OR POSSIBLY RELATED TO NOVA SCOTIA, FOR WHICH NO EVENT-SPECIFIC SEARCH COULD BE INITIATED BECAUSE OF TIME LIMITATIONS OR (IN FOUR CASES) FOR WHICH AN EVENT-SPECIFIC SEARCH YIELDED NO SIGNIFICANT NEW DATA	66

INDEX (CONTINUED)

VOLUME 1

LIST OF APPENDICES

		<u>Page No.</u>
<u>APPENDIX 1</u>	NOVA SCOTIAN NEWSPAPERS FOR WHICH LONG RUNS WERE SEARCHED IN THE STUDY AT THE PUBLIC ARCHIVES OF NOVA SCOTIA	69
<u>APPENDIX 2</u>	OTHER NOVA SCOTIAN NEWSPAPERS WHICH WERE USED AT THE PUBLIC ARCHIVES OF NOVA SCOTIA IN EVENT-SPECIFIC SEARCHES IN THE STUDY, ARRANGED BY COMMUNITY	73
<u>APPENDIX 3</u>	A) ISSUES OF THE <u>ROYAL GAZETTE</u> LOCATED IN THE LEGISLATIVE LIBRARY TO FILL IN GAPS IN THE LONG RUNS SEARCHED IN THE PUBLIC ARCHIVES OF NOVA SCOTIA COLLECTION	80
	B) MISSING ISSUES OF NEWSPAPERS NOT FOUND IN SEARCHING THE LONG RUNS; ORDERED BY NEWSPAPER	81
<u>APPENDIX 4</u>	A LIST OF THOSE ISSUES OF MISCELLANEOUS CAPE BRETON COUNTY NEWSPAPERS, FOUND ON CAPE BRETON MISCELLANEOUS REELS 1 TO 6, INDEXED BY JOHN MACLEOD, AT THE PUBLIC ARCHIVES OF NOVA SCOTIA, 1984	86
<u>APPENDIX 5</u>	EVENT-SPECIFIC DATA FOUND DURING THE SEARCH OF THE LONG RUN OF NEWSPAPERS FROM 1752 TO 1867 OR FOUND DURING THE EVENT-SPECIFIC SEARCHES; PERIOD COVERED 1755 TO 1915 PLUS ONE EVENT IN 1985. EVENT-SPECIFIC DATA ARE ARRANGED CHRONOLOGICALLY; EIGHTY FIVE REPORTS IN ALL	108
<u>APPENDIX 6</u>	COPY OF NEWFOUNDLAND RESEARCH INTO NEWFOUNDLAND STANDARD TIME	339

INDEX (CONTINUED)

VOLUME 1 (CONTINUED)

LIST OF APPENDICES (CONTINUED)

Page No.

<u>APPENDIX 7</u>	COMPENDIUM OF DIRECT COPIES OF ALL REPORTS OF EARTHQUAKES AND RELATED PHENOMENON, FOUND IN SECONDARY SOURCES DURING THE STUDY, ARRANGED IN ALPHABETICAL ORDER OF THEIR FIRST AUTHOR, ANNOTATED AS TO THEIR SOURCE AND DATE, AS WELL AS TO THE PAGE NUMBER IN THE SOURCE. REFERENCE SHOULD BE MADE TO THE SECTION OF REFERENCES USED IN THE STUDY FOR FULL DETAILS AS TO THE SOURCE NOTE: IN A NUMBER OF CASES WHERE WE LOCATED AND USED SMITH'S (1962) REFERENCES, WE HAVE NOT REPRODUCED THEM IN THIS APPENDIX	343
-------------------	---	-----

(End of Volume 1)

VOLUME 2

<u>APPENDIX 8</u>	CHRONOLOGICAL COMPENDIUM OF DIRECT COPIES OF ALL THE NEWSPAPER ARTICLES FOUND DURING THE STUDY, WHICH DEALT WITH EARTHQUAKES OR RELATED PHENOMENON, ANNOTATED AS TO THEIR NEWSPAPER SOURCE, DATE OF PUBLICATION AND THE NEWSPAPER PAGE AND COLUMN NUMBER, ALONG WITH NOTES REGARDING OTHER RELEVANT MATTERS; A CHRONOLOGICAL LIST OF ALL ARTICLES PRECEEDS THE COLLECTION OF COPIES	378
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LIST OF ENCLOSURES

VOLUME 1

<u>ENCLOSURE 1</u>	NEWSPAPER INDEX MAP OF NOVA SCOTIA (ALSO SHOWING FELT LOCATIONS RECORDED IN THIS REPORT)	In Pocket at end of Volume 1
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This report may be referenced as:

Ruffman, Alan and Jean Peterson. 1986. Pre-confederation Historical Seismicity of Nova Scotia With an Examination of Selected Later Events. Geomarine Associates Ltd., Halifax, Nova Scotia, Project 85-69, Contract Report, DSS Contract No. OSQ85-00141 for Canada Department of Energy, Mines and Resources, Earth Physics Branch, Division of Seismology and Geomagnetism, Ottawa, Ontario, Geological Survey of Canada, Open File No. 88- , 900 pp. in two volumes, one map enclosure, 1:640,000, Mercator projection.

ABSTRACT

PRE-CONFEDERATION HISTORICAL SEISMICITY OF NOVA SCOTIA

WITH AN EXAMINATION OF SELECTED LATER EVENTS

by

Alan Ruffman and Jean Peterson

A recent four-month archival, contract research program for the Earth Physics Branch* of the Canada Department of Energy, Mines and Resources has investigated the historical seismicity of Nova Scotia from 1752-1867. Long runs of all available issues of long-publishing Halifax newspapers were scanned for all earthquakes and tsunami.

All earthquake references were extracted to ascertain the usefulness of the newspaper and the degree to which the journal covered seismic events, or simply used them as fillers, if at all. The Halifax 'Royal Gazette' was found to not detail local news very well and to not detail local earthquakes at all in the period of 1752 to 1813 when the Halifax Acadian Recorder became the local newspaper of record. The Acadian Recorder was found to be much better for the study. A twenty-year period of the Yarmouth Herald was also scanned from 1848 to 1867 to gauge the comparative coverage and to sample the Province at the southwest end where more earthquakes appear to have been felt over the last 200 years. Some 6,000 newspaper issues were examined in the study and about 478 newspaper articles and other references were extracted in the study for inclusion in the final report. These articles allowed eighty five** event-specific reports to be assembled in this report.

Prior to this study beginning, only three tsunami were known to have impinged on the shores of Newfoundland in 1755, 1864 and 1929; and one of these, in 1929, was known for Nova Scotia; now three newly-documented tsunami are known to have affected the shores of Nova Scotia: at Liverpool, in the Yarmouth area and at Cape North in Cape Breton. There may be a fourth tsunami that also affected northernmost Cape Breton. A previously-unreported tsunami has been documented for Newfoundland with another possible tsunami seen in Lake Huron, Ontario. A recent earthquake and small tsunami in Greenland are also documented.

Prior to this study beginning only thirteen earthquakes were known in Nova Scotia for the pre-1916 period; this number is reduced to ten when the three 'ghosts' found in this study are removed. Some fourteen new, previously-undocumented, earthquakes have been defined for Nova Scotia; three definite (and three possible) 'ghost' or erroneous events have

been defined and five more events will have their dates corrected. Three seismic events that may each be related to a meteorite impact have been found. Significant new data for some nine previously-known Nova Scotia events have been found.

Similarly, about thirty three** apparently new, previously-undocumented, events for New Brunswick, the northeast U.S. and for Upper Canada may have been found with new data on thirteen other previously-known events in these areas. Only four previously-known events, in Nova Scotia, failed to yield new data when event-specific newspaper searches were done. There were six other Nova Scotian events, in the period 1868 to 1915, for which time ran out and no event-specific searches were done; there were also fifteen late nineteenth or early twentieth century events in southern New Brunswick, at Eastport, Maine, or in the Bay of Fundy, which may have been felt in Nova Scotia, but which had no work done on them whatsoever, for the same reason.

* On April 1, 1986 the Earth Physics Branch was reorganized to become part of the Geophysics Division of The Geological Survey of Canada. The Earth Physics Branch in name no longer exists.

** The number of event-specific searches in Tables 2 and 5 and in Appendix 5 rose to eighty five on March 7, 1987 when a note added in proof added yet another new, previously-unreported, event thus the number of new, non-Nova Scotian, events rose to thirty three.

RESUME

Séismicité historique de la Nouvelle-Ecosse antérieure à la Confédération et examen de certains événements postérieurs à 1867

par

Alan Ruffman et Jean Peterson

Un contrat de recherche récent pour la Direction de la physique du globe* du Ministère de l'énergie, des mines et des ressources, d'une durée de trois mois, a permis l'examen de la seismicité historique de la Nouvelle-Ecosse entre 1752 et 1867. De longues séquences de tous les numéros disponibles des journaux d'Halifax publiés pendant longtemps furent examinés pour retracer des tremblements de terre et des tsunamis.

Toutes les références de journaux furent extraites pour évaluer l'utilité du journal et le degré avec lequel il avait couvert les événements séismiques, ou s'il les avait utilisés pour remplir les pages, lorsque présents. Le *Royal Gazette* de Halifax a démontré son inaptitude à bien couvrir les nouvelles locales et à détailler les séismes locaux de la période 1752 à 1813, jusqu'à ce que le *Acadian Recorder* devienne le journal local utilisé. Le *Acadian Recorder* démontra sa supériorité pour cette étude. Une période de vingt ans du *Yarmouth Herald* fut aussi examinée de 1848 à 1867 pour comparer sa couverture et pour échantillonner le Sud-Ouest de la Province où plusieurs événements furent rapportés ressentis au cours des derniers 200 ans. Quelques 6,000 numéros de journaux furent examinés pour cette étude et environ 478 articles de journaux et autres références furent extraits pour inclusion dans le rapport final. Ces articles ont permis d'assembler quatre-vingt-cinq** rapports d'événements spécifiques dans ce rapport.

Avant le début de cette étude, seuls trois tsunamis étaient connus comme ayant affectés les rives de Terre-Neuve en 1755, 1864 et 1929; et un de ceux-ci, en 1929, était connu pour la Nouvelle-Ecosse; maintenant, trois tsunamis nouvellement documentés furent reconnus comme ayant affectés les côtes de la Nouvelle-Ecosse: à Liverpool, dans la région de Yarmouth et à Cape North au Cap Breton. Il pourrait exister un quatrième tsunami qui aurait affecté la partie nord du Cap Breton. Un tsunami non-rapporté jusqu'ici fut documenté pour Terre-Neuve avec un autre possible dans le lac Huron en Ontario. Un séisme récent et un faible tsunami au Groenland furent aussi documentés.

Avant le début de cette étude, seulement treize tremblements de terre étaient connus pour la période antérieure à 1916 en Nouvelle-Ecosse; ce nombre est maintenant réduit à dix suite à l'élimination de trois "fantômes" trouvés dans cette étude. Quelques quatorze nouveaux tremblements de terre autrefois non-documentés furent définis pour la Nouvelle-

Ecosse; trois "fantômes" ou événements erronés (et trois possibles) furent définis et cinq autres auront leurs dates corrigés. Trois événements séismiques, qui pourraient être reliés à des impact météoritiques furent trouvés. Des nouvelles données significatives furent trouvés pour quelques neuf autres événements de la Nouvelle-Ecosse déjà connus.

De façon semblable, environ trente-trois événements apparemment nouveaux et non déjà documentés pourraient avoir été trouvés pour le Nouveau-Brunswick, le Nord-Est des E.-U., et pour le Haut-Canada, avec des données supplémentaires sur treize autres événements déjà connus dans ces régions. Des recherches de données dans des journaux pour des événements spécifiques se sont révélées infructueuses pour seulement quatre événements déjà connus. Il y avait six autres événements néo-écossais, dans la période 1868 à 1915, pour lesquels le temps a manqué et pas de recherche spécifiques n'ont été faites; il y avait aussi quinze événements de la fin du dix-neuvième ou du début du vingtième siècle du sud du Nouveau-Brunswick, à Eastport au Maine, ou dans la Baie de Fundy, qui aurait pu être ressenti en Nouvelle-Ecosse, mais pour lesquels aucune recherche n'a pu être faite pour les mêmes raisons.

* Le 1er avril 1986, la Direction de la physique du globe fut réorganisée pour devenir une partie de la Division de la géophysique de la Commission géologique du Canada. La Direction de la physique du globe en tant que telle n'existe plus.

** Le nombre de recherches d'événements spécifiques dans les tableaux 2 et 5 et dans l'annexe 5 s'est accru à quatre-vingt-cinq le 7 mars 1987, lorsqu'une note annexée en preuve a ajouté un autre événement nouveau jusqu'ici non-rapporté, faisant du nombre d'événements néo-écossais nouveaux égal à trente-trois.

INTRODUCTION

In 1983, the Division Seismology and Geomagnetism of the Earth Physics Branch (EPB) of the Canada Department of Energy, Mines and Resources initiated a series of historical seismicity studies employing mainly newspaper and other written sources. The first of these was in 1983-84 in Newfoundland where the numbers and sources of newspapers were modest. A second study occurred to review three newspapers of northern New Brunswick in 1984-85.

In Newfoundland, a run of available newspapers was reviewed from 1810 to 1914, with selected later events. The report by Staveley et al. (1984) defined three new earthquakes all in the modern, but for Newfoundland, the pre-instrumental era, (1940, 1956, 1957) and the study defined significant changes to the Canadian Earthquake Epicentre File (CEEF) for seven other previously-known events. Only 37 references to possible earthquakes were found between 1828 and 1898 inclusive (Table 2; Adams and Staveley, 1985). This report is now available as an EPB open file (Adams and Staveley, 1985).

In northern New Brunswick, the research team looked at long runs of three newspapers covering the period from 1867-1943 (Burke et al., 1985). Their study was, in part, prompted by the recent 1982 event in the interior of the Central Highlands. This study defined some nineteen new, previously-unreported, post-1866 events. Leblanc and Burke (in press, 1985) have since done a specific historical study of the 1817, 1855, 1869 and 1904 earthquakes and have refined the estimates of their size and epicentre location.

The present study was called for to continue the coverage in the Atlantic area. The study was to restrict itself to events recorded in Nova Scotian sources (Figure 1). Nova Scotia has a relative wealth of newspaper sources that begin in 1752 and which are collected and generally microfilmed in the Public Archives of Nova Scotia in Halifax. The longest and best collected runs of newspapers are Halifax papers, but the study was also to do an overlapping 20-year run from Yarmouth, Nova Scotia for comparative purposes.

Originally, it was hoped that the Nova Scotia study would cover the period 1752 to July 30, 1952 when truly modern and sensitive seismometers were put in Halifax at the Dalhousie University seismograph station (Stevens, 1980). The first seismograph was installed in the old Dalhousie Physics Building in 1915 (Stevens, 1980). This was an air-damped, long-period, small Mainka horizontal pendulum instrument and it was not initially very sensitive to anything but the larger earthquake events. Thus, reaching the 1915 period was a fall-back initial objective for this study.

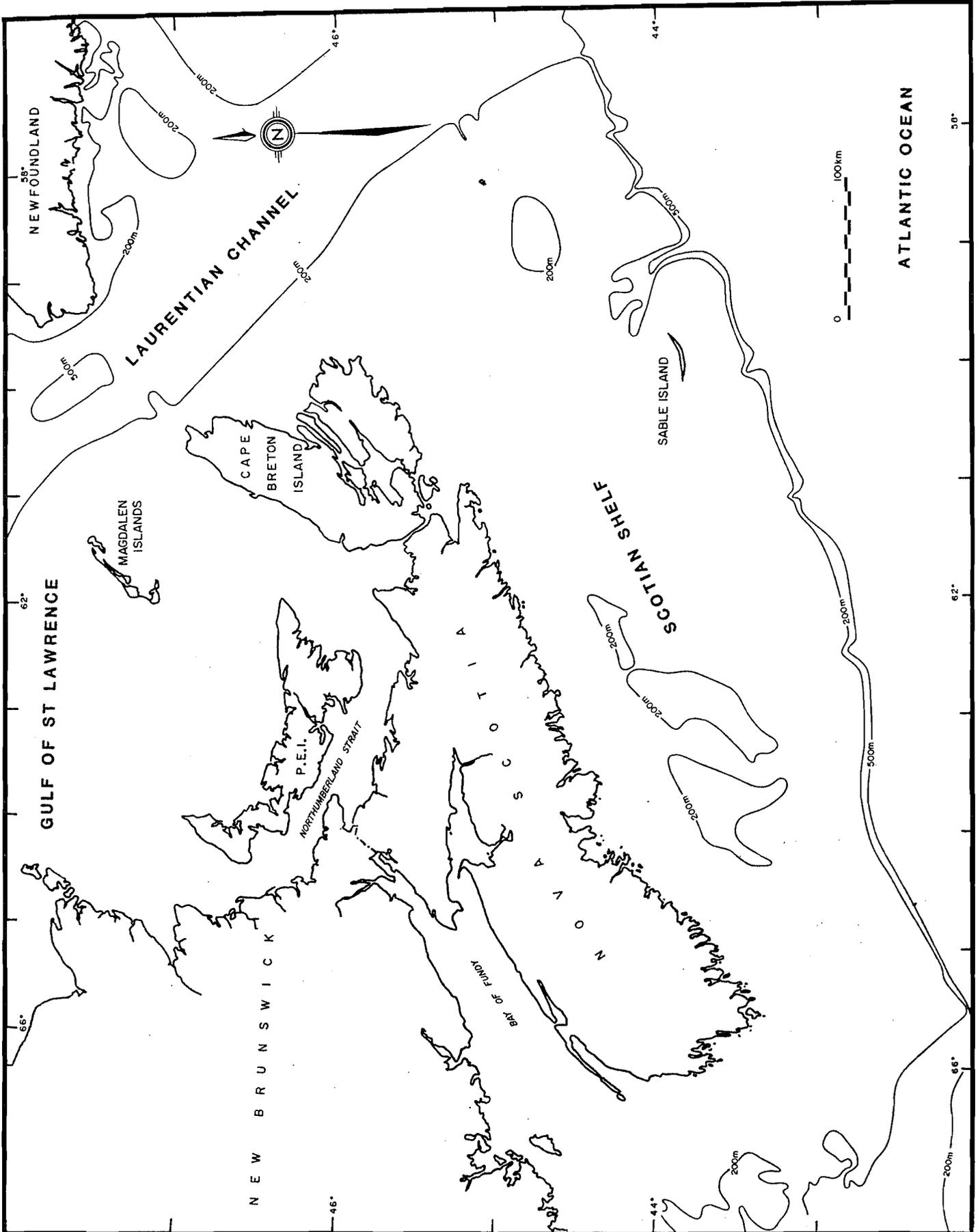


FIGURE 1

In fact, the sources were quite numerous and generally the runs were quite complete (Figure 4) and the material was quite rich after about 1790. Numerous reports were found and a significant number of previously-unreported events were found both for Nova Scotia and beyond in Canada, in Newfoundland and in the northeast United States. Neither 1915 nor 1952 were reached. An arbitrary cut off of December 31, 1867 was set at a mid-project meeting with the Scientific Authority, Dr. John Adams, to ensure that there was time for the 20-year Yarmouth comparison and for event-specific searches for those previously-unreported events found in Nova Scotia prior to 1868. Even the December 31, 1867 cut off proved far too optimistic; Geomarine had to contribute an immense amount of extra time to satisfactorily complete the project to that date.

As it was, the 1752 to December 31, 1867, period was covered using Halifax newspapers with the January 1, 1848 to December 31, 1867 period of a Yarmouth newspaper searched. The pre-1868, newly-reported, events in Nova Scotia and the pre-1868, previously-known, events were all subjected to event-specific searches around the time of their occurrence to try and amplify the material available. A good number of the post-1867, pre-1916, events were selected and subjected to event-specific searches. In fact, the study, even limited to 1752-1867 as it was, took significantly far more time than anticipated when it was budgeted. In the order of twenty two times the professional time, 1.3 times the archival researcher time, seven times the word processing time and three times the drafting over and above the originally budgeted time were required to complete this study.

POPULATION AND LITERACY

In 1748, the population of Nova Scotia was scattered, with large concentrations found in the area of the Annapolis Basin, the Minas Basin and Piziquid* areas (Figure 2). In the next year, Halifax was founded by approximately 2500 settlers, and a few years later Lunenburg was settled by German and Swiss immigrants. Fishing villages had been established by 1750 at Barrington, Pubnico, Shelburne, LaHave, Guysborough, Canso and at various, less important, outposts (Bird, 1955).

* Piziquid was Windsor, Nova Scotia

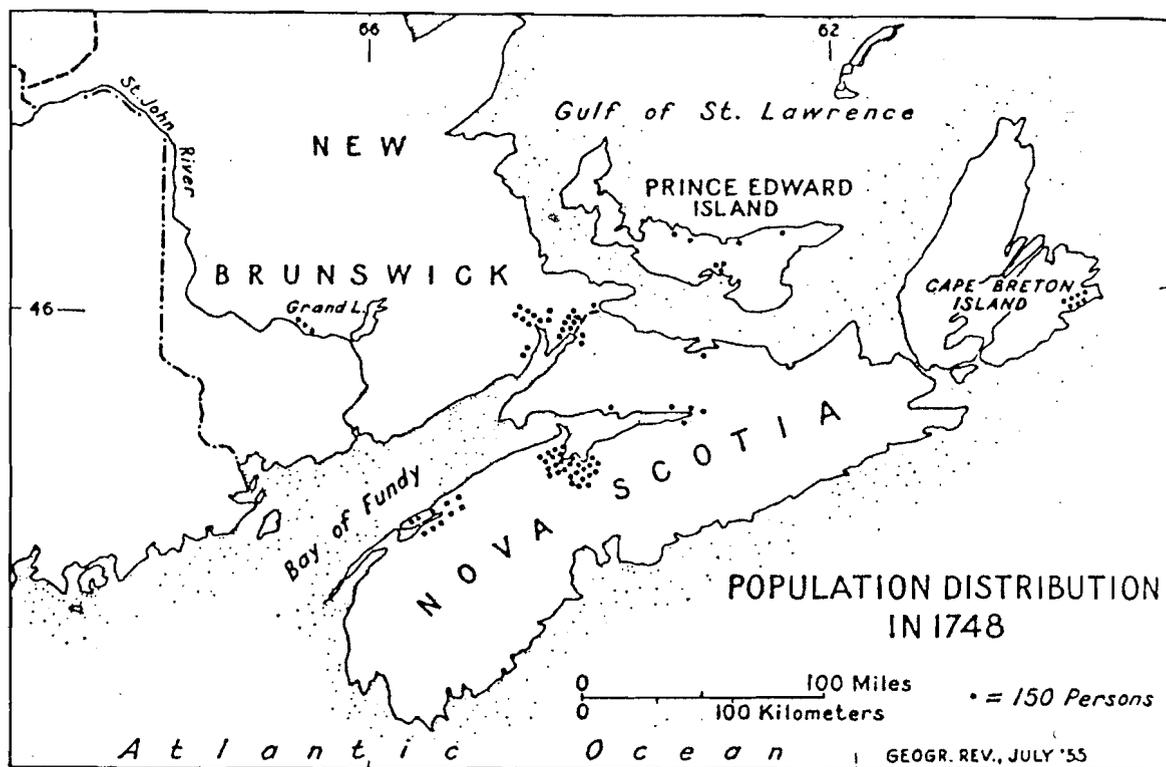


FIG. 2—Population of maritime Canada in 1748. For source of figures, see footnote 18 above and Table I.

TABLE I—ESTIMATED POPULATION OF MARITIME CANADA, 1748*

Annapolis Basin	1400	Tatamagouche	150
Port Royal garrison	100	South shore Nova Scotia	500
Minas	2200	Cape Breton Island	1000
Piziquid	2000	Prince Edward Island	1000
Cobequid	950	New Brunswick (less Chignecto)	400
Chignecto Basin	3000		
		TOTAL	12,700

*Both the distribution and the total (excluding Indians) follow the French sources, slightly reduced except for the Piziquid settlement, which, reported as 900 by the English and some 2500 by the French, has been reduced from the latter figure to 2000.

Geographic Review
 Vol. 45, 1955
 "Settlement Patterns in Maritime Canada
 1687-1786"
 J. Brian Bird

FIGURE 2: Taken from Figure 2 and Table 1 of Bird (1955) showing the population of Maritime Canada for 1748.

Between 1760 and 1765, about seven thousand industrious New Englanders settled at Barrington, Liverpool and Horton Township, among other places. People of Scottish and Irish origin settled the Cobequid district in the townships of Truro and Londonderry. Between 1772 and 1775, over a thousand Yorkshire men and women landed in Nova Scotia and settled around Sackville* (Hobson, 1954; p. 50).

The next large wave of settlers was the arrival of approximately 20,000 United Empire Loyalists around 1776. This immigration reinforced and extended the Atlantic shore pattern of settlement (Bird, 1955). The Loyalists founded Shelburne, Digby, Parrsboro, Guysborough, Wallace and Wilmot, as well as increasing the population of already established townships such as Barrington and Halifax. Their presence almost doubled the population of the province of Nova Scotia and eventually led to the creation of the new province of New Brunswick in 1784.

The last and largest immigration into Nova Scotia, between 1773 and 1838, that of thousands of Highland Scots, settled the only unoccupied land left, apart from the forested interior, which was the upland country of the east and Cape Breton Island (Hobson, 1954; p. 50). Figure 3 of 1786 shows the change in population when compared to Figure 2 of 1748 (Bird, 1955).

In 1784, the province of New Brunswick was created through the partitioning of the province of Nova Scotia. Thence forward, the two provinces existed as separate political entities with the political boundary as we know it today on the isthmus between Amherst, Nova Scotia and Sackville, New Brunswick.

By 1827, the population of the province of Nova Scotia was approximately 123,000, with settlements all along the Atlantic Coast.

The first newspaper, in what is now referred to by historians as British North America, was published in Halifax, Nova Scotia on March 23, 1752. This paper, the Halifax Gazette, the official organ of the government, is still published today under the name, the Royal Gazette, the name it assumed in 1843 (Appendix 1). In this report, we use the term 'Royal Gazette' as a generic term to encompass all versions of this newspaper from the initial 'Halifax Gazette' through numerous name changes to to present day (Appendix 1).

* Sackville was in Nova Scotia prior to the partitioning off of New Brunswick in 1784.

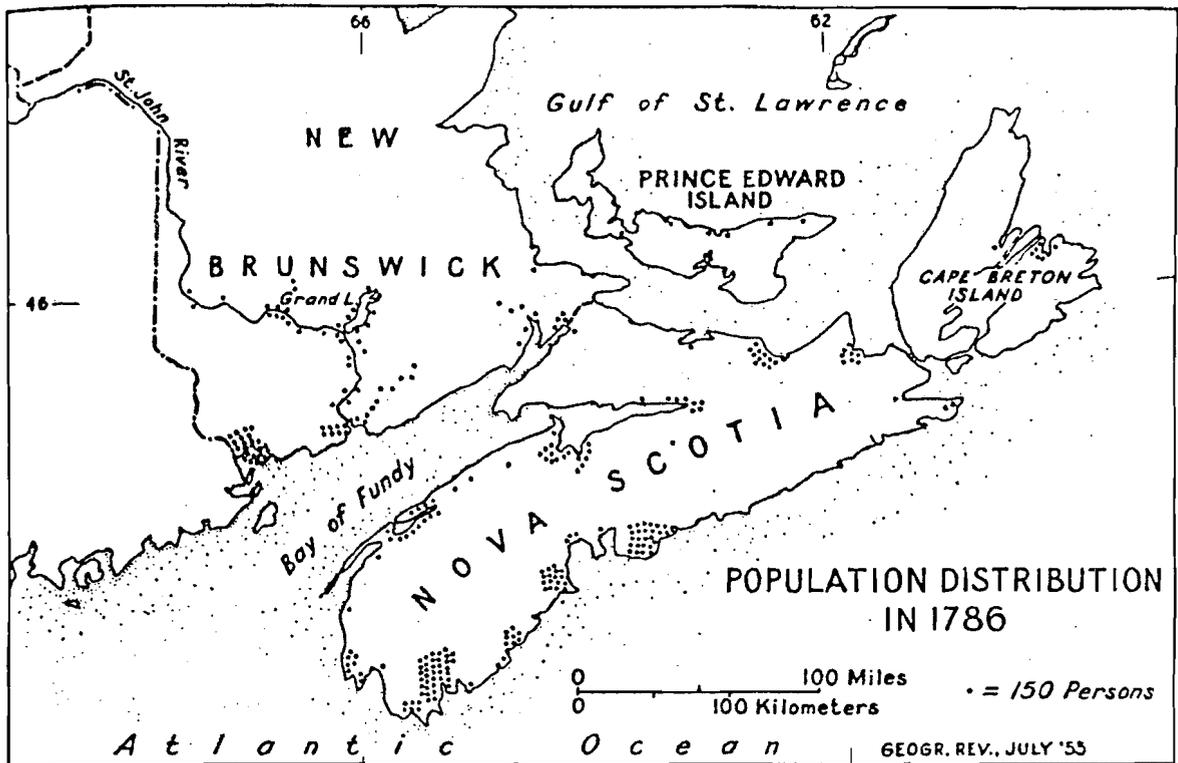


FIG. 4—Population of maritime Canada, 1786, compiled from several sources, including Ganong (see footnote 17, above) and Hollingsworth (see footnote 30, above).

Geographic Review
 Vol. 45, 1955
 "Settlement Patterns in Maritime Canada
 1687-1786"
 J. Brian Bird

FIGURE 3: Taken from Figure 4 of Bird (1955) showing the population of Maritime Canada in 1786. Ganong and Hollingsworth references used by Bird.

Since 1752, there have been many newspapers published in Nova Scotia, under more than 500 titles (Tratt, 1957; 1979). The Royal Gazette, under its various names, was the only Nova Scotia newspaper until 1781. The publishing of new newspapers in Nova Scotia tended, in a general way, to follow the growth and spread of the population. Shortly after, the Halifax Journal began publication in 1781, Shelburne was publishing three newspapers, none of which lasted into the next century (Appendix 1).

Early Nova Scotia papers generally, almost only reported extracts from European and American papers that arrived by trading packets. The early Nova Scotian newspapers seemed to be more interested in what was going on across the Atlantic than in their own hometown. The new colonialists still felt much stronger ties to their former homelands and seemed to have no concept that the colonial settlements in Nova Scotia were making their own "news". The early Shelburne papers, however, did show interest in their fellow Loyalists in New Brunswick and elsewhere (Peterson, 1984).

The Colonial Patriot began publishing in Pictou in 1827; thus, it became the only paper at this time published outside Halifax; there had been others (e.g. in Shelburne) which did not survive (Tratt, 1957; 1979). In the 1830s the situation began to change. In 1833, the Telegraph began publishing in Yarmouth; Pictou published the Observer and Eastern Advertiser, 1831-1835; and the Cape Breton Herald began publishing in Sydney in 1832; among others. As well, there were numerous new papers which were appearing in Halifax (Tratt, 1957; 1979).

By the 1830's the appearance and content of Nova Scotia newspapers changed. On the front page, which had previously consisted of advertisements, there now appeared a literary comment or maybe foreign news. Meanwhile, the newspapers, through their editors and, presumably, their readers, had been becoming more self-conscious and independent concerning the importance of the Province of Nova Scotia with regard to other British North American colonies, the United States and Great Britain herself (Bird, 1955).

Another important change occurred by 1849 when most of Nova Scotia was linked by telegraph to the rest of the British North American colonies and to the United States, enabling news to travel much more quickly. The first trans-Atlantic telegraph cables were in operation by 1869. In the early newspapers in the eighteenth century, the very few earthquake reports that appear were often delayed by several months. Reports often were printed months after the event; having travelled by sailing vessels; indeed, the Nova Scotia Gazette and Weekly Chronicle's six-part article on the February 5, 1783, (and subsequent) earthquakes in Sicily was datelined Naples, May 23, 1783, and was published in the February 8, 15,

22, March 1 and March 8, 1785, issues about two years after the event (Appendix 8).

In later issues, one sees reports only delayed by the time it took a fast packet to sail the Atlantic or from Boston to Halifax, etc. Finally, in the newspapers near the end of the study period, reports are arriving with only one to three days delay, except those from remote and isolated locations or from parts of the world with minimal communication facilities. Eventually the newspapers begin to carry sections, "By Telegraph" which have news, 'hot off the wire', so to speak and it is possible to see same day reports of earthquakes.

NEWSPAPERS SEARCHED IN LONG RUNS

Initially only the Royal Gazette of Halifax under its many and varied earlier names was available in Nova Scotia beginning on March 23, 1752 (Appendix 1). This was the first long run we searched in this study. Figure 4 illustrates the many gaps in the weekly record of this publication and Appendix 3 lists the issues found in the Legislative Library at Province House in Halifax and lists the issues missing in this run through to May 12, 1813.

The Halifax Weekly Chronicle was searched from the first available issues in January 1788 to 1813; there are many significant gaps in this weekly (Figure 4; Appendix 3). This publication changed its name in 1827 to the Acadian and General Advertiser and continued to publish until 1834. The period 1827 to 1834 was searched but again there are significant gaps (Appendix 3, Figure 4).

In an attempt to fill in gaps in the early record the three early private Shelburne newspapers were searched as issues could be found for the 1783 to 1796 period; again the collection at the Public Archives of Nova Scotia (PANS) is spotty in its completeness (Figure 4; Appendix 3).

The most valuable newspaper to the study and a fortuitous choice for us in the beginning was the Halifax Acadian Recorder. The Acadian Recorder has quite a complete run with few significant gaps (Figure 4, Appendix 3). It also seemed to have a series of news editors who were interested in seismic events and included them whereas the Royal Gazette in the early years until about the 1790s seemed to have little interest in North American earthquakes; we found the Royal Gazette the least valuable source. The run of the Acadian Recorder was searched from 1813 to December 31, 1867 and was our most valuable source.

The Acadian Recorder was at first a weekly publishing on Saturdays. On September 5, 1864 it also issued a tri-weekly on Monday, Wednesday and Friday and four years later commenced a daily as well; all three continued simultaneously to give six-day-a-week coverage until 1930 (Appendix 1; Tratt 1957 and 1979). Thus the work load to search the Acadian Recorder tripled with the September 5, 1864 issue.

A twenty-year section of the Yarmouth Herald from January 1, 1848 to December 31, 1867 was searched to give a comparison with the Acadian Recorder for this period and to strengthen the coverage at the western end of the province where more earthquakes seem to have been felt. The weekly Yarmouth Herald had changed its name from the Yarmouth Herald and Western Advertiser with the issue of December 22, 1843 when it became the Province's first semi-weekly (Tratt, 1957; 1979). The Herald reverted to a weekly in August 1850.

Alexander Lawson was editor of the Yarmouth Herald from its inception in 1833 until his death in 1895 save for a 5.3 year period from August 1845 until about mid-December 1850. Alexander Lawson's son, J. Murray Lawson, wrote the county history of Yarmouth County in 1902. Lawson's (1902) Yarmouth, Past and Present has an "Earthquakes" section on pp. 597-598 that mentions nine earthquakes (and one tsunami in another section) for the period from April 18, 1843 to December 31, 1882. We found that Lawson's brief accounts of these events are taken directly from the Yarmouth Herald's accounts and in at least three of the cases the items are circled in the original Herald as seen on the PANS' microfilm. They were clearly circled by Lawson himself or by an assistant. Thus Lawson had also searched at least the same 20-year period of the Yarmouth Herald for his research on the nineteenth century. We suspect we were somewhat more complete and had a single purpose where Lawson clearly had many interests for a broad county history. We have found at least one event in the Yarmouth Herald which J. Murray Lawson failed to report on February 8, 1943.

The fold-out Figure 4 gives the full visual picture of our coverage in the long runs from March 23, 1752 to December 31, 1867. There are near complete gaps in 1756, 1757, 1758, 1759, 1760, 1762, 1763 and 1765 with thin coverage in the other early years. Coverage is very thin to nonexistent for 1771, 1776, 1777, 1778, 1842, 1843 and 1844. The gaps in the nineteenth century can be filled with other Halifax newspapers but time did not permit us to do so; the gaps in the eighteenth century will be much harder to fill but some other sources such as diaries are available.

The newspapers used in the long runs (Figure 4) had a variety of outlooks and formats (Tratt, 1957; 1979). We have given a brief review of these in Appendix 1 as taken from Peterson (1984) and Tratt (1957; 1979). Suffice to say that the Halifax

Acadian Recorder and Yarmouth Herald were the most useful sources.

All articles on all earthquakes prior to about 1860 were noted during the search of the long runs of Halifax newspapers and later copied. After about 1860, generally only earthquakes in Canada and the northeastern U.S. were copied or noted. In the 20-year period search of the Yarmouth newspaper only Canadian or northeast United States events were copied for Appendix 8.

The retrieved articles were then mounted on 8.5 x 11 in paper after the sheet was annotated as to the source, date, page and column number and any relevant notes as to the source or as to the actual date of the event and whether the earthquake (if an eastern Canadian or northeastern U.S. event) was noted in Smith's (1962) compendium (Appendix 8). At the beginning of this study, the Canadian Earthquake Epicentre File (CEEF) for the 1752 to 1867 period still essentially reflected the compendium of Smith (1962) with few exceptions. Appendix 8 generally notes whether the event is recorded in Smith (1962) where relevant.

All mounted newspaper articles are found in Appendix 8 with a comprehensive list at the start of the collection. All articles are in strict chronological sequence. In some cases longer articles are continued on successive pages. Occasionally where articles were impossible to read on the microfilm copies then transcripts are included in Appendix 8. Copies of microfilm made on a xerox plain paper copier were invariably better than those made on various chemically-coated paper copiers. Unfortunately most archives and libraries still have the chemically-coated paper copiers.

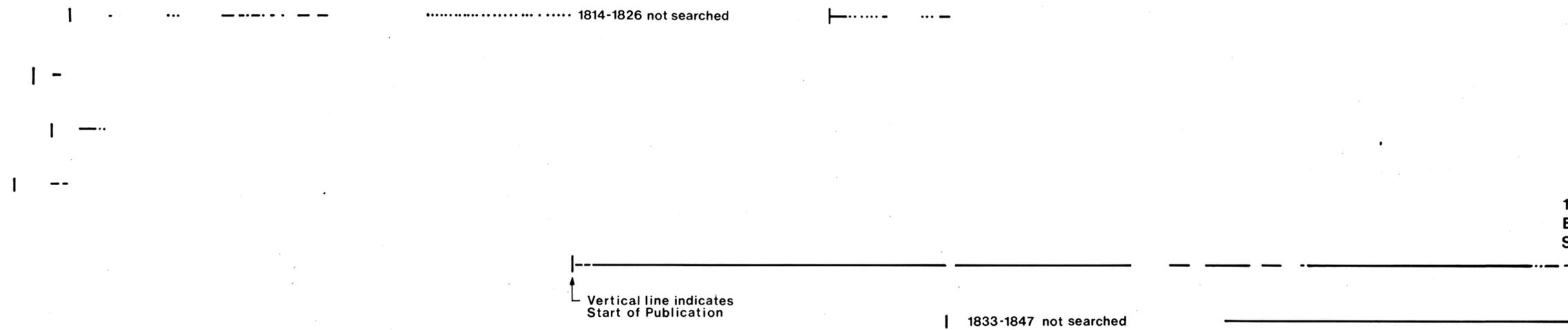
The study also had the benefit of John MacLeod's (1984) search and cataloguing of some six reels of "Miscellaneous Cape Breton County Newspapers". One of his categories in the catalogue was, "Earthquakes" and he cited five articles of interest to our study (Appendix 4). MacLeod (1984) has searched some quite complete runs of the Cape Breton News from September 1, 1852 to August 18, 1855 and July 4, 1862 to September 30, 1865 plus later runs of other publications beyond our December 31, 1867 cut off.

We do not know how complete MacLeod (1984) was and therefore do not show his search periods on Figure 4 showing the runs searched and we do not show his work in Appendix 1 and 3. We do know that in some of our event-specific searches we found additional articles in Cape Breton papers which MacLeod (1984) does not list and in one case we found an article on an earthquake in an issue which he listed as searched but on a different

1752 1760 1770 1780 1790 1800 1810 1820 1830 1840 1850 1860 1870

Royal Gazette (Halifax)
 Gazette(1752-1765)
 Gazette or the Weekly Advertiser (1765-1766)
 Nova Scotia Gazette (1766-1770)
 Nova Scotia Chronicle & Weekly Advertiser (1769-1770)
N.S. Gazette & the Weekly Chronicle (1770-1789)
 Royal Gazette & the N.S. Advertiser (1789-1800)
 N.S. Gazette & Weekly Advertiser (1801-1827)
 Nova Scotia Royal Gazette (1801-1843)
 Weekly Chronicle (Halifax) (1786-1827;1827-1834)
 (changed it's name in 1827 to Acadian and General Advertiser)
 Port Roseway Gazetteer & Shelburne Advertiser (Shelburne) (1784-1785)
 N.S. Packet & General Advertiser (Shelburne) (1785-1796)
 Royal American Gazette (Shelburne) (1783?-1786?)
Acadian Recorder (Halifax) (1813-1930)
(Yarmouth) Herald (1833 to present)
 (originally called The Herald And Western Advertiser from 1833 to December 16,1843)

1749 Founding of Halifax



OPEN FILE
 DOSSIER PUBLIC
1917
 GEOLOGICAL SURVEY OF CANADA
 COMMISSION GÉOLOGIQUE DU CANADA
 OTTAWA

SHEET 2 OF 2

RUNS OF NEWSPAPERS SEARCHED DURING THE STUDY

FIGURE 4

page* (6th item): the actual cross correlation however has not been done.

EVENT-SPECIFIC SEARCHES

Both Smith (1962) and the Canadian Earthquake Epicentre File (CEEF) indicated a number of events in Nova Scotia for what became our primary search period from 1752 to 1867 inclusive and for the period 1868 to 1915, which was also part of our originally-proposed search period. These were listed along with any newly-documented events apparently located in Nova Scotia (or in the Bay of Fundy) once the long runs of the "vertical" search were complete to December 31, 1867. Using this list, a series of event-specific or "horizontal" searches were initiated around each previously-known and around each apparently-new, previously-unrecorded, event in Nova Scotia for the period 1752 to 1867. The same thing was done for the major portion of the previously-known, Nova Scotian, events and for all the apparently-new, Nova Scotian, events for the period 1868 to 1915 inclusive. No event-specific searches were initiated for any events from 1916 to 1952. (Our originally mooted goal was 1952.)

An event-specific search involved returning to PANS, or on occasion to the Legislative Library, to check out several newspapers covering the period of the event and then searching forward from the date of the event for one, to generally not more than three weeks, looking for other reports to amplify the felt report coverage, to resolve the time or magnitude etc. Occasionally the event-specific searches themselves yielded other events such as those found on October 6, 1886 and December 23, 1909.

All articles found in the event-specific searches were similarly annotated and mounted on 8.5 x 11 in sheets and added to Appendix 8 in chronological sequence. Thus Appendix 8 is comprised of about 456 separate newspaper reports of earthquakes.

We developed a standard format for all the event-specific data. We listed for all known, pre-1916, Nova Scotian, events or events felt in Nova Scotia; for all known, pre-1916, possible Nova Scotian events; for all previously-unreported, Nova Scotian events (including tsunami); for all previously-unreported (in Smith (1962) and in the CEEF), New Brunswick, Quebec, New England or Ontario events; and for each of one previously-unreported event (including tsunami) in St. Pierre, in Newfoundland and Ontario and in northeastern Greenland, the following items:

* We later realized the the November 23, 1929 issue of the Victoria-Inverness Bulletin which MacLeod examined was an incomplete issue; this was not noted in MacLeod (1984).

EARTHQUAKE EPICENTRE:
 MAGNITUDE:
 DATE:
 TIME:
 SUMMARY OF REPORTS:
 REFERENCES AND TRANSCRIPTS:
 DISCUSSION AND CONCLUSIONS:

The above format was adhered to throughout Appendix 5 to allow each event to be evaluated in a similar manner.

Each event-specific report records the sources of information in detail and wherever appropriate the sources are transcribed. The 'Discussion and Conclusion' sections of each event-specific report make any recommendations we have for changes to the CEEF or for further work.

Appendix 5 with 85 event-specific reports (Table 2) and the detailed documentation therein represents the fruit of this contract report.

It should be noted that in the cases of the four earthquakes which Leblanc and Burke (in press, 1985) examined in detail, we did not do major event-specific searches, ie. the earthquakes on May 22, 1817, February 8, 1855, October 22, 1869 and on March 21, 1904. However, some new data were obtained on each of the first three in the course of other searches and where relevant these are included as an event-specific report (Table 2); we did not seek, and we gleaned no, new data for the March 21, 1904 event (Table 2) which Leblanc and Burke (in press, 1985) did not already have in their excellent report*.

Similarly there were a number of Grand Manan, Bay of Fundy or southern New Brunswick events recorded by Kain (1898) or by Smith (1962) which we had hoped to search for in western Nova Scotia and in the Annapolis Valley newspaper sources. Time just did not permit this. Thus there are fifteen events on February 8, 1870; March 17, 1870; February 22, 1873; February 27, 1874; November 20, 1876; January 26, 1884; middle of June 1885; March 22, 1896; January 26, 1897; January 28, 1897; February 14, 1897; October 12, 1897; January 11, 1898; December 11, 1912 and January 13, 1914 that did not get any event-specific searches done in Nova Scotia sources. Only the first two of these have event-specific reports in Appendix 5 to illustrate the chores required (Table 2; Appendix 5). All fifteen should be examined in western Nova Scotian sources for felt reports; the full years 1896, 1897 and 1898 may be important to search completely in Annapolis Valley and Yarmouth newspapers since there seemed to be increased

* The editor of Earthquake Notes of the Seismological Society of America was ill for some time and this paper did not get printed and distributed until 1987 (Leblanc and Burke, 1987; dated 1985 but not printed and distributed until early 1987).

activity during the period March, 1896 to at least January, 1898.

Besides the fifteen previously-known southern New Brunswick or Bay of Fundy events which we were unable to search for in Nova Scotian newspapers there were two previously-known (Smith, 1962) and one new Nova Scotian (or felt in Nova Scotia) events, (and one previously-known Newfoundland event), which did not get event-specific searches done on them because of the severe problem with the lack of time. These were:

- February 8, 1843 Yarmouth County (new event), found late in the study
- May 13, 1908 Digby, Annapolis, Shelburne and Yarmouth Counties
- July 27, 1915 Mahone Bay to Shelburne including Sable River
- ? 1928 tsunami(?) Curling, Humber Arm, Bay of Islands, Newfoundland from Keith (1930) (outside scope of the study)

These four events are included in the event-specific reports (as were the events of February 8, 1870 and March 17, 1870 from southern New Brunswick) but no real event-specific searches were carried out (Table 2) and little to no new data are presented. Thus six, plus the March 21, 1904 event, of the eighty five event-specific reports do not add much in the way of new data (Table 2). Similarly, four of our event-specific searches on the previously-known November 18, 1755 event, on the September 30, 1764 event, on the October 17, 1860 event and on the January 22, 1915 event added little new data (Table 2).

However 75 of the 85 event-specific reports do reflect the addition of some new data for the events or in many cases reflect apparently entirely new, previously-unreported, earthquake events and tsunami events (Table 2). While the figure 75 may seem initially quite impressive, it should be noted that many of the events recorded were beyond Nova Scotia and hence beyond the areal scope of this study.

In these non-Nova Scotian cases the relevant data and sources, as found in the normal course of the search of the long runs of newspapers were recorded in the event-specific reports and no further work was done on events which were beyond the areal scope of the study. These apparently new, non-Nova Scotian, events should be followed up with additional research on New Brunswick, Quebec, Ontario or New England sources. However, in a number of cases, the information provided here, in the event-specific reports of Appendix 5, is good enough, to allow changes to be made to the CEEF, even for events beyond Nova Scotia that have not yet been subjected to a detailed event-specific search in extra-provincial sources.

OTHER SOURCES LOCATED

After the Lawson (1902) county history was discovered, all the county histories were looked at and this led to the location of the historical items in Calnek (1897; reprinted 1980), Campbell (1876), DesBrisay (1895; reprinted 1980), The Diary of Adolphus Gaetz by Ferguson (1965), Haliburton (1829; reprinted 1973), Munro (1855; reprinted 1972), More (1873; reprinted 1972), Murdock (1865) and Tennyson (1978). All of these secondary references are included in this report as mounted xeroxes in Appendix 7 and arranged in alphabetic order by the senior author. They are quoted or transcribed where appropriate in the event-specific reports (Appendix 5).

A search of the Proceedings of the Nova Scotian Institute of Science led to finding McIntosh (1913) and a real find in the discovery of a new tsunami in 1914 in McIntosh (1919) plus a possible tsunami in 1908(?). The McIntosh (1919) reference led us, after a lot of hard work, given that Professor McIntosh mis-cited it (and mis-quoted it), to J. J. Cowie's (1914) report of the results of the May 1914 tsunami in northern Cape Breton Island.

References such as Anonymous (1819a;b) and Aubert de La Rue (1937) come from a long pursuit of inter-library loans; in the last case from France. Other references, such as Fournier (1979), Kroll (1979) and Staveley *et al.* (1984) are of little consequence to the report and are only included for completeness. All the above material is included in Appendix 7. All in all, twenty two sources are reproduced in Appendix 7.

The reference list for the report includes certain other sources used which have not been included in Appendix 7 because these sources were previously-known and cited in Smith (1962) or in other reports familiar to the Earth Physics Branch. The newspaper articles in Appendix 8 and the secondary sources in Appendix 7 bring the total to about 478 sources included in the report. If one adds to that total the other earthquake references consulted, as noted in the reference list, during the event-specific searches, then the total number of sources used swells to just over 500 sources.

We would estimate that in the order of 6000 newspaper issues were examined in the study between the long runs searched (Figure 4) and the 36 event-specific searches launched (Table 2) to examine Nova Scotian or Nova Scotia-related events. Thus 36 of the 85 event-specific searches in Appendix 5 occasioned the examination of further issues of Nova Scotian newspapers whereas the other 49 event-specific searches involved events that were beyond the areal scope of the study and no further Nova Scotian sources were sought out other than those already found in the normal search of the newspapers. These other 49 events deserve event-specific searches in various N.B., Upper Canadian or U.S. newspapers.

LOCAL TIME VS GREENWICH MEAN TIME

This report faithfully records the local time throughout all the tables and in the event-specific reports of Appendix 5. In all cases, the senior author assumed that the local times in Nova Scotia were Atlantic Standard Time (AST) hence whenever Greenwich Mean Time (GMT) is shown it is shown as $AST + 4 \text{ hours} = GMT$.

Similarly, all local times in New Brunswick were assumed to be AST; those in Maine and other parts of the United States, in Ontario and in Quebec were assumed to be Eastern Standard Time (EST) thus GMT where shown is shown as $EST + 5 \text{ hours} = GMT$. In all cases in this report we assumed there was an integral number of hours between the local time and GMT - except in Newfoundland. It was here we were prompted to ask some questions of the Newfoundland Archives and their research is included in Appendix 6.

Their uncertainty should have triggered us to the potential problems of relating local time to GMT. However, it was not until late in the compilation of the report that we read Captain Samuel Trott's letter of January 2, 1883 to the editor of the Halifax Morning Chronicle and printed in the issue of Wednesday, January 3, p. 3, col. 2 re the Sunday, December 31, 1882 earthquake, that we realized the problem. Captain Trott of the cable steamer MINIA recorded the exact time at the end of the first shock as 1007:25 pm thus, he says, "giving Greenwich mean time [of] 14 h. 15 m. 19 s."

Captain Trott's difference between AST and GMT, given so precisely, was plus 4 hours, 7 minutes and 54 seconds which is not, needless to say, the integral number of four hours we had been using throughout the report to convert AST to GMT. We now realize the problem is complex and that many of the communities may have had different and varying standard times all with differing differences with GMT. Kain (1899) cites the time of "3:09 am 3:14 am (75th meridian time)" for the August 14, 1898 event.

Thus in this report the local times cited should be accepted and the GMT times usually in brackets, taken as 'nominal' GMT only.

NEWSPAPER AND FELT LOCATIONS INDEX MAP OF NOVA SCOTIA

A map was prepared using the 1985 highways map of Nova Scotia as a base (Anonymous, 1985). The county boundaries were initially added and a minimum of physical features were named to avoid cluttering the map (Enclosure 1).

Then all communities in Nova Scotia which have had a newspaper at one time or another were added as a black dot on the map with the name and the known dates of publication of the paper from Tratt (1957, 1979) or Peterson (1984) added off to the side or often out in the water to avoid cluttering.

Any other newspapers from that community which were also used in this study were also listed usually in chronological order by the first year of publication; their dates of publication are also listed after the name. The first-listed newspaper in any community's list is the first-published newspaper in the community. If it does not have a symbol to the left of the name then it was not used in the study.

The newspapers in each community's list on the map generally have one of two symbols to the left of the name. A solid black square indicates that the newspaper was used in the study in searching long runs of newspapers to cover the period from 1752 to 1867 (see Figure 4); only Halifax, Shelburne and Yarmouth papers are involved. The open square to the left of the newspaper's name indicates that the newspaper was used in the event-specific searches.

By looking at the first name in the list of newspapers for each community and by looking at the date of first publication, one can get a sense from Enclosure 1 of the history of publishing in Nova Scotia and of the spread of community-based, non-Halifax, newspapers. Halifax's dominance of publishing is evident from the map; the map may also reflect the fact that Halifax papers were archived more consistently than some of the outlying newspapers hence Geomarine could find them on microfilm to use.

The map was also used to locate all the other communities mentioned in the articles, in Smith (1962), in Leblanc and Burke (in press, 1985), and in other references as having felt earthquakes or, in a few cases, as having experienced tsunamis. These other communities with felt reports are shown as small black triangles. It should be clear that many of the communities with newspapers shown as black dots also felt earthquakes on occasion and are mentioned in this report's collection of articles and references.

In some cases the Nova Scotian communities mentioned in felt reports are no longer known by the same name or do not even exist on modern road maps, for example, North Williamstown; the modern name is shown in brackets at times. There were some Nova Scotian communities we never really located on a map such as Lakeville on the Pugwash River; Cook's Harbour in Yar-

mouth County*; Cape Sable which we presume was near the southern end of Cape Sable Island; Salmon River Bridge which is just upstream from Liverpool; Pier's Mills on the western shore of Bedford Basin to the north of Halifax; Granville Mountain, which we were told by a person with local knowledge, was on North mountain just 'behind' or northwest of Granville Centre (it is no longer occupied); North Williamstown which we believe is North Williamston in the Annapolis Valley and Belledale that several people suggest must have been Belleisle in the Annapolis Valley. We also are somewhat uncertain where The Cove is in Yarmouth Harbour but the librarian at the Yarmouth County Museum has consulted local people who feel it would have been Kellys Cove on the east side of the entrance to Yarmouth Harbour just south of Bunkers Island; the fishermen still use it and refer to it as, "The Cove".

Similarly we did not locate the New Brunswick felt locations of Utopia, Negro Town Point, Torryburn (near Oak Point?) or Portland Valley (near Saint John?). We are not certain if we have located the area Milltown, New Brunswick correctly and we are uncertain exactly where Sand Point in the harbour of Saint John is located.

The small location map in the top righthand corner of Enclosure 1 can only show a very few of the felt locations recorded in our material outside Nova Scotia, Prince Edward Island and New Brunswick. We show the major epicentre areas such as La Malbaie, Ottawa, etc.

Thus the following, non-Maritime, American felt locations recorded in the sources in this report are not plotted; Kingston, Medford, Cambridge, Taunton, Roxbury, Belvidere[sic], Salem, Gloucester, Reading, Lexington, Newbury and East Boston in Massachusetts; Lancaster in Pennsylvania; Manchester, Dover, East Conrad, Milton and Dorchester in New Hampshire; Wiscasset, Richmond, Rockland, Addison, Dover-Foxcroft, Milo, Kennebec County, Jonesport, Blanchard, Orrington, Charlotte, Machaisport, Maple Grove, Dennysville, Augusta, Steuben, Perry, North Perry, Pembroke, Belfast, Ellsworth, Limington (not Livingstone), San-

* The librarian of the Yarmouth County Museum was consulted and while no precise map location could be turned up she recognized the family names of the fishermen on the schooner BEE in the 1843 tsunami account as local names from the Chebogue Point area. Charts of the day show a Cook's Beach on the east side of Chebogue Harbour and there are fishing shacks to this day on Cook's Beach. We have shown Cook's Harbour as Chebogue Harbour on Enclosure 1.

ford, and Saco in Maine; Woodstock in Vermont; Jersey City and Weuhawken in New Jersey; New London in Connecticut; Provincetown in Rhode Island; Oyster Bay, Williamsburgh, Rosly, Glencove, Hempstead Branch, Hempstead and Jamaica on Long Island, New York; and Brooklyn, Hudson River Valley, Green Hill (?) and Lowville, New York.

In Ontario we did not have room to show on Enclosure 1's index map the following felt localities mentioned in the material of our report; St. Catherines, Grimsby, Jordan, Thorald, Fells [sic], Queenstown, Owen Sound, Fort Mississangua [sic] or Bytown (which is simply the early name of Ottawa). In Quebec the following communities which felt events reported in our material are not plotted on our map for lack of room; Valcartier and Isle aux Noix, neither of which we have found on a modern road map, Beauport, St. Foy, Lachine, William Henry (which we have also not found on modern maps), Hochalaga and Huntington.

The map of Enclosure 1 represents one of the only times the newspapers of Nova Scotia have been presented this way. It will also serve as a guide to the felt areas for any given event; however, caution should be used in calculating areas inside of any particular felt intensity isoseismal line on this map since the original map did not have latitude and longitude hachure marks or a clear scale. We believe that the scale is approximately 1:640,000 and that the projection is Mercator.

NEW EARTHQUAKES FOUND IN NOVA SCOTIA

Table 1 was laboriously constructed from numerous sources to show the events in Eastern Canada, that were known before the study began and, that might in any way have been felt in Nova Scotia. Table 1 has three sections:

- (a) List of earthquakes from the Canadian Earthquake Epicentre File (CEEF), which either occurred in the area of Nova Scotia, in the area of the Bay of Fundy and Southern New Brunswick or in the area of the Laurentian Slope off southern Newfoundland, and which were known prior to this study beginning.
- (b) List of other earthquakes in the United States or farther afield in eastern Canada which were known prior to this study beginning to have been felt in Nova Scotia.
- (c) List of tsunami which impinged on the Atlantic coast of Canada and which were known prior to this study beginning.

Prior to this study beginning about thirteen events were listed for the period of 1752-1915 as occurring in Nova Scotia; no tsunami were listed though the 1929 tsunami was clearly known to have affected Nova Scotia. A further ten or so large events centred outside Nova Scotia were known to have been felt in the province. When one takes into account the ghost events listed on the CEEF for Nova Scotia (see below) then the number of previously-known, confirmed, earthquakes in Nova Scotia was only ten for the 1752 to 1915 period.

The event-specific data in Appendix 5 and Table 2 have been partitioned to form Table 3 listing the new earthquakes found in Nova Scotia. There are ten definite new earthquakes, two more that may have occurred to cause local tsunami at Liverpool and at Cook's Harbour, and Yarmouth, plus one that appears to definitely be the result of a meteorite impact (ie. a non-tectonic cause) and one in 1839 that may in fact be in New Brunswick (and conversely the 1827 event in New Brunswick may belong in Nova Scotia) for a total of fourteen possible new Nova Scotia events. All but two of the events are prior to 1868.

Thus study has effectively more than doubled the known, pre-1916, seismicity of Nova Scotia by intensively searching only the period 1752 to 1867; the period 1868 to 1915 prior to the first seismograph being installed at Dalhousie University and the period 1915 to 1952 when Dalhousie got its really sensitive equipment have yet to be searched.

Furthermore, a number of Nova Scotian "ghost events" have been eliminated (Table 8). We can find absolutely no record in the newspapers of the day for the previously-listed (Smith, 1962 and in the CEEF) events on Friday, January 1, 1847, and on Saturday, January 1, 1848 or the so-called volcano event listed only as June, 1855. Thus three of the approximately thirteen events listed for Nova Scotia in the CEEF were ghosts; two others will have their dates changed from March 12, 1874 to March 5, 1874 and from October 14, 1886 to October 13, 1886. Care should be taken that ghosts do not remain in the CEEF's list.

NEWLY-DOCUMENTED, PREVIOUSLY-KNOWN NOVA SCOTIA EVENTS

Beyond the fourteen possible new Nova Scotian events a further nine of the previously-known, Nova Scotian events, or events felt in Nova Scotia, which were subjected to event-specific searches, turned up significant new data (Table 4). These new data ranged from the two corrections in dates mentioned above to expanding the felt area for the Monday, December 20, 1909 Cape Breton event, to adding times or felt information for some earlier events.

Some of the new information found came from careful rereading of a number of the earlier references. A good example was the reexamination of the "June 1855" Granville Mountain event and its supposed volcano. All the Nova Scotian sources stemmed from one Nova Scotian newspaper which reprinted a Saint John, New Brunswick account but reprinted it leaving out a small portion of the original correspondent's report. That missing portion then allowed one to put the correspondent's report in context and firmly satisfy oneself that the Granville Mountain event was a ghost of an earlier major event in 1855; it also was not a volcano and indeed was not even centred in Nova Scotia.

A number of these exercises where we could get back to the original sources have convinced us of the value of such an examination of the earlier work, so much so that we would recommend that in future contracts the Earth Physics Branch provide the consultant with a much fuller library of the very early material cited by Smith (1962) or others.

It is also apparent to us that on occasion not even Smith (1962) and some of the other earlier compilers went back to original material such as newspapers. A good example is the ghost event of October 11, 1818 in Quebec City as listed by Smith (1962). While this event is beyond the areal scope of the study, we did come upon an article in a Halifax paper quoting a datelined September, 1818 account from a New York paper and clearly indicating this Quebec event as being on September 11, 1818 not October 11, 1818.

NEW EARTHQUAKES FOUND OUTSIDE NOVA SCOTIA

We have constructed Table 5 from Appendix 5 to be a chronological list of apparently new, previously-undocumented, earthquakes in New Brunswick, Quebec, Ontario, northeast United States, St. Pierre et Miquelon and Greenland. There are thirty three items on this list which represent quite a surprising return from Nova Scotian papers. Of the thirty three items ten are from New Brunswick, twelve are from the Province of Quebec, two are from Ontario, seven are from the northeast United States and two are foreign being from St. Pierre et Miquelon (France) and from Greenland (Denmark).

We are not aware how many of the seven apparently new northeast United States events may have been recovered in other historical seismicity studies such as those of Weston Geophysical Research, Inc. (1976), Boston Edison Company (1976a; b), Chiburis and Ahner (1976) or present studies ongoing in the United States to support the United States nuclear power plant industry.

Of the ten apparently new New Brunswick events, half are in the north and four are in the southwest near the United States border; one has an unknown location (Table 5). None of our ten apparently new New Brunswick events overlap with,

and are duplicates of, the new events found by Burke et al. (1985) in their study of Historical Seismicity of Northern and Eastern New Brunswick 1867-1943. Burke et al. added nineteen new events to New Brunswick's list of events; this study can apparently contribute ten more plus twelve to Quebec's list and two to Ontario's.

The two foreign events came, in one case, through perseverance to locate a reference Staveley et al. (1984) cited but could not find at their time of writing. In the other case, the July 24, 1985 event in Greenland came through a chance personal contact at a conference with a former student of the senior author. The 1985 event is included only for completeness since it came from a remote, poorly-instrumented area, of the Arctic (Appendix 5).

None of the thirty three new earthquake events and none of the new tsunami located outside Nova Scotia have been subjected to detailed event-specific searches; all deserve some further attention in newspaper sources closer to the events' epicentres to both confirm the events and to detail their parameters better than we can from often only a single article printed in a Nova Scotian paper weeks after the event. Three of the thirty three apparently new events outside Nova Scotia may be ghost events and will require work to remove this concern (Table 8); one of these events found on Monday, November 7, 1842 appears to define the Wednesday, November 9, 1842 event in Smith (1962) (and we presume also on the CEEF) as a ghost event (Appendix 5).*

EARTHQUAKES DOCUMENTED IN GREATER DETAIL OUTSIDE NOVA SCOTIA

Beyond the thirty three apparently new events found outside Nova Scotia, a further thirteen events, outside of Nova Scotia, were newly-documented from the sources found to add significant new data (Table 6). These new data include removing the ghost event on October 11, 1818 and replacing it with the corrected September 11, 1818 date. Similarly, the July 12, 1861 event should be July 11, 1861. Of the thirteen newly-documented, previously-known, events outside Nova Scotia, five were in Que-

* Note added in proof: This has already been established through the historical seismicity research of Pierre Gouin, S.J., Observatoire de Geophysique, Collège Jean-de-Brébeuf, 3200 Chemin Ste-Catherine, Montréal, P.Q., H3T 1C1. He reports in a letter (personal communication, February 27, 1987) that, "P.S. In Nov. 1842, There was only [one] event or one series of events on the 7th. I have over 20 records of it!" Thus the Thursday November 10, 1842 event in Tables 5 and 8 is also a ghost. The Wednesday, November 9, 1842 event in Smith (1962) is a ghost and the correct date for this event (or series of events) is Monday, November 7, 1842.

bec, three were in New Brunswick with three more in the United States and two related to Ontario events.

Again none of these events were subjected to event-specific searches in newspapers local to the events' epicentres and more research with local sources will be most rewarding. Any information referred to in Table 6 (and for that matter in Table 5), hence in Appendix 5, generally came to us only as a result of the searches of the long runs of Nova Scotian (generally Halifax) newspapers. We were really quite surprised to find that a search of the Halifax press would lead to data on up to thirty three apparently new previously-unrecorded, earthquakes outside Nova Scotia and would lead to significant new data on up to thirteen other, previously-known events, outside Nova Scotia.

These discoveries may reflect a more sophisticated Halifax press that gave more attention to other Canadian news than did the Newfoundland press in Staveley *et al.* (1984) or than did the three, essentially rural, northern, New Brunswick newspapers examined by Burke *et al.* (1985). Newfoundland was not part of Canada during this period. The greater number of non-Nova Scotian new events may also, in part, reflect the use of one single, experienced, newspaper researcher.

EARTHQUAKES ASSOCIATED WITH METEORITES

Three of the earthquakes were found to possibly be related to meteorite impacts (Table 9). The Monday, December 21, 1863 event in Parrsboro and Amherst seems, almost certainly, not to be a tectonic earthquake, but rather an event caused by the meteorite impact or "meteorite termination" (Appendix 5).

The New Year's Eve events of Sunday, December 31, 1882 are complex to sort out in their own right; indeed more work is needed here. The event is further complicated by at least three observations of this earthquake which are associated with observations of a prominent meteor. The Friday, January 29, 1847 event, while immediately followed by a bright meteor, seems to be less likely associated with it, in any way, than the above two examples in 1863 and 1882.

GHOST EVENTS

These have been mentioned in the above sections. Suffice to say here that they are gathered for convenience on Table 8. There are eight definite ghost events in Smith (1962) and on the CEEF (Tables 2 and 8). Five of these involve date changes and three in Nova Scotia are to be removed entirely.

One of the latter is the January 1, 1847 event which Smith (1962) credits to Woodworth's (1915) 6th Annual Report of the Harvard Seismograph Station.* We have not seen this and would like to do so before removing the event; we did look at a large number of local Nova Scotian newspapers for the period and found no reports.*

There are a further three possible ghost events in Table 8 that will require more research with newspapers from areas closer to the events' epicentres. It has been pointed out to us that the term "ghost" should be reserved only for events which not only appear on the CEEF as an incorrect date but also appear on the list with their correct date. We agree with this. Thus the event on January 1, 1848 and the event "a few months since" June 1855 are true "ghosts" on Table 8 whereas others such as the October 11, 1818 event at Quebec City which actually occurred on September 11, 1818 are just plain errors on the CEEF, in this case inherited from Smith (1962).

NEW TSUNAMI FOUND IN THE STUDY

Prior to this study, only three tsunami were known to have impinged upon the shores of Atlantic Canada; all were in Newfoundland and one of these affected Nova Scotia in 1929 (Table 1). These three tsunami resulted after the large Lisbon earthquake of Saturday, November 1, 1755, after a presumed, smaller, more local earthquake, south of Newfoundland, on Monday, June 27, 1864 and after the major continental slope event and slumps that were caused by the Monday, November 18, 1929 Laurentian Slope earthquake (originally referred to as the "Grand Banks" Earthquake). These three seismic events caused tsunami that respectively impinged on Bonavista, St. Shotts and the Burin Peninsula of Newfoundland plus Cape Breton Island of Nova Scotia. Staveley et al. (1984) provided the corrected date for the June 27, 1864 St. Shotts tsunami and provided documentation re the November 1, 1755 tsunami at Bonavista, Newfoundland. Doxsee (1948), Gregory (1929; 1930), Heezen and Ewing (1952), Hodgson and Doxsee (1930), Keith (1930) and Smith (1966) are some of the earlier sources re the "Grand Banks" earthquake.

This study has found as many as six (or possibly eight) new tsunami (Tables 2 and 7, Appendix 5); one of these in 1908 is very poorly documented at the present time, one on July 24, 1985 was documented in northwestern Greenland from a personal contact and one in Lake Huron on April 18, 1855 may be tornado-related and not a seismically-induced tsunami.

* Note added in proof: Woodworth's (1915) report refers briefly to this event but gives absolutely no references and we still recommend that the January 1, 1847 event be removed from the CEEF.

On Tuesday, January 19, 1813 Liverpool's harbour shipping was put into chaos by a tsunami and there is even a suggestion of a local earthquake source. Similarly on Tuesday, April 13, 1843 three areas near Yarmouth experienced a tsunami. Again there is a suggestion of a local earthquake source in the description provided by one of the men actually on board the schooner BEE in a rather careful description (Appendix 5).

Keith (1930) very briefly referenced a 1928 "tidal wave" in Humber Arm of the Bay of Islands in western Newfoundland at the town of Curling near the head of the Arm (Appendix 5). In the absence of more data, we are inclined to dismiss this as an exaggerated atmospheric or lunar tide not a tsunami of tectonic origin.

On Sunday, September 24, 1848 Bonavista and Catalina, on the same peninsula of northeast Newfoundland, experienced a tsunami; the causative event is not known. While the exact date of the May, 1914 tsunami that affected Meat Cove, Bay St. Lawrence, Pleasant Bay and Dingwall in northern Cape Breton Island, is not known, it is pretty obvious that the "abnormal wave" of McIntosh (1919) was a tsunami as he presumed. McIntosh attributed it to local marine slumping (hence a fairly local earthquake).

The experience of Milner and his assistant in the July 24, 1985, Ubekendt Island event (Appendix 5) indicates that on occasion a very small local earthquake can give rise to a tsunami. This may well be the explanation for the May, 1914 event in Cape Breton or even the June 27, 1864 St. Shotts event. The April 18, 1855 event in Owen Sound is assumed to be a storm-related event by the Editor of the local Comet (Appendix 5) but it too could be the result of a small earthquake nearby. However, a careful search of the Atlantic Ocean epicentre file for the new Atlantic tsunami dates may define distant sources for these newly-documented tidal wave events in Canada. As it stands this study has more than doubled the known tsunami experienced in Atlantic Canada.

CHANGES TO THE CANADIAN EARTHQUAKE EPICENTRE FILE

The fourteen possible new events in Nova Scotia and thirty three apparently new events found outside of Nova Scotia could lead to as many as forty seven new entries on the CEEF. The ghost events and possible ghost events on Table 8 will lead to at least three removals from the CEEF, five changes in dates and three other possible changes. The nine newly-documented, previously-known, Nova Scotian events and thirteen newly-documented, previously-known, events outside Nova Scotia could lead to as many as twenty two events having changes made to them in the CEEF. The four definite tsunami are also to be added. Only the ten events listed in Table 10 either did not yield any potential CEEF changes when searched (four cases) or

yielded no new data because there was not time for a search (six cases).

Thus there could be up to fifty new entries to the CEEF (including the new tsunami), certainly three removals of ghosts and five date changes, and a further twenty two changes to events in the CEEF. A careful reading of our "Discussion and Conclusions" section in each of the eighty five event-specific reports will show that many of the possible or proposed CEEF changes require some additional work to confirm or tighten up the changes. This study produced far more material than certainly the authors or our client envisaged and time has not permitted many of the loose ends to be followed up.

CONCLUSIONS

This study, while very badly underestimated in time and badly overestimated in scope, has certainly proved out the method to evaluate Nova Scotia's historical seismicity. We have benefited from an experienced newspaper archivist and from a relatively complete collection of newspapers on microfilm from at least 1813 onwards.

The study also benefited from the earlier work of Staveley et al. (1984) in Newfoundland and that of Burke et al. (1985) in New Brunswick. The success ratio seems to be somewhat higher in the Nova Scotian study than in the Newfoundland study; this may only reflect the greater number of earthquakes in or near Nova Scotia, a better communication system with rural communities, or the particular proclivities of the various newspapers' editors. Nova Scotian editors will also have reported other Canadian news preferentially whereas Newfoundland editors would still have looked to England as their colonial master for news.

The detailed conclusions of the study are contained at the end of each of the eighty five event-specific reports in Appendix 5. In general we have already more than doubled Nova Scotia's pre-instrumental historical seismicity (pre-1916) by just searching the initial period 1752 to 1867 inclusive. Similarly we have more than doubled the number of known tsunamis which have impinged on the shores of Atlantic Canada.

RECOMMENDATIONS

Again the detailed recommendations are found at the end of each of the eighty five event-specific reports in Appendix 5. These concern each event and its particular problems or data gaps.

In general we would recommend that the Earth Physics Branch consider funding research to:

- (a) clean up the many loose ends left in the 1752 to 1867 period including attempting to catch every source for certain events to try an evaluation of these events similar to that done by Leblanc and Burke (in press, 1985) for four major New Brunswick events; other historical sources should be considered to fill in the many gaps in the Royal Gazette prior to 1813 and the few significant gaps in the Acadian Recorder should be bridged.
- (b) search the pre-instrumental period 1868 to 1915 inclusive for Nova Scotia.
- (c) search the pre-sensitive instrumental period 1915 to 1952 for Nova Scotia.
- (d) search newspaper sources in southern New Brunswick, on Grand Manan Island and in northeastern Maine after obtaining the nuclear power plant industry's studies of seismicity of New England. It is our belief that in addition to the ten events which we have defined another twenty could be expected in New Brunswick's first 200 years of the historical record.
- (e) search the newspaper and private journal sources on St. Pierre et Miquelon and consider a parallel run of Cape Breton newspapers to address the Laurentian Slope Seismic Zone.
- (f) search the newspaper and other sources for Yarmouth prior to 1848 and after 1867 to address the apparently larger number of earthquakes experienced in southwestern Nova Scotia and possibly relating to the southeastern seaward extension of the Oak Bay - Passamaquoddy seismic zone into the Gulf of Maine at the mouth of the Bay of Fundy.
- (g) ensure that the list of foreign events at the start of Appendix 8 is circulated to worldwide data centres to assist other historical seismicity workers to possibly define new previously-unreported events.

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TABLES

TABLE 1Page No.

Part A)	LIST OF EARTHQUAKES FROM THE CANADIAN EARTHQUAKE EPICENTRE FILE (CEEFF), WHICH EITHER OCCURRED IN THE AREA OF NOVA SCOTIA, IN THE AREA OF THE BAY OF FUNDY AND SOUTHERN NEW BRUNSWICK, OR IN THE AREA OF THE LAURENTIAN SLOPE OFF SOUTHERN NEWFOUNDLAND, AND WHICH WERE KNOWN PRIOR TO THIS STUDY BEGINNING	46
	Nova Scotia and nearby earthquakes	46
	Bay of Fundy, southern New Brunswick and eastern Maine earthquakes	47
	Earthquakes in the Atlantic Ocean in the area of the Laurentian Slope Seismic Zone off Southern Newfoundland (approximately 440 km east of Guysborough, Nova Scotia)	50
Part B)	LIST OF OTHER EARTHQUAKES IN THE UNITED STATES OR FARTHER AFIELD IN EASTERN CANADA WHICH WERE KNOWN, PRIOR TO THIS STUDY BEGINNING, TO HAVE BEEN FELT IN NOVA SCOTIA	51
Part C)	LIST OF TSUNAMI WHICH IMPINGED ON THE ATLANTIC COAST OF CANADA AND WHICH WERE KNOWN PRIOR TO THIS STUDY BEGINNING	52
	Newfoundland	52
	Nova Scotia	52

TABLE 1 - PART A

LIST OF EARTHQUAKES FROM THE CANADIAN EARTHQUAKE EPICENTRE FILE (CEEF), WHICH EITHER OCCURRED IN THE AREA OF NOVA SCOTIA, IN THE AREA OF THE BAY OF FUNDY AND SOUTHERN NEW BRUNSWICK, OR IN THE AREA OF THE LAURENTIAN SLOPE OFF SOUTHERN NEWFOUNDLAND, AND WHICH WERE

Nova Scotia and nearby earthquakes

YEAR	DATE MONTH	DAY	TIME* (hrs min sec)	EPICENTRE LOCATION		EARTHQUAKE MAGNITUDE (Intensity)	PLACE FELT*
				LATITUDE	LONGITUDE		
1832	??	??	?	45.0°N	64.0°W	3.7	Windsor, Annapolis Valley (Smith, 1962)
1847	01	01	?	43.8°N	66.1°W	3.7	Yarmouth (Smith, 1962)
1848	01	01	?	45.0°N	63.5°W	3.7	"Nova Scotia" (Smith, 1962)
1848	02	01	?	43.5°N	65.5°W	3.0	Yarmouth & Shelburne (Smith, 1962)
1853	06	03	?	44.8°N	65.3°W	3.0	Bridgetown, Windsor, Annapolis County (Smith, 1962)
1855	06	??	?	44.7°N	65.5°W	3.7	One report of a volcano & earthquake, Digby area (Smith, 1962)
1873	07	08	00 ??	44.65°N	63.6°W	2.4	Halifax (Smith, 1962)
1874	03	12	?	43.8°N	66.1°W	2.4	Yarmouth (Smith, 1962)
1886	10	14	22 30 ??	46.2°N	60.2°W	3.0	Sydney (Smith, 1962)
1908	05	13	23 45 ??	44.0°N	65.8°W	4.0	Yarmouth - Annapolis, Shelburne County (Smith, 1962)
1909	12	19 or 20	15 00 ??	46.5°N	60.5°W	4.0	Cape Breton Island (Smith, 1962)
1915	01	22	?	41.0°N	60.0°W	5.0	M/V ALEPPO reported at sea 300 km southeast of Halifax (Smith, 1962)
1915	07	27	12 30 ??	44.0°N	65.0°W	4.0	Sable River and Shelburne; Mahone Bay (Smith, 1962)
1926	12	29	00 30 ??	46.2°N	60.2°W	3.7	Sydney and North Sydney; awakened residents (Smith, 1962)
1927	11	24	16 40 ??	44.0°N	60.0°W	3.0	near Sable Island offshore; Reported by island's residents (Smith, 1962)
1930	02	10	12 30 ??	46.2°N	59.95°W	2.4	Glace Bay (rock burst in coal mine?)
1931	08	07	am	44.62°N	65.77°W	3.6	Bigby; accompanied by a severe electrical storm
1934	03	17	?	43.5°N	65.5°W	3.4	six towns on south coast, N.S. (Smith, 1966)
1937	09	05	11 08 15	41.5°N	66.0°W	3.5	Georges Bank near Corsair Canyon
1938	06	19	13 45 ??	?	?	?	Cabot Strait
1938	07	03	02 05 ??	?	?	?	Sherbrooke? not in Smith (1966)
1943	06	08	early am	43.7°N	65.7°W	3.0	Yarmouth and Shelburne Co.; woke sleepers
1952	08	22	19 13 44	?	?	3.3	About 280 km from the Halifax station
1952	09	12	12 03 24	?	?	3.3	About 195 km from the Halifax station
1953	09	27	16 50 29	?	?	4.0	About 520 km from the Halifax station
1953	11	21	04 02 57	?	?	3.5	About 333 km from the Halifax station
1955	01	24	01 22 29	45.03°N	59.03°W	3.6	About 145 km southeast of Glace Bay
1966	05	20	00 05 ??	44.25°N	66.50°W	3.8	Near Brier Island
1984	10	13	13 53 ??	?	?	3.3	Near Bear River

TABLE 1 - PART A (Continued)

Bay of Fundy, southern New Brunswick and eastern Maine earthquakes

YEAR	DATE MONTH	DAY	TIME* (hrs min sec)	EPICENTRE LATITUDE	LOCATION LONGITUDE	EARTHQUAKE MAGNITUDE (Intensity)	PLACE FELT*
1764	09	30	12 00 ??	45.3°N	66.0°W	4.4	Saint John, N.B.
1817	05	22	03 30 ??	45.1°N**	67.0°W**	5.0**	St. Stephen, Saint John, Fredericton, St. Andrews, N.B.; Dennysville, Maine. Correct time 0331 or 0831 local time.*** Time incorrect by 11.5 or 6.5 hr in Smith (1962)
1821****	05	05	?	44.8°N	68.8°W	(V)	Bangor, Maine
1821	05	10	07 30 ??	44.4°N	69.0°W	3.7	Belfast, Maine
1821	07	09	?	?	?	?***	Eastport, Maine
1823****	06	10	?	44.8°N	68.8°W	(V)	Bangor, Maine
1824	07	09	21 15 ??***	46.5°N	66.5°W	4.3	Much of New Brunswick; Eastport, Maine
1850****	01	30	?	45.1°N	67.1°W	3.7	St. Andrews, New Brunswick
1851	01	30	17 00 ??	44.8°N?	67.0°W?	3.0 est.	Eastport, Maine; St. Andrews, N.B. Smith (1962) notes incorrectly as St. Andrews, Quebec. Epicentre estimate may be incorrect. CEEF may have error in that it does not show Smith's January 30 event, but does show a January 3 event at 44.5°N, 69.7°W. Rand (1977) shows a January 30, 1850 event in the same area (this may well be a ghost)
1855	02	08	06 30 ??	46.0°N	64.5°W	5.2**	Machais, Eastport, Maine; Saint John, Moncton, Dorchester, N.B.
1857****	12	08	?	46.7°N	68.0°W	(IV)	Maple Grove, Maine
1859***	10	26	02 30 ??	?	?	?***	Calais, Maine; Saint John, N.B.
1861***	01	25	05 45 ??	?	?	?***	Steuben, Eastport, Maine
1862***	01	23	20 30 ??	44.5°N	67.2°W	?***	Pembroke, Maine
1869	10	22	05 45 ??	45.0°N	67.2°W**	5.73**	Georgetown, St. Stephen, Fredericton, Saint John, N.B.; Machais, Maine
1870	02	08	?	44.1°N	67.1°W	3.7	Bay of Fundy, position from Smith (1962). CEEF in error?
1870	03	17	06 00 ??	45.5°N	66.5°W	3.7	Saint John and Fredericton, N.B.; Eastport, Maine
1873	02	22	07 30 ??	44.9°N	67.0°W	3.0	Eastport, Machias, Maine; St. George, St. Stephen, N.B.
1874	02	27	22 35 ??****	45.2°N****	67.3°W****	(4.5)****	Machais, Machaisport, Calais, Bangor, Eastport, Maine; St. Stephen, N.B.
1876	11	20	12 40 ??***	44.9°N	67.0°W	2.4	Machias, Eastport, Maine
1882	12	31	10 00 ??	45.0°N	67.0°W	4.3	Saint John, Fredericton, St. Stephen, Sussex, Rothesay, N.B.; Machais, Eastport, Maine, this is not a ghost event on the list here (as was apparently noted on a list which we received from EPB, Ottawa).

TABLE 1 - PART A (Continued)

Bay of Fundy, southern New Brunswick and eastern Maine earthquakes

YEAR	DATE	TIME*	EPICENTRE LOCATION	EARTHQUAKE	PLACE FELT*
MONTH	DAY	(hrs min sec)	LATITUDE LONGITUDE	MAGNITUDE (Intensity)	
1883	01	02 58 ??	44.6°N 67.7°W	3.7	Passamaquoddy Bay, N.B.; Addison, Maine
1883***	01	05 00 ??***	44.7°N*** 67.5°W***	?***	Aftershock at Machais, Maine
1883	01	08 28 ??	44.6°N 67.7°W	2.4	Addison, Maine
1884	01	?	45.4°N 66.0°W	3.0	Rothsasy, Saint John, N.B.; three shocks
1885	06	10 00 ??	45.1°N 66.1°W	3.7	Seal Cove, Grand Manan Island, Rothsasy, N.B.
1896	03	20 30 ??***	45.2°N 67.2°W	4.0	Charlotte and York Counties, Grand Manan Island, N.B.;
1897	01	11 30 ??**	44.9°N 66.9°W	3.0	Calais, Machias, Maine
1897	01	21 00 ??	44.5°N 66.8°W	3.7	Machias, Calais, Charlotte, Maine; Campobello and Deer Islands, N.B.
1897	02	21 00 ??	44.7°N 66.8°W	3.0	Grand Manan Island, N.B.
1897	09	13 05 ??	44.2°N 68.8°W	3.7	Grand Manan Island, N.B.
1897	09	13 00 ??***	?	?***	Machias, Bangor, Belfast, Ellsworth, Maine; Rand (1977) shows two events on this date.
1897	10	22 35 ??	44.7°N 66.8°W	3.0	Calais, Maine (This is probably a ghost event in Smith and Bridges (1983))
1898	01	02 00 ??***	44.7°N 66.8°W	3.7	Grand Manan Island, N.B.
1898***	08	03 09 ??	45.5°N*** 66.1°W***	?***	Grand Manan Island, N.B., time wrong in CEEF; not 0900 GMT
1898	09	10 54 ??	44.3°N 69.1°W	3.7	Torryburn, Oak Point, N.B. (see also Kain (1899) - not seen in Smith (1962))
1904	03	01 04 ??	45.0°N 67.2°W	5.90**	Belfast, central coastal Maine
1909	04	night	45.4°N 66.4°W	3.0	St. Stephen, N.B.; Lewiston, Eastport, Maine
1912	03	07 00 ??	45.17°N 67.28°W	3.0	Westfield, Welsford, N.B.
1912	12	05 15 ??	45.0°N 68.0°W	4.0	Calais, Maine
1914	01	03 00 ??	45.1°N 67.2°W	4.4	Augusta to Eastport, Maine; Fredericton, N.B.
1918	01	14 02 20 ??	45.0°N 67.3°W	3.7	Calais, Eastport, Maine; St. Stephen, N.B.
1920	11	19 40 ??	45.0°N 67.3°W***	3.7	Calais, Eastport, Maine; St. Stephen, N.B.
1921	10	08 00 ??	44.8°N 67.0°W	3.7	Eastport and other towns in Maine
1922	09	01 00 ??	45.01°N 67.12°W	3.0	Eastport, Perry, Pembroke, Maine; Campobello Is., N.B.
1926	11	14 30 ??	45.0°N 67.5°W	3.7	North Perry, Maine
1928	02	?	45.3°N 69.0°W	(VI)****	Eastport, Calais, Perry, Maine; St. Stephen, N.B.
1928	11	21 30 ??	45.0°N 67.2°W	3.6	Milo, Maine
1929	03	00 00 ??	45.2°N 67.3°W	2.4	northwest of Eastport, Pembroke, Perry, Maine
1931	04	am	45.0°N 67.0°W	3.0	Calais, Maine
1934	08	11 36 ??	44.9°N 67.0°W	3.0	Deer Island, N.B.

TABLE 1 - PART A (Continued)

Bay of Fundy, southern New Brunswick and eastern Maine earthquakes (Continued)

YEAR	DATE	DAY	TIME* (hrs min sec)	EPICENTRE LOCATION LATITUDE	LONGITUDE	EARTHQUAKE MAGNITUDE (Intensity)	PLACE FELT*
1935	03	04	02 40 ??	44.9°N	67.0°W	2.4	Eastport, Maine
1937	09	30	07 58 10	45.47°N	65.83°W	5.0	Rothessay, Saint John and area, New Brunswick
1938	08	22	12 48 13	44.7°N	68.8°W	4.1	Orrington, Bangor, Maine
1943	01	14	21 32 38	45.25°N	69.6°W	5.0	Blanchard, Dover-Foxcroft, Maine
1945	07	15	10 44 59	44.9°N	67.0°W	4.6	Eastport, Maine
1945	08	28	01 37 ??	44.9°N	67.0°W	2.3	Eastport, Maine
1947	12	28	19 58 18	45.27°N	69.25°W	4.4*****	Dover-Foxcroft, Milo, Maine
1948	11	21	15 41 ??	44.9°N	67.0°W	3.0	Eastport, Maine
1957	04	26	11 40 06	43.6°N	69.8°W	4.7	Casco Bay, Portland, Maine
1966	07	24	?	44.5°N	67.6°W	(V)*****	Jonesport, Maine; offshore; U.S. Dept. Comm. (1973) shows this event as being on July 23, 1966
1967	03	11	23 39 ??	45.1°N	67.2°W	2.3*****	Calais, Maine
1967	07	01	??	?	?	3.8	Kennebec County, Maine; 14 shocks in all
1974	12	22	05 25 ??	45.4°N	67.1°W	2.9*****	St. Stephen, N.B.
1975	01	17	00 10 ??	44.9°N	66.9°W	3.1*****	Bay of Fundy, N.S.
1977	12	26	16 19 ??	45.0°N	66.9°W	2.1*****	Passamaquoddy Bay, N.B.
1978	02	19	10 25 ??	45.3°N	67.2°W	2.1*****	Oak Bay, N.B.
1978	03	09	19 09 ??	45.2°N	67.2°W	1.6*****	southeast of Calais, Maine
1978	03	15	19 13 ??	45.2°N	67.3°W	1.9*****	southeast of Calais, Maine
1978	04	28	13 27 ??	45.1°N	67.0°W	1.5*****	Passamaquoddy Bay, N.B.
1979	09	24	13 41 ??	45.0°N	67.1°W	1.8*****	Passamaquoddy Bay, Maine
1979	12	30	11 19 ??	45.2°N	66.7°W	2.1*****	northeast of Utopia, N.B.
1980	01	07	10 30 ??	45.0°N	67.0°W	2.2*****	Deer Island, N.B.
1980	07	17	05 01 ??	44.8°N	67.4°W	1.9*****	northeast of Machais, Maine
1980	07	29	02 37 ??	45.2°N	66.9°W	2.1*****	Passamaquoddy Bay, N.B.
1982	01	09	12 53 ??	46.98°N	66.62°W	5.7	Near the Little Southwest Miramichi River, N.B. Numerous aftershocks.

Note: All data from Smith (1962) or from a printout of Canadian Earthquake Epicentre File (CEEF) unless otherwise noted.

* pre-1929 times are local times; 1929 and post-1929 times are GMT (AST plus 4 hours; EST plus 5 hours). The earthquakes in the CEEF and the felt information essentially reflected the data of Smith (1962) at the start of this study.

** from Leblanc and Burke (in press, 1985)

*** from Smith and Bridges (1983)

**** from printout of Chiburis Catalogue, Weston Observatory (1985); see also Chiburis and Ahner (1976)

***** from Rand (1977)

TABLE 1 - PART A (Continued)

Earthquakes in the Atlantic Ocean in the area of the Laurentian Slope Seismic Zone Off Southern Newfoundland (approximately 440 km east of Guysborough, Nova Scotia)

YEAR	DATE	DAY	TIME*	EPICENTRE	LOCATION	EARTHQUAKE	PLACE FELT*
	MONTH		(hrs min sec)	LATITUDE	LONGITUDE	MAGNITUDE	
						(Intensity)	
1929	11	18	20 32	00.7**	56.3°W**	7.2**	Laurentian Slope Zone. Felt throughout Atlantic Canada
1929	11	18	23 01	44.5°N**	56.3°W	6.0	Laurentian Slope Zone, aftershock, felt in Nfld.**
1929	11	18	23 20	44.5°N	56.3°W	4.9	Laurentian Slope Zone, aftershock
1929	11	19	02 01	44.5°N	56.3°W	5.8	Laurentian Slope Zone, aftershock
1929	12	13	00 58	44.5°N	56.3°W	4.4	Laurentian Slope Zone, aftershock. Felt in Sherbrooke, N.S.
1929	12	13	11 19	44.5°N	56.3°W	5.0	Laurentian Slope Zone, aftershock. Felt in Sherbrooke, N.S.
1930	02	10	12 30	46.2°N	59.95°W	2.4	Possibly also in the Laurentian Slope Seismic Zone. Felt in Glace Bay, N.S. May be an aftershock of the main November 18, 1929 event. If so then the position listed here from Smith (1962) is incorrect and it should be adjusted to the position of the epicentre of the Nov. 18, 1929 event.
1940****	04****	11****	04 30	??****	57.1°W****	3.6****	South coast of Newfoundland
1951	06	27	13 17	45.0°N	57.0°W	5.0	Laurentian Slope Zone, 1952 installation of sensitive in- struments in Halifax
1954	08	28	15 23	45.17°N	56.87°W	5.2	Laurentian Slope Zone
1954	10	16	06 45	44.83°N	56.80°W	5.3	Laurentian Slope Zone
1965	11	28	23 26	45.57°N	57.90°W	3.6	Laurentian Slope Zone, 1964 installation of St. John's in- struments
1971	06	11	10 33	45.70°N	55.05°W	4.2	Laurentian Slope Zone
1971	06	21	01 35	44.40°N	56.33°W	3.6	Laurentian Slope Zone
1975	03	31	17 08	44.70°N	56.22°W	4.6	Laurentian Slope Zone
1975	10	06	22 21	44.71°N	57.07°W	5.7	Laurentian Slope Zone
1977	07	16	11 37	44.52°N	55.83°W	3.8	Laurentian Slope Zone, 1977 Cornerbrook installation
1978	06	14	18 00	44.70°N	56.22°W	3.5	Laurentian Slope Zone
1979	07	20	21 45	44.76°N	56.23°W	3.7	Laurentian Slope Zone
1981	08	09	13 25	44.58°N	55.16°W	3.2	Laurentian Slope Zone
1982	01	12	01 36	44.62°N	55.92°W	3.6	Laurentian Slope Zone
1983	03	14	20 41	44.83°N	56.99°W	4.0	Laurentian Slope Zone
1983	12	09	05 45	44.48°N	56.59°W	3.6	Laurentian Slope Zone
1984	02	02	11 15	44.66°N	56.38°W	4.2	Laurentian Slope Zone
1984	08	13	13 51	44.73°N	56.35°W	3.5	Laurentian Slope Zone
1984	11	29	02 13	44.64°N	56.17°W	2.7	Laurentian Slope Zone

Note: All data from Smith (1962) or from a printout of the Canadian Earthquake Epicentre File (CEEFF) unless otherwise noted.

* pre-1929 times are local times; 1929 and post-1929 times are GMT (AGT plus 4 hours; EST plus 5 hours). The earthquakes in the CEEFF and the felt information essentially reflected the data of Smith (1962) at the start of this study.

** time and position are as given in the CEEFF. Piper et al. (in press, 1987) cite Dewey and Gordon's (1984) relocation of the event as 2031:53 GMT at 44°41.5'N, 56°00.4'W with a magnitude Ms = 7.2. Dewey and Gordon (1984) actually give a time of 2032:00.2 GMT and a magnitude of 6.7.

*** Personal communication from Dr. John Adams, EPB in October, 1986 while reviewing this report, citing a study of the felt effects of the 1929 event then underway by Prof. Michael Staveley, Dean of Arts at Memorial University, St. John's, Newfoundland.

**** From Adams and Staveley (1985; open file report)

TABLE 1 - PART B

LIST OF OTHER EARTHQUAKES IN THE UNITED STATES OR FARTHER AFIELD IN EASTERN CANADA WHICH WERE KNOWN, PRIOR TO THIS STUDY BEGINNING, TO HAVE BEEN FELT IN NOVA SCOTIA

YEAR	DATE MONTH	DAY	TIME* (hrs min sec)	EPICENTRE LOCATION LATITUDE	LONGITUDE	EARTHQUAKE MAGNITUDE (Intensity)	PLACE FELT*
1638	06	11	18 20 ??	42.5°N	69.0°W	6.3	130 km east of Cape Ann, Massachusetts, we do not know with certainty if this event was felt in Nova Scotia
1663	02	05	17 30 ??	47.6°N	70.1°W	7.0	Between the mouth of Rivière La Malbaie and Rivière Ouelle, Quebec
1755	11	18	04 12 ??	41.5°N	67.0°W	6.5**	320 km east-southeast of Cape Ann, Massachusetts; 210 km east of Cape Cod. Felt in Halifax and in Annapolis Royal. Reported in Smith (1962) as causing a tsunami in the West Indies but this is believed by EPB (Anne Stevens, personal communication, August 1984, cited by Adams and Staveley (1985) on p. 50) to have been a report of the tsunami from the November 1, 1755 Lisbon earthquake (Appendix 5)
1766	02	02	? ?	42.0°N	68.0°W	5.0	140 km east of Provincetown, Cape Cod, Massachusetts
1785	01	02	07 15 ??	40.0°N	67.0°W	5.7	275 km southeast of Cape Cod, Massachusetts
1886	08	31	21 50 ??	32.9°N	80.0°W	7.0?	Charleston, N.C.

* pre-1929 times are local times; 1929 and post-1929 times are GMT (AST plus 4 hours; EST plus 5 hours). The earthquakes in the CEEF and the felt information essentially reflected the data of Smith (1962) at the start of this study.

** from Dr. John Adams, EPB (personal communication, 1986); a magnitude of 7.0 is given in the Canadian Earthquake Epicentre File (CEEF)

TABLE 1 - PART C
 LIST OF TSUNAMI WHICH IMPINGED ON THE ATLANTIC COAST OF CANADA AND WHICH WERE
 KNOWN PRIOR TO THIS STUDY BEGINNING

Newfoundland

<u>YEAR</u>	<u>DATE</u> <u>MONTH</u>	<u>DAY</u>	<u>TIME*</u> <u>WAVE</u> <u>STRUCK</u>	<u>EPICENTRE LOCATION</u> <u>LATITUDE</u>	<u>LONGITUDE</u>	<u>EARTHQUAKE</u> <u>MAGNITUDE</u> (Intensity)	<u>PLACE FELT*</u>
1755	11	01	p.m.	36.0°N	10.5°W	8.75-9.0	tsunami from the Lisbon earthquake, observed at Bonavista, Newfoundland; identified by Staveley et al. (1984). The 1755 event occurred at 0940 (parameters of 1755 event from Tomás R. Espirito Santo, Director General, Instituto Nacional de Meteorologia e Geofisica, Lisboa, letter of January 5, 1988).
1864	06**	27**	19 00	46.5°N	53.7°W	4.4	tsunami observed at St. Shotts, Newfoundland on the southwestern Avalon Peninsula (Smith, 1962).
1929	11	18	23 00 or afterwards	44.5°N***	56.3°W***	7.2***	tsunami from the Laurentian Slope earthquake seen on the Burin Peninsula of Newfoundland, on the Island of St. Pierre and at Sydney, Nova Scotia. Also seen on the Halifax tide record.

Nova Scotia

<u>YEAR</u>	<u>DATE</u> <u>MONTH</u>	<u>DAY</u>	<u>TIME*</u> <u>WAVE</u> <u>STRUCK</u>	<u>EPICENTRE LOCATION</u> <u>LATITUDE</u>	<u>LONGITUDE</u>	<u>EARTHQUAKE</u> <u>MAGNITUDE</u> (Intensity)	<u>PLACE FELT*</u>
1929	11	18	23 00 or afterwards	44.5°N***	56.3°W***	7.2	tsunami from the Laurentian Slope earthquake seen on the Burin Peninsula of Newfoundland, on the Island of St. Pierre and at Sydney, Nova Scotia. Also seen on the Halifax tide record.

* pre-1929 times are local time; 1929 and post-1929 times are GMT (AST plus 4 hours; EST plus 5 hours). The earthquakes, the felt information and the tsunami in the CEEF essentially reflected the data of Smith (1962) at the start of this study.

** from Adams and Staveley (1985; open file report), Staveley et al. (1984) corrected the day and the month from Smith (1962) who reported the event as July 28, 1864. Smith gave the position from his assumption that a nearby local earthquake

was the initiating event; there are however no felt events presently documented and the letter Smith (1962) refers to has not been located. *** time and position are as given in the CEEF. Piper et al. (in press, 1987) cite Dewey and Gordon's (1984) relocation of the event as 2031:53 GMT at 44°41.5'N, 56°00.4'W with a magnitude Ms = 7.2. Dewey and Gordon (1984) actually give a time of 2032:00.2 GMT and a magnitude of 6.7.

TABLE 2

CHRONOLOGICAL LIST OF EIGHTY FIVE EVENT-SPECIFIC
REPORTS FOUND ON APPENDIX 5

TABLE 2
 CHRONOLOGICAL LIST OF EIGHTY FIVE EVENT-SPECIFIC REPORTS
 FOUND IN APPENDIX 5

<u>TITLE/DATE</u>	<u>PREVIOUS* INFORMATION</u>	<u>TYPE**</u>	<u>EPICENTRE OR AREA FELT</u>	<u>DETAILED EVENT-SPECIFIC SEARCH</u>
November 18, 1755 Event	P-K	E, TG	Boston to Halifax	Yes
September 30, 1764 Event	P-K	E	Saint John, New Brunswick	Yes
June 25, 1808 Event	N	E, PG	Portland, Maine; Boston, Massachusetts	No
January 19, 1813 Tsunami Event	N	I, E?	Liverpool, Nova Scotia	Yes
November 9, 1816 Event	N	E	Montreal, Quebec	No
May 22, 1817 Event	N-D	E	Passamaquoddy Bay, New Brunswick	Yes
September 11, 1818 Event	N-D	E	Mountain base north of Quebec City, Quebec	Yes
		Remove		
		"ghost"		
		October		
		11, 1818		
"Latter end of November", 1819 Event	N	E	St. Lawrence River Valley, Quebec	No
February 1, 1821 Event	N	E	New London, Connecticut	No
February 27, 1821 Event	N-D	E	Valcartier, Quebec City area, Quebec	No
December 21, 1822 Event	N	E	Isle aux Noix, Quebec	No
July 12, 1823 Event	N	E	Kingston, Massachusetts	No
July 23, 1823 Event	N-D	E	Area north of Boston, Massachusetts	No
July 9, 1824 Event	N-D	E	65 km north of Fredericton in the Central Highlands of New Brunswick	No
? 1827 Event(s)	N	E	New Brunswick or Nova Scotia	Yes
February 7, 1831 Event	N	E	Near Quebec City, Quebec	No
July 14, 1831 Event	N-D	E	Near La Malbaie, Quebec	No
August 12, 1832 Event	N-D	E	Western Nova Scotia	Yes
March 5, 1834 Event	N	E	Lancaster, Pennsylvania	No
February 1(?), 1835(?) Event	N	E	Hartford, Connecticut	No
July 6, 1836 Event	N	E	Wickham, St. Stephen and Milltown, New Brunswick	No
? 1839 Event(s)	N	E	Nova Scotia or New Brunswick	Yes
September 26, 1840 Event	N	E	Hamilton, Ontario	No
January 25, 1841 Event	N-D	E	Long Island, New York City and 60 miles south	No
November 7, 1842 Event	N	E	Montreal, Lachine, Trois Rivières and several other places, Quebec	No
		Remove		
		"ghost"		
		November		
		9, 1842***		

TABLE 2 (Continued)

TITLE/DATE	PREVIOUS* INFORMATION	TYPE*	EPICENTRE OR AREA FELT	DETAILED EVENT-SPECIFIC SEARCH
November 10, 1842 Event***	N(?)	E, PG	Quebec City and Trois Rivières, Quebec	No
February 8, 1843 Event	N	E	Yarmouth County, Nova Scotia	No
April 18, 1843 Tsunami and Possible Earthquake Event	N	T, E?	Off Cook's Harbour near Yarmouth, and at Yarmouth, Nova Scotia	Yes
May 13, 1844 Event****	N	E	25 to 30 kms outside Montreal, Quebec	No
August, 1844 Event	N	E	Montreal Mountain, Quebec	No
November 28, 1844 Event	N-D	E	Montreal, Quebec	No
April 29, 1845 Event	N	E	Montreal, Trois Rivières, Quebec	No
October 26, 1845 Event	N-D	E	Hudson River Valley, Felt in New York City, N.Y. on Long Island, in Brooklyn and in Connecticut	No
January 1, 1847 Event	N-D	G	Yarmouth, Nova Scotia	Yes
January 29, 1847 Event	N	E, PM	Antigonish, Nova Scotia	Yes
January 1, 1848 Event	N-D	G	Between Halifax and Truro?!, Nova Scotia	Yes
February 1, 1848 Events	N-D	E	Near Halifax, Nova Scotia	Yes
September 24, 1848 Tsunami Event	N	I	Bonavista and Catalina, Newfoundland	No
Circa early November 1850 Event	N	E	Fredericton, New Brunswick	No
March 19 or March 20, 1853 Event	N?	E, PG	St. Catharines and Niagara, Ontario	No
April 2, 1853 Event	N	E	Halifax, Nova Scotia	No
May 24, 1853 Event	N-D	E	Ottawa, Ontario	No
June 3, 1853 Events	N-D	E	Yarmouth, Annapolis, Bridgetown, Kentville, Brooklyn, Newport, and Windsor, Nova Scotia	Yes
February 8, 1855 Event	N-D	E	Centered on Dorchester, New Brunswick, felt over whole area	Yes
March 13, 1855 Event	N	E	Yarmouth area, Nova Scotia	Yes
April 18, 1855 Possible Tsunami Event	N	T?	Owen Sound, Ontario; on Lake Huron	No
"A Few Months Since", June 1, 1855 Event	N-D	G	Granville Mountain, opposite Digby, Nova Scotia	Yes
January 15, 1856 Event	N	E	Yarmouth area, Nova Scotia	Yes
May 28, 1856 Event	N	E	Yarmouth, Nova Scotia	Yes
March 4, 1858 Events	N	E	Portland, Maine	No
March 30, 1859 Event	N	E	Halifax area, Nova Scotia	Yes
October 26, 1859 Event	N	E	Saint John, New Brunswick	Yes
October 12, 1860 Event	N	E	North-Central New Brunswick	No
October 17, 1860 Event	P-K	E	In the St. Lawrence River north of the mouth of Rivière Ouelle, Quebec	Yes

TABLE 2 (Continued)

<u>TITLE/DATE</u>	<u>PREVIOUS*</u> <u>INFORMATION</u>	<u>TYPE**</u>	<u>EPICENTRE OR</u> <u>AREA FELT</u>	<u>DETAILED</u> <u>EVENT-SPECIFIC</u> <u>SEARCH</u>
July 11, 1861 Event	N-D	E Remove "ghost" July 12, 1861	Ottawa, Ontario	No
October 30, 1861 Event****	N	E	St. Croix, New Brunswick	No
March 8, 1862 Event	N	E	Quebec City, Quebec	No
June 29, 1862 Event(s?)	N	E	Grand Lake, New Brunswick	No
January 1, 1863 Event	N	E	St. Andrews, New Brunswick	No
Circa mid-March 1863 Event	N	E	Miramichi, New Brunswick	No
October 6, 1863 Event	N	E	Montreal, Quebec	No
December 21, 1863 Meteorite Event	N	E, M	Amherst and Parrsboro, Nova Scotia	Yes
November 29, 1866 Event	N	E	Saint John, New Brunswick or in the Bay of Fundy	No
December 23, 1866 Event	N	E	Lakeville on the Pugwash River, Nova Scotia	Yes
September 29, 1867 Event	N	E	Huntington, Quebec	No
October 22, 1869 Event	N-D	E	Passamaquoddy Bay area, New Brunswick	Yes
February 8, 1870 Event	P-K	E	Mouth of the Bay of Fundy	No
March 17, 1870 Event	P-K	E	Eastern Maine; west of St. Stephen, New Brunswick	No
October 20, 1870 Event	N-D	E	Baie-St. Paul, Quebec	Yes
July 8, 1873 Event	N-D	E	Halifax, Nova Scotia	Yes
March 5, 1874 Event	N-D	E	Yarmouth area, Nova Scotia	Yes
		Remove "ghost" March 12 1874		
December 31, 1882 Events	N-D	E, PM	Passamaquoddy Bay, New Brunswick	Yes
October 6, 1886 Event	N	E?	Annapolis and Queens Counties, Nova Scotia	Yes
October 13, 1886 Event	N-D	E	Sydney, Cape Breton, Nova Scotia	Yes
		Remove "ghost" October 14, 1886		

TABLE 2 (Continued)

TITLE/DATE	PREVIOUS* INFORMATION	TYPE**	EPICENTRE OR AREA FELT		DETAILED EVENT-SPECIFIC SEARCH
March 21, 1904 Event	P-K	E	Oak Bay-Passamaquoddy Bay area	No	
August 21, 1904 Event	N	E	Offshore French Islands of Saint Pierre et Miquelon	No	
May 13, 1908 Event	P-K	E	Western Nova Scotia	No	
Circa 1908(?) Tsunami(?) Event	N	T?	Northern Cape Breton, Nova Scotia	Yes	
December 20, 1909 Event	N-D	E	West side of Cape Breton Island, Nova Scotia	Yes	
December 23, 1909 Event	N	E	Near mouth of Isaacs Harbour, Nova Scotia	Yes	
May 1914 Tsunami Event	N	T, E?	Northern Cape Breton Island, Nova Scotia	Yes	
January 22, 1915 Event	P-K	E	M/V ALEPPO south of Sable Island, Nova Scotia	Yes	
July 27, 1915 Event	P-K	E	Southwestern Nova Scotia	No	
? 1928 Tsunami(?) Event	N	T?	At Curling at the head of Humber Arm, Bay of Islands, west coast of Newfoundland.	No	
July 24, 1985 Event	N	E, T	Ubekendt Island, northwest Greenland	No	

* Previous Information: P-K, Previously-known, little or no new information added by this study.

N-D, Newly-documented, previously-known event to which significant new data has been added by this study
N, New event, previously-unreported in Smith (1962) or in the Canadian Earthquake Epicentre File (CEEP)

**Type: E, earthquake; E?, possible earthquake

T, tsunami; T?, possible tsunami

M, meteorite impact, meteorite termination

PM, possible meteorite termination?

G, ghost event

PG, possible ghost event?

TG, tsunami ghost event listed in Smith (1962) in his U.S. section for the November 18, 1755 event; this mention of a West Indies tsunami in fact is a ghost of the November 1, 1755 Lisbon Earthquake's tsunami which propagated to the West Indies and to Bonavista, Newfoundland. (See Stevens, personal communication, August, 1984 cited in Adams and Staveley (1985) on p.50.)

*** Note added in proof: This event is now known to be an erroneous report. Pierre Gouin, S. J., Observatoire de Géophysique, Collège Jean-de-Brébeuf, 3200 Chemin Ste-Catherine, Montréal, P.Q., H3T 1C1 (personal communication, February 27, 1987) reports in a letter: "P.S. In Nov. 1842, there was only [one] event or one series of events on the 7th. I have over 20 records of it!"

**** Note added in proof: This event was brought to our attention by Ken Donovan, Historian, Fortress of Louisbourg National Park, Box 160, Louisbourg, N. S., BOA 1M0 (personal communication, January 27, 1987) very late in the process and has been added to Table 2, Table 5, Appendix 5 and Appendix 8 since it is a previously-unreported new event, not in Smith (1962). Thus we actually have 85 event-specific reports in Table 2 and in Appendix 5 and have 33 new non-Nova Scotian events in Table 5. Pierre Gouin, S. J. (personal communication, February 27, 1987) reports that he has also located his event: "My file shows that the shock was felt more strongly some 25-30 km outside Montreal and really shook people up."

***** Note added in proof: Burke et al. (1987) have firmly established that this date is in fact October 23, 1861 one week earlier. This was found during an event-specific search of the New Brunswick press in southwest New Brunswick for this event around the October 30, 1861 date as provided by our work here.

TABLE 3

CHRONOLOGICAL LIST OF NEW, PREVIOUSLY-UNDOCUMENTED, EARTHQUAKES
IN NOVA SCOTIA, FOUND DURING THIS STUDY

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
Tuesday, January 19, 1813 (possible local earthquake)	1130 AST	Liverpool, Nova Scotia
? 1839	not known	not known (arbitrarily put in Nova Scotia)
Wednesday, February 8, 1843	not known	Yarmouth County, Nova Scotia
Tuesday, April 18, 1843 (possible local earthquake)	2000 AST	Yarmouth, Cook's Har- bour, Bunker Island, The Cove, Yarmouth County, Nova Scotia
Friday, January 29, 1847	2130 AST	Antigonish, Nova Scotia
Saturday, April 2, 1853	1145 AST	Halifax, Nova Scotia
Tuesday, March 13, 1855	2300 AST	Yarmouth, Nova Scotia
Tuesday, January 15, 1856	0730 AST	Yarmouth, Nova Scotia
Wednesday, May 28, 1856	0900 AST	Yarmouth, Nova Scotia
Wednesday, March 30, 1859	0740 AST	Halifax, Nova Scotia
Monday, December 21, 1863 (metrorite event)	2310 AST	Amherst, Parrsboro, Minudie, Nova Scotia
Sunday, December 23, 1866	0045 AST	Lakeville on the Pug- wash River, Nova Scotia
Wednesday, October 6, 1886	at night	Annapolis and Queens Counties, Nova Scotia
Thursday, December 23, 1909	1530 AST	Isaacs Harbor Mouth, Nova Scotia

TABLE 4

CHRONOLOGICAL LIST OF NEWLY-DOCUMENTED, PREVIOUSLY-KNOWN,
EARTHQUAKES IN NOVA SCOTIA, OR FELT IN NOVA SCOTIA,
TO WHICH THIS STUDY WAS ABLE TO ADD SIGNIFICANT NEW INFORMATION

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
Thursday, May 22, 1817	0330 AST	centered in Passamaquoddy Bay. Felt Maine to New Brunswick to Nova Scotia. Also in Massachusetts
Sunday, August 12, 1832	0640 AST	western Nova Scotia
Tuesday, February 1, 1848	0735 and 0800 AST	Halifax, western Nova Scotia (possibly two events?)
Friday, June 3, 1853	1600 AST and second shock in the evening	western Nova Scotia; Windsor, Hants County, Nova Scotia
Thursday, February 8, 1855	0645 AST	Maritime Provinces, Maine
Tuesday, July 8, 1873	0100-0200 AST	Halifax, Nova Scotia
Thursday, March 5, 1874 (remove ghost March 12, 1874)	1400 AST	Yarmouth, Nova Scotia
Wednesday, October 13, 1886 (remove ghost October 14, 1886)	2230 AST	Sydney, Nova Scotia
Monday, December 20, 1909	1500 AST	Western side of central Cape Breton Island, Nova Scotia

TABLE 5

CHRONOLOGICAL LIST OF APPARENTLY NEW, PREVIOUSLY-UNDOCUMENTED, EARTHQUAKES
IN NEW BRUNSWICK, QUEBEC, ONTARIO, NORTHEAST UNITED STATES,
ST. PIERRE ET MIQUELON AND GREENLAND, FOUND DURING THIS STUDY

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
Saturday, June 25, 1808 (possible ghost event)	0255 EST	Boston, Salem, Massachusetts; Portland, Maine
Saturday, November 9, 1816	1205 EST	Montreal, P.Q.
late November, 1819	not known	St. Lawrence River Valley(?)
Thursday, February 1, 1821	0657 EST	New London, Connecticut
Saturday, December 21, 1822	morning	Isle aux Noix, P.Q.
Saturday, July 12, 1823	not known	Kingston, Massachusetts
? 1827	not known	not known (arbitrarily put in New Brunswick)
Monday, February 7, 1831	very early in morning(?)	Quebec City, P.Q.
Wednesday, March 5, 1834	not known	Lancaster, Pennsylvania
Sunday, February 1, 1835	1800 EST	Hartford, Connecticut
Wednesday, July 6, 1836	1500 AST	southwestern New Brunswick
Saturday, September 26, 1840	at night	Hamilton, Ontario
Monday, November 7, 1842 (remove ghost November 9, 1842)	0600-0800 EST	Montreal, Lachine, Trois Rivières, P.Q.
Thursday, November 10, 1842* (possible ghost event)	0900 EST	Quebec City, Trois Rivières, William Henry, Berthier, P.Q.

* Note added in proof: This event is now known to be an erroneous report. Pierre Gouin, S. J. , Observatoire de Géophysique, Collège Jean-de-Brébeuf, 3200 Chemin Ste-Catherine, Montréal, P.Q., H3T 1C1 (personal communication, February 27, 1987) reports in a letter; "P.S. In Nov. 1842 there was only [one] event or one series of events on the 7th. I have over 20 records of it!".

TABLE 5 (Continued)

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
May 13, 1844*	*1130-1200 EST	25-30 km outside Montreal, P.Q.
August ?, 1844	not known	Montreal, P.Q.
Tuesday, April 29, 1845	1630 EST	Montreal, Trois Rivieres, P.Q.
circa early November, 1850	not known	Fredericton, New Brunswick
Saturday, March 19 or Sunday	0100 EST	St. Catherines, Niagara, Ont.
March 20, 1853 (possible ghost event)		
Thursday, March 4, 1858	0100 and 0200 EST	Portland, Maine
Wednesday, October 26, 1859	0220 AST	Saint John, New Brunswick
Friday, October 12, 1860	not known	north-central New Brunswick
Wednesday, October 30, 1861**	0800 AST	St. Croix, New Brunswick
Saturday, March 8, 1862	not known	Quebec City, P.Q.
Sunday, June 29, 1862	morning	Grand Lake, New Brunswick
Thursday, January 1, 1863	2400 AST	St. Andrews, New Brunswick
circa mid-March, 1863	not known	Miramichi, New Brunswick
Tuesday, October 6, 1863	1455 EST	Montreal, P.Q.
Thursday, November 29, 1866	2400 AST	Saint John, New Brunswick
Sunday, September 29, 1867	not known	Huntington, P.Q.
Sunday, August 21, 1904	2000 local time	Saint-Pierre et Miquelon
Wednesday, July 24, 1985	0800-0900 ADT	North tip of Ubekendt Island, western Greenland

* Note added in proof: This event was brought to our attention by Ken Donovan, Historian, Fortress of Louisbourg National Park, Box 160, Louisbourg, N. S., BOA LMO (personal communication, January 27, 1987) very late in the process and has been added to Table 2, Table, 5, Appendix 5 and Appendix 8 since it is a new, previously-unreported, event not in Smith (1962). Thus we actually have 85 event-specific reports in Table 2 and in Appendix 5 and we have 33 new, non-Nova Scotian, events in Table 5. Pierre Gouin, S. J. (personal communication, February 27, 1987) reports that he has also located this event: "My file shows that the shock was felt more strongly some 25-30 km outside Montreal and really shook people up."

** Note added in proof: The actual date is October 23, 1861, one week earlier, as discovered by Burke *et al.* (1987) in doing an event-specific search of the southwest New Brunswick newspapers.

TABLE 6

CHRONOLOGICAL LIST OF NEWLY-DOCUMENTED, PREVIOUSLY-KNOWN,
EARTHQUAKES IN NEW BRUNSWICK, QUEBEC, ONTARIO, AND
NORTHEAST UNITED STATES TO WHICH THIS STUDY WAS ABLE TO
ADD SIGNIFICANT NEW INFORMATION

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
Friday, September 11, 1818 (remove ghost October 11, 1818)	not known	Quebec City, P.Q.
Tuesday, February 27, 1821	0400 EST	Valcartier, Quebec City, P.Q.
Wednesday, July 23, 1823	0700 EST	Boston, Massachu- setts and area to north
Friday, July 9, 1824	2115 AST	New Brunswick; East- port, Maine
Thursday, July 14, 1831	2400 EST	near La Malbaie, P.Q.
Monday, January 25, 1841	0545 EST	Long Island, New York City; New Jersey to south
Thursday, November 28, 1844	not known	Montreal, P.Q.
Sunday, October 26, 1845	1815 EST	Long Island, New York City, Hudson River Valley; Connecticut
Monday, May 24, 1853	0200 EST	Ottawa, Ontario
Thursday, July 11, 1861 (remove ghost July 12, 1861)	2100 EST	Ottawa; Montreal; Brockville and Ogdensburg, New York
Friday, October 22, 1869	0545 AST	Passamaquoddy Bay, New Brunswick, felt all over the Maritimes
Thursday, October 20, 1870	1130 EST	Baie-St.-Paul, felt in much of the Maritimes
Sunday, December 31, 1882	2206 and 2243 AST	Passamaquoddy Bay, felt all over the Maritimes, Maine, etc.

TABLE 7

CHRONOLOGICAL LIST OF NEW, PREVIOUSLY-UNDOCUMENTED, TSUNAMI
EXPERIENCED IN NOVA SCOTIA, NEWFOUNDLAND, ONTARIO AND GREENLAND,
FOUND DURING THIS STUDY

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
Tuesday, January 19, 1813	1130 AST	Liverpool, Nova Scotia
Tuesday, April 18, 1843	2000 AST	Yarmouth, Cook's Harbour, Bunker Island, The Cove, Yarmouth County, Nova Scotia
Sunday, September 24, 1848	1530 local time	Bonavista and Catalina, Newfoundland
Wednesday, April 18, 1855	daylight hours	Owen Sound, Ontario, on Lake Huron
circa 1908 (?)* (possible tsunami)	daylight hours	northern end of Cape North, Cape Breton Island, Nova Scotia
? May, 1914	2300 AST	Cape North, Northern Cape Breton Island, Nova Scotia
? 1928 (date not known- possible(?) tsunami)	not known	Curling near the head of Humber Arm of the Bay of Islands on the west coast of Newfoundland
Wednesday, July 24, 1985	0800-0900 ADT	north tip of Ubekendt Island on the west coast of Greenland

* Note added in proof: Professor Ken B. S. Burke at the Department of Geology at the University of New Brunswick, Fredericton, N. B. has kindly sent us a newspaper reference (personal communication, 1986) confirming that this event which occurred on Friday, September 11, 1908 was a tsunami observed in at least the Baie des Chaleurs region of New Brunswick.

TABLE 8

CHRONOLOGICAL LIST OF GHOST* OR POSSIBLE GHOST EVENTS
DOCUMENTED IN THIS STUDY

<u>RECORDED DATE</u>	<u>RECORDED LOCAL TIME</u>	<u>PLACE SUPPOSEDLY FELT</u>
Saturday, June 25, 1808 (possible ghost event)	0255 EST	Boston, Salem, Massachus- etts, Portland, Maine
Sunday, October 11, 1818	not given	Quebec City, P.Q.
Wednesday, November 9, 1842	not given	Montreal, Trois Rivières, P.Q.
Thursday, November 10, 1842** (possible ghost event)	0900 EST	Quebec City, Trois Rivières, William Henry, Berthier, P.Q.
Friday, January 1, 1847	not given	Yarmouth, Nova Scotia
Saturday, January 1, 1848	not given	"Nova Scotia"
Saturday, March 19 or Sunday, March 20, 1853 (possible ghost event)	0100 EST	St. Catherines and Niagara, Ontario
"A few months since" June 1, 1855	not given	Granville Mountain, Nova Scotia (volcano)
Friday, July 12, 1861	2100 EST	Ottawa, Montreal, Brock- ville and Odgensburg[sic], New York
Thursday, March 12, 1874	not given	Yarmouth, Nova Scotia
Thursday, October 14, 1886	2230 AST	Sydney, Nova Scotia

* The term "ghost" event is probably best reserved for only those events which appear on the CEEF list with an incorrect date while also appearing on the list with their correct date. Thus, above, only the January 1, 1848, and the "a few months since" June 1, 1855 events are true "ghosts" of the Tuesday, February 1, 1848 event and the Thursday, February 8, 1855 event respectively; the Friday, January 1, 1847 event is also probably a true ghost of the Saturday, January 1, 1848 ghost event which is itself a ghost of the Tuesday, February 1, 1848 event - a case of ghosts spawning ghosts! The others on this list are errors, or typographic errors, in earlier researchers' work.

**Note added in proof: This event is now known to be an erroneous report. Pierre Guin, S.J., Observatoire de Géophysique, Collège Jean-de-Brébeuf, 3200 Chemin Ste-Catherine, Montréal, P.Q., H3T 1C1 (personal communication, February 27, 1987) reports in a letter; "P.S. In Nov. 1842 there was only [one] event or series of events on the 7th. I have over 20 records of it!".

TABLE 9

CHRONOLOGICAL LIST OF EARTHQUAKE EVENTS THAT WERE, OR MAY HAVE BEEN,
ASSOCIATED WITH METEORITE IMPACTS*

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
Friday, January 29, 1847 (possibly related to a meteorite)	2130 AST	Antigonish, Nova Scotia
Monday, December 21, 1863 (definitely related to a meteorite)	2310 AST	Amherst, Parrsboro Minudie, Nova Scotia
Sunday, December 31, 1882 (possibly one of the events is related to a meteorite)	2206 and 2243 AST	reported as centered at Passamaquoddy Bay, New Brunswick. Felt all over the Maritimes and Maine (Note added in proof: The senior author now believes this event was a major event offshore of Nova Scotia perhaps near the shelf edge west of Sable Island.)

* The term "meteorite termination" is often used in recognition of the fact that a meteorite need not actually strike the earth to cause a loud earthquake-like noise and earth vibrations; this can occur as a meteorite penetrates deep into the atmosphere and destroys itself while still somewhat above the ground surface.

TABLE 10

CHRONOLOGICAL LIST OF PREVIOUSLY-KNOWN EARTHQUAKES, IN NOVA SCOTIA OR POSSIBLY RELATED TO NOVA SCOTIA, FOR WHICH NO EVENT-SPECIFIC SEARCH COULD BE INITIATED BECAUSE OF TIME LIMITATIONS OR (IN FOUR CASES) FOR WHICH AN EVENT-SPECIFIC SEARCH YIELDED NO SIGNIFICANT NEW DATA

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
Tuesday, November 18, 1755 (searched but little new data found)	0412 EST	Boston; Chesapeake Bay to Annapolis Royal and Halifax; Lake George, New York to 200 miles east of Cape Ann, Massachusetts
Sunday, September 30, 1764 (searched but little new data found)	1200 AST	Saint John, New Brunswick
Wednesday, February 8, 1843 (new event but found at end of contract; no search done)	not known	Yarmouth County, Nova Scotia
Wednesday, October 17, 1860 (searched but little new data found)	0615 EST	North of the mouth of Rivière Ouelle, felt all over New Brunswick, Maine, and Quebec
Tuesday, February 8, 1870 (no search done)	not known	Bay of Fundy mouth
Thursday, March 17, 1870 (no search done)	0600-0800 AST	Eastern Maine
Monday, March 21, 1904 (no search done)	0204 AST	Oak Bay - Passamaquoddy Bay area
Wednesday, May 13, 1908 (no search done)	2345 AST	western Nova Scotia
Friday, January 22, 1915 (searched but little new data found)	not known	well south of Sable Island
Tuesday, July 27, 1915 (no search done)	1100-1200 AST	southwestern Nova Scotia

TABLE 10 (CONTINUED)

Fifteen Southern New Brunswick or Eastport, Maine Events
Not Searched for in Nova Scotian Sources

<u>DATE</u>	<u>LOCAL TIME</u>	<u>PLACE FELT</u>
Tuesday, February 8, 1870	not known	Bay of Fundy, felt in the Maritimes and in Maine
Thursday, March 17, 1870	0600 AST	Saint John, Fredericton, New Brunswick; Eastport, Maine
Saturday, February 22, 1873	0730 EST	Eastport, Machias, Maine; St. Stephen, St. George, New Brunswick
Friday, February 27, 1874	2235 EST	Bangor, Calais, Machias, Eastport, Maine; St. Stephen, New Brunswick
Monday, November 20, 1876	1240 EST	Machias, Eastport, Maine
Saturday, January 26, 1884	not known	Rothesay, Saint John, New Brunswick
June ?, 1885	1000 AST	Seal Cove, Grand Manan Island, Rothesay, New Brunswick
Sunday, March 22, 1896	2030 AST	Grand Manan Island, Charlotte and York Counties, New Brunswick; Calais, Machias, Maine
Tuesday, January 26, 1897	1130 AST	Campobello and Deer Islands, New Brunswick; Machias, Calais, Charlotte, Maine
Thursday, January 28, 1897	2100 AST	Grand Manan Island, New Brunswick
Sunday, February 14, 1897	2100 AST	Grand Manan Island, New Brunswick
Tuesday, October 12, 1897	2235 AST	Grand Manan Island, New Brunswick
Tuesday, January 11, 1898	0200 AST	Grand Manan Island, New Brunswick
Wednesday, December 11, 1912	0515 AST	Augusta to Eastport, Maine; St. Stephen, New Brunswick
Wednesday, January 13, 1914	0300 AST	Calais, Eastport, Maine; St. Stephen, New Brunswick

APPENDICES

APPENDIX 1

NOVA SCOTIAN NEWSPAPERS FOR WHICH LONG RUNS WERE SEARCHED IN
THE STUDY AT THE PUBLIC ARCHIVES OF NOVA SCOTIA

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NOVA SCOTIA NEWSPAPERS FOR WHICH LONG RUNS WERE SEARCHED
IN THE STUDY AT THE PUBLIC ARCHIVES OF NOVA SCOTIA

Royal Gazette, published in Halifax, Nova Scotia 1752 - present.
The "Royal Gazette" or the "Gazette" is a general name for all the papers in the list below:

Gazette, published Halifax, Nova Scotia, 1752 - 1765 (Bushell; Bulkeley; Henry - editors)

Gazette or the Weekly Advertiser, published Halifax, Nova Scotia, 1765 - 1766 (Anthony Henry)

Nova Scotia Gazette, published Halifax, Nova Scotia, 1766 - 1770 (Fletcher)

Nova Scotia Weekly Chronicle, published in Halifax, Nova Scotia, 1770-1770 (Anthony Henry)

Nova Scotia Chronicle and Weekly Advertiser, published Halifax, Nova Scotia, 1769 - 1770 (Anthony Henry)

Nova Scotia Gazette and Weekly Chronicle, published Halifax, Nova Scotia, 1770 - 1789 (Fletcher sold to Anthony Henry)

Nova Scotia Gazette and General Advertiser, published Halifax, Nova Scotia, 1785 - 1787 (not examined; not available at the P.A.N.S.)

Royal Gazette and Nova Scotia Advertiser, published Halifax, Nova Scotia, 1789 - 1800, or possibly early 1801? (Anthony Henry then Mrs. Henry briefly)

Nova Scotia Gazette and Weekly Chronicle, published Halifax, Nova Scotia, 1801 - 18?? (in another place 1800-1801?) (Gay and Merlin??)

Nova Scotia Gazette and Weekly Advertiser, published Halifax, Nova Scotia, 1801 - 1827 (John Howe)

Nova Scotia Royal Gazette, published Halifax, Nova Scotia, 1801 - 1843

Royal Gazette, published, Halifax, Nova Scotia, 1843 - present

Royal Gazette - 1752 to present. This official organ of the Nova Scotia government traces its history back to the Halifax Gazette, the earliest paper published in what is now British North America. The first issue appeared on March 23, 1752. As can be seen by the above titles, the name of the paper has changed at various times. Overlapping of titles is due to continued publication of a paper after withdrawal of government patronage and their support of another printer.

The Royal Gazette contained mainly reprints from British, American and European newspapers, shipping notices, a little local news, proclamations, legal notices and a few business cards and other miscellaneous notices. (See Gertrude Tratt's 1957 thesis on Nova Scotia newspapers for further information - published in 1979.)

The Royal Gazette was searched from March 23, 1752 to May 12, 1813. Over this time span there were no recordings of earthquakes felt in Nova Scotia and only one recording of an earthquake felt in New Brunswick in 1764. Nor were there mentions of the earthquakes felt in the Boston area in 1766, 1775 and 1785. The Gazette, however, does cover earthquakes felt in Europe, the West Indies and South America.

Judging from the number of recorded earthquakes felt in the Bay of Fundy area and Nova Scotia in the nineteenth and twentieth centuries, it is difficult to believe that there were no similar shocks felt between 1752 and 1813 in New England, Nova Scotia or New Brunswick. Those areas where earthquakes are recorded as being felt in the nineteenth and twentieth centuries, Yarmouth, Shelburne, Wolfville, for example, were all settled by 1783. One is, therefore, inclined to conclude that if earthquakes were felt in Nova Scotia between 1752 and 1813, they were not recorded in the Gazette, for one reason or another.

The Royal American Gazette - published Shelburne, Nova Scotia, 1783?-1786?. The Public Archives of Nova Scotia holds copies of fifteen issues published from January 24 to August 8, 1785. (January 24, 31; February 7, 21; April 11, 16, 25; May 9 30; June 6, 13, 20, 27; Aug. 1, 8, 1785.) Contained local correspondence, advertising and reprints of foreign news. (Peterson, 1984) All available issues were searched. No recordings of earthquakes were found in these issues.

Port Roseway Gazetteer and the Shelburne Advertiser - published Shelburne, Nova Scotia, 1784-1785. The Public Archives of Nova Scotia have nine issues between February 17 and July 21, 1785. (February 17, 24; April 21, 28; May 12, 19, 26; June 19; July 21, 1785.) A literary paper with some news and notices, but chiefly given over to essays, poetry, letters and stories extracted from American or English periodicals. (Peterson, 1984) All available issues were searched. Two reports of earthquakes in Europe were recorded in this paper.

Nova Scotia Packet and General Advertiser - published Shelburne, Nova Scotia, 1785-1796. Public Archives of Nova Scotia have the issues from July 6, 1786 to January 18, 1787, except the issue of August 3, 1786. The Packet concerned itself largely with things of interest; shipping news, Loyalist movements, colonial reprints and some foreign news. (Peterson, 1984) All available issues were searched. There was no mention of any earthquakes.

Weekly Chronicle - published Halifax, Nova Scotia, 1786 - 1827; 1827 - 1834?, weekly on Fridays. Name changed to Acadian and General Advertiser in 1827. The Weekly Chronicle contained many items reprinted from American and European publications, advertisements, legal notices and some correspondence. In 1829, the paper became a strong Tory supporter (Tratt, 1979). The Weekly

Chronicle was searched from 1786 - 1813; 1827 - May 9, 1834. All issues from 1786 to 1791 and 1800 to 1804 are missing except one issue in January, 1788; all of 1830 and 1831 and much of 1833 and 1834 are also missing from the later period searched (Appendix 3B).

Acadian Recorder - published Halifax, Nova Scotia, 1813 - 1930. At first a weekly; issued on Saturdays; by September 5, 1864, it also issued a tri-weekly edition published Monday, Wednesday and Friday, and four years later commenced a daily as well. All three continued simultaneously until 1930. The Acadian Recorder's front page consisted largely of advertisements at first, but this gave way to one containing headlines and news items, and the advertisements were gradually relegated to the back pages. It remained a four-page sheet for its entire life. The Acadian Recorder politically favoured the Liberals and was pro-British. In the early years of its publication, while Anthony Henry Holland was the editor and publisher, news was reprinted from newspapers from abroad. The early Acadian Recorder also published "Agricola's" column, trade news, items on education, temperance, government and issues of concern in the province (Tratt, 1979). By the 1850's this paper was printing less foreign news and concerning itself more with Nova Scotia politics and current events throughout the province. This paper seemed to give good coverage of unusual occurrences, such as earthquakes. Many items were reprints from other papers. The Acadian Recorder was searched from 1813 to 1867 inclusive. Any significant gaps are seen on Figure 4.

Herald - published Yarmouth, Nova Scotia, 1833-?; 1843-1850; 1851-1931; 1931 to present. A weekly (on Fridays) when published in 1833, it became the first semi-weekly (on Mondays and Thursdays) in the history of the province in 1843 and used the name Herald at this point; it then reverted to its weekly status in August, 1850. The paper contained foreign and local news and items of provincial interest. Originally it was called The Yarmouth Herald and Western Advertiser; until 1843 when it became a semi-weekly. The last issue of the Herald and Western Advertiser was on December 16, 1843. The first issue to be called simply the Yarmouth Herald was on Monday, December 22, 1843. It merged with the Yarmouth Telegram in 1931 to become the Yarmouth Herald-Telegram (Tratt, 1957; 1979).

APPENDIX 2

OTHER NOVA SCOTIA NEWSPAPERS WHICH WERE USED AT THE
PUBLIC ARCHIVES OF NOVA SCOTIA IN EVENT-SPECIFIC
SEARCHES IN THE STUDY, ARRANGED BY COMMUNITY

- Halifax
- Amherst
- North Sydney
- Sydney
- Pictou
- Yarmouth
- Liverpool
- Bridgetown
- Antigonish
- Annapolis Royal
- Truro

APPENDIX 2

OTHER NOVA SCOTIA NEWSPAPERS WHICH WERE USED AT THE
PUBLIC ARCHIVES OF NOVA SCOTIA IN EVENT-SPECIFIC
SEARCHES IN THE STUDY, ARRANGED BY COMMUNITY

Halifax Newspapers

The Provincial or Halifax Monthly Magazine - published Halifax, Nova Scotia, 1852-1853. A forty-page literary monthly, featuring "Our Correspondence", "Our Monthly Gossip" and "Review of the Past Month". It also contained book reviews, poetry, plays, biographies, stories and essays on diverse subjects (Tratt, 1979).*

Christian Messenger - published Halifax, Nova Scotia, 1837-1884. Weekly newspaper. An organ of the Baptists, its interests in politics was only to the point of safeguarding religion privileges. Included shipping news, market prices, gave accounts of local church affairs and of missionary and temperance activities and carried death and marriage notices, "appropriate" advertisements and poetry (Tratt, 1979).

Church Times - published Halifax, Nova Scotia, 1849-1858. Weekly newspaper, religious paper, published by the Anglican Church. There were two editors, one the clerical editor and the other a general editor, resulting in some inconsistencies in the paper's views. A particular target for attack was the Halifax Catholic, but it also took stands on free trade, temperance and clergy reserves, for example. The newspaper covered European news, as well as local and provincial items (Tratt, 1979).

Presbyterian Witness and Evangelical Advocate - published Halifax, Nova Scotia, 1848-1905. Weekly newspaper on Saturdays. It was at first Free Church, then more generally Presbyterian as various mergers drew the more tolerant elements in the denomination closer together (Tratt, 1979).

Free Press - published Halifax, Nova Scotia, 1815-1830(?). Weekly newspaper on Tuesdays. This paper contained mainly news, advertisements and marine, legal and financial notices (Tratt, 1979).

* Tratt completed her thesis in 1957; it was not published until 1979.

Halifax Newspapers (Continued)

NovaScotian - published Halifax, Nova Scotia, 1824-1892; 1892-1922; 1922-1926(?). Began as a weekly in 1824 on Wednesdays under the title NovaScotian or Colonial Herald, which was then reduced to the NovaScotian in 1840, when it published on Mondays, and continued under this name until 1892 when it became the Nova Scotian and Weekly Chronicle. It was renamed the Nova Scotian, Nova Scotia' Farm and Home Journal in 1922 and retained that title until 1926(?) when publication was suspended. The early NovaScotian was traditionally Liberal; it dealt with political views primarily, but in other ways resembled most other contemporary papers. It did not, though, seem to carry much in the way of daily events and local concerns (Tratt, 1979).

Morning Chronicle - published Halifax, Nova Scotia, 1844-1912. Originally a tri-weekly on Tuesdays, Thursdays and Saturdays. This paper supported reform and at first advocated British North America, then later it supported Maritime Union. In appearance it resembled other publications of the era (Tratt, 1979).

Citizen - published Halifax, Nova Scotia, 1863-1870; 1870-1877. This daily edition carried advertisements on the front page, notices, business cards, "literature" and various sorts of "intelligence" (Tratt, 1979).

Halifax Journal - published Halifax, Nova Scotia, 1781-1800?; 1810-1819; 1819-1870, under various names. Originally a four-page weekly on Mondays, it published local and shipping news, but most of the paper consisted of reprints of news and literature from outside sources, as did most newspapers of the time (Tratt, 1979). The Halifax Journal was searched from 1781 to 1849, but only for those issues found on reels with the Royal Gazette. The issues searched were:

1781 - July 5
 1790 - July 22, 29; August 5, 12, 19
 1796 - January 7 to December 29 except February 4; May 12; June 2, 30; September 15; December 8
 1797 - May 4; October 26; November 2, 16, 29
 1798 - January 18; February 1, 15; April 19; May 3, 24; June 7, 14; August 2, 16; September 13, 20; October 11, 18
 1799 - March 14, 21, 28; April 4, 18; May 23, 30; June 6, 13, 20, 27; July 4, 11, 18, 25; August 1, 8, 15, 22, 29; September 5, 12, 19, 26; October 3, 24, 31; November 7, 14, 21, 28; December 12, 19
 1817 - November 17
 1818 - March 9
 1821 - June 18
 1849 - June 11

Halifax Newspapers (Continued)

Morning Herald - published in Halifax, Nova Scotia, 1876?-? (Tratt [1979] states two dates for the beginning of this publication - 1872 and 1876.). Circulated a daily, tri-weekly and weekly editions and was "an independent opposition to both the existing Dominion and Provincial Administrations...generally regarded as the leading Liberal-Conservative newspaper of the Maritime Provinces" (Tratt, 1979).

Herald - published in Halifax, Nova Scotia, 1897-1950, when it merged with the Chronicle to become the Chronicle Herald as we know it today in Nova Scotia (Tratt, 1979).

Morning Herald - published in Halifax, Nova Scotia, 1840-1848. Tri-weekly. Professed to concentrate "on news rather than on politics" (Tratt, 1979).

Times - published in Halifax, Nova Scotia, 1834-1848. Tory in sympathies, this paper was described as "the best edited and most ably managed of all the newspapers which supported the official class in its struggle against the Reformers" (Tratt, 1979).

Evening Reporter - published in Halifax, Nova Scotia, 1860-1867? Concerned with current affairs, shipping, commercial and general news (Tratt, 1979).

'Daily' Sun - published in Halifax, Nova Scotia, 1845-1867? This was a daily paper and is generally referred to as the "daily" Sun. The paper began March 17, 1845 as the Sun (tri-weekly on Mondays, Wednesdays, and Fridays), then in 1850 became the Halifax Sun and in 1852 the Daily Sun. The Daily Sun became The Morning Sun from 1857 to 1865 and then the Sun and Advertiser to 1867? It was a tri-weekly at the end. The newspaper was devoted to literature, humour, politics, general intelligence, etc. (Tratt, 1979).

British Colonist and North American Railway Journal - published in Halifax, Nova Scotia, 1848-1855; 1855-1873(?). Tri-weekly; Tuesday, Thursday, Saturday. Concerned with politics, trade, education and the roles of the fisherman and farmer, and covered local and international news. Name changed to the British Colonist in 1855 (Tratt, 1979).

British North American - published in Halifax, Nova Scotia, 1850 - 1855. Tri-weekly newspaper; Monday, Wednesday, Friday.

Amherst Newspaper

Amherst Daily News - published in Amherst, Nova Scotia, 1893-? (Tratt, 1979).

North Sydney Newspapers

Cape Breton Spectator - published North Sydney, Nova Scotia, 1846-1848(?). Weekly newspaper on Saturdays. Described itself as "A weekly newspaper devoted to literature, commerce, news, etc.". Also covered marine, foreign and local news (Tratt, 1979). When the North Sydney Cape Breton Spectator ended circa mid-1848?, it was followed by the Times and Cape Breton Spectator which was published in Sydney Mines, Nova Scotia, 1848?-1849?. The replacement was published by the same person in Sydney Mines. Its content and format was similar to the Cape Breton Spectator. The Times and Cape Breton Spectator "lasted for only a few months* and was followed almost immediately by the Cape Breton News, 1849-1872" which published weekly on Wednesdays (Tratt, 1979).

North Sydney Herald - published North Sydney, Nova Scotia, 1872-1948(?). The oldest weekly (Wednesdays) in Cape Breton, it carried political items, as well as current, local and provincial news (Tratt, 1979).

Sydney Newspapers

Cape Breton News - published Sydney, Nova Scotia, 1849-1872(?). Weekly on Wednesdays. Contained mostly news items, but also carried poetry and advertisements (Tratt, 1979).

Sydney Daily Post - published Sydney, Nova Scotia, 1896-1934; 1934 to present. Originally called the Post and published weekly until 1900 when it became a daily, hence, the name. In 1934 the Daily Post and Record merged to become the Sydney Post Record, which is still being published.

Sydney Record - published in Sydney, Nova Scotia, 1884-1934. Originally a weekly; became a daily in 1896 but continued a weekly under the name the Reporter for some time. This paper was a Liberal paper as opposed to the Sydney Daily Post which was Conservative. The Sydney Daily Post and the Record merged to become the Sydney Post Record which is still being published today.

Pictou Newspapers

Observer and Eastern Advertiser - published Pictou, Nova Scotia, 1831-1835; 1838-1840; 1843. Weekly newspaper on Wednesdays. Initially this paper was called the Pictou Observer and Eastern Advertiser. It was discontinued in 1835 (Tratt says 1833 in one place), then revived in 1838 as the Observer until 1840. It was briefly revived again in 1843 (Tratt, 1979). Strongly Conservative, this paper was filled with the usual advertisements, local colonial and foreign news (Tratt, 1979).

* Jean Peterson believes this statement by Tratt is not correct.

Pictou Newspapers (Continued)

Eastern Chronicle - published Pictou, Nova Scotia, 1843-1868. Weekly newspaper on Thursdays. The Eastern Chronicle contained many items from recent British papers, legal notices, agricultural and religious news (Tratt, 1979).

The Colonial Standard - published in Pictou, Nova Scotia, 1858-1907. This paper focused on agricultural matters, politics, literature, local and general news (Tratt, 1979).

Yarmouth Newspapers

Yarmouth Tribune - published in Yarmouth, Nova Scotia, 1855-1888. Originally a semi-weekly, the Tribune covered commerce, literature, politics and local news. In 1859, the Tribune became a weekly series, and in 1868, the name was altered to the Tribune and Western Advertiser. By this time, it included telegraphic news, literature, advertisements, legal news and items of local interest (Tratt, 1979).

Telegram - published in Yarmouth, Nova Scotia, 1885-1931. Published as a Friday supplement to the Herald (Yarmouth) with which it merged in 1931 to become the Herald-Telegram (Tratt, 1979).

Times - published in Yarmouth, Nova Scotia 1883-1890?; 1890? - 1925?. Originally a semi-weekly called the Times and Western Counties Journal then changed its name to the Times in 1882, became a daily in 1898 and in April 1910 reverted to a semi-weekly, began to decline in 1920; it covered local and general news (Tratt, 1979).

Liverpool Newspapers

Liverpool Transcript - published in Liverpool, Nova Scotia, 1854-1868. A weekly paper, it covered political and local news, literature, art, science and popular information (Tratt, 1979).

Liverpool Advance - published in Liverpool, Nova Scotia, 1878-1928. A weekly edition; this paper was Liberal in politics (Tratt, 1979).

Bridgetown Newspaper

Weekly Monitor - published in Bridgetown, Nova Scotia, 1873-1909. Politically independent, this paper served local interests and gave some coverage to wider events (Tratt, 1979).

Antigonish Newspaper

The Casket - published in Antigonish, Nova Scotia, 1852 to present. Part of the paper was published in Gaelic initially and one column still is. Strongly Roman Catholic in interest and apparently in ownership. It is the official organ of the Archdiocese of Antigonish and yet it claimed political independence (Tratt, 1979).

Annapolis Royal Newspaper

Nova Scotia Farmer and Annapolis County Times - published in Annapolis Royal, Nova Scotia, 1873-?. A weekly; this paper concentrated on agricultural interests. It began shortly after the Nova Scotia Farmer ceased publication in 1871? (Tratt, 1979).

Truro Newspaper

Colchester Sun - published Truro, Nova Scotia, in the 1870s(?) Nearly three-quarters of its total space was taken up with advertisements. Claimed to be politically independent, but actually retained Conservative sympathies. Went through several name changes and publishes today as the Truro Daily News (Tratt, 1979).

APPENDIX 3

- A) ISSUES OF THE ROYAL GAZETTE LOCATED IN THE LEGISLATIVE LIBRARY TO FILL IN GAPS IN THE LONG RUN SEARCHED IN THE PUBLIC ARCHIVES OF NOVA SCOTIA COLLECTION

- B) MISSING ISSUES OF NEWSPAPERS NOT FOUND IN SEARCHING THE LONG RUNS; ORDERED BY NEWSPAPER

A) ISSUES OF THE ROYAL GAZETTE LOCATED IN THE LEGISLATIVE LIBRARY TO FILL IN GAPS IN THE LONG RUN SEARCHED IN THE PUBLIC ARCHIVES OF NOVA SCOTIA COLLECTION

Royal Gazette, published Halifax, Nova Scotia. List of additional issues located at the Legislative Library, Halifax, Nova Scotia. August 13, 20, 27; September 3, 10, 17, 24; October 8, 15, 22, 29; November 5, 12, 19, 26; December 3, 10, 17, 24, 31, 1767; January 7, 14, 21, 28; February 4, 11, 18, 25; March 3, 10, 17, 24, 31; April 7, 14, 21, 28; May 5, 12, 19, 26; June 2, 9, 16, 23, 30; July 7, 14, 21, 28; November 3, 10, 17, 24; December 1, 8, 15, 22, 29, 1768.

B) MISSING ISSUES OF NEWSPAPERS NOT FOUND IN SEARCHING THE LONG RUNS; ORDERED BY NEWSPAPER

Halifax Royal Gazette - missing issues
(searched March 23, 1752 to May 12, 1813)

1752	June 6, 13, 20; July 4; August 1, 8, 15; October 28, November 4
1753	January 20; April 7; September 15, 22; October 13; November 17, 24
1754	July 13; August 31; September 7, 14, 21; October 26; November 2, 9, 23; December 7, 14, 21, 28
1755	January, all issues missing; February 1, 8, 22; March 8, 15, 22, 29; April; May; June; July; August 2, 9, 16, 30; September; October; November; December
1756	all issues missing
1757	all issues missing
1758	all issues missing except December 9
1759	all issues missing
1760	all issues missing
1761	January, all issues missing; February; March; April; May 7; June 5; July; August; September; October; November; December
1762	all issues missing
1763	all issues missing except July 28
1764	all issues missing except September 27; December 13, 20
1765	all issues missing from January to August 22; September, all issues missing; October 10, 31; December 12
1766	missing from March 13 onwards
1767	missing from January to August 6 inclusive, except for February 19, 26; October 1
1770	September, all issues missing; October; November; December
1771	all issues missing except February 12 and May 7
1772	all issues missing from January to the end of August except July 14; also missing September 15; November 3, 17; December 15
1774	last issues of January and May are missing

Halifax Royal Gazette - missing issues (continued)

- 1775 October 31; November 14, 21, 28; December 5, 12, 19, 26
- 1776 January to June, all issues missing; July 2, 16, 23, 30; August; September 3, 24; October to December
- 1777 all issues missing *
- 1778 all issues are missing except October 6
- 1779 January 5; February 2, 9; August 17; September 7; November 23
- 1780 February 22; April 25; July 4; August 15, 29; September 19; October 10, 17, 31; November 7; December 5
- 1781 October 9, 23; November 13, 20; December 18, 25
- 1782 January 8, 15; April 9, 30; May 21; June 4, 11; July 2, 16; August 20; September 24; November 5; December 24
- 1783 January 28; February 11; August 5, 12; September 23; October 7; November 18; December 2
- 1784 January 6, 13; April 13, 27; May 18
- 1785 February 1; April 12
- 1791 May 24
- 1797 December 13, 20, 27
- 1801 January, all issues missing; February; March 5, 12, 26; April 2, 16, 30; May 28; June 18, 25; July 2, 16, 30; August 6, 13, 27; September 3, 24; October; November 12, 19; December 10, 17, 24
- 1802 January 21, 28; March 11, 25; April 22; June 3, 24; July 1, 8, 15, 22; August 5, 12; October 28; November 4; December 9, 23
- 1803 all issues missing except January 6; July 28; September 29
- 1804 all issues missing except February 9; March 8; April 19, 26; May 24, 31
- 1805 April 4; May 23; June 20; July 18; October 3; November 28
- 1806 January 3, 10; May 1, 29; June 25; August 7; September 4
- 1807 all issues missing except April 28; July 7; September 1
- 1808 April 26; May 10, 31; June 28; July 5; November 22; December 6
- 1809 June 27
- 1810 January 2, 9, 16; 23, 30; February 6; April 10, 24; May 15, 22; June 5, 12; July 17, 31; August, all issues missing; September 5, 26; October 24; November 7, 14; December 19
- 1811 February 27
- 1812 January 1; February 19, 26; March 11, 18, 25; April 8, 22; July 29; August 19; December 16

Halifax Weekly Chronicle - missing issues (searched
1788 to 1813 and 1827 to May 9, 1834)

1786 all issues missing
 1787 all issues missing
 1788 all issues missing except one issue in January
 1789 all issues missing
 1790 all issues missing
 1791 January, all issues missing; February 5, 12; March
 19; May 28; June 18; August 20; September 17, 24;
 October; November 5, 12; December
 1792 all issues missing
 1793 all issues missing
 1794 January, all issues missing; February 1; March 1, 8;
 August 23; September 20, 27; October; November 1, 8,
 22, 29; December
 1795 February 21; March 14; June 13; July 25; August 1, 8,
 22; October 3, 24
 1796 January 16; March 19; April 2, 23; May 28; June 25
 1797 all issues missing except the first issue in May
 1798 January 6, 13, 20, 27; February 3, 24; May 22; August
 25; September 29; November 10, 17, 31; December 22, 29
 1799 January, all issues missing; February 2, 9; August 24;
 October 5, 19, 26; November; December
 1800 all issues missing
 1801 all issues missing
 1802 all issues missing
 1803 all issues missing
 1804 all issues missing
 1805 January, all issues missing; February 2, 9, 16; March
 9; April 6, 13; May 18; June 8, 22; July 6, 13;
 August 17, 24; September 21, 28; October 5, 12, 19;
 November 2, 9; December
 1806 January 4, 18; February 1; March 22; July 5; Sep-
 tember 27; October 3; November 14, 21, 28; December,
 all issues missing
 1807 March 6; April 24; June 24; July 10, 24; September
 18; November 13; December 18
 1808 April 8, 22, 29; May 6, 13; July 7; September
 23; October 14; November 25; December 2, 9
 1809 April 7, 14, 21; October 13, 20, 27
 1810 January, all issues missing; February 2, 23; June 8;
 July 5, 12; August 3; September 28; October 5;
 November 2; December 7, 21
 1811 January 4; March 1; June 7; August 2; October 18;
 December 13
 1812 March 13, 20, 27; April 3, 10, 17; May 1, 8; June
 12, 19; July 3; August 14, 21; September 4, 18; Octo-
 ber 2, 16, 23; November 6, 20, 27; December 11, 25
 1813 no issues missing
 1814-1826 not searched
 1827 The name of the Weekly Chronicle was changed to the
Acadian and General Advertiser

Halifax Acadian and General Advertiser - missing issues (searched 1827 - May 9, 1834)

1827 no missing issues
 1828 January 4, 11, 25; February 1, 22; March 7, 28; April 23, 30; May 6; June 20; July 4, 11, 18; August, all issues missing; September 5, 19, 26; October 3, 24; November 14, 21, 28; December 5, 19, 25
 1829 January 9, 16, 23; February 6, 20, 27; March 6, 13, 20; April 17; May 1, 8; June 19; July 3; September 25; November 13, 20
 1830 all issues missing
 1831 all issues missing
 1832 January; February 3, 10, 17; March 2; April 27; May 11, 25; June 15, 22; July 20; August 3; September 14, 21, 28; October 5; November and December, all issues missing
 1833 January 4, 11; from the March 15 issue the rest of the year has all issues missing
 from the May 16 issue the rest of the year has all issues missing
 1834

Halifax Acadian Recorder - missing issues (searched 1813-1867, inclusive)

1813 January 23; May 22, 29; June 12, 19; August 7
 1814 February 19; April 2
 1833 January, all issues missing; February; March 16, 23, 30; May 2, 23, 30; June 15; August 17; September 7; December 14
 1843 all issues missing
 1844 all issues missing
 1845 December 20, 27
 1846 all issues missing
 1849 January 6, 13; April - December, all issues missing
 1852 all issues missing
 1853 January 27; February 26; March 19; April 2
 1863 December 26
 1864 September 3, 5, 7, 9, 10, 12, 14, 16, 17, 21, 23, 26, 28, 30; October 3, 5, 7, 8, 10, 12, 14, 17, 19, 21, 24, 26, 28; November 2, 4, 5, 7, 9, 11, 12, 14, 16, 18, 21, 23, 25, 28, 30; December 2, 5, 7, 9, 12, 14, 16, 19, 21, 23, 26, 28, 30 (Tri-weekly edition began publication September 5, 1864)
 1865 October 14 to the end of December (weekly), all issues missing
 1866 January 27; April 7 to June 2; June 16; September 29 to November 24
 1867 March 2; June 8; July 6 to August 24; November 2, 9, 16; December 14, 21, 28

Shelburne Newspapers - missing issues

Royal American Gazette
Port Roseway Gazetteer and the Shelburne Advertiser
Nova Scotia Packet and General Advertiser

A list of missing issues is not relevant since in Appendix 1, under each newspaper, we list all issues found; there were not many.

Yarmouth Herald - missing issues (searched Jan. 1848
 - Dec. 1867, inclusive)

1848	January 6, 13; October 26, 30; November 2, 6
1849	January 1; July 2, 5, 9, 12, 19; September 17; December 26
1850	June 3; November 28
1851	January, all issues missing; February 1, 8
1857	February 5, 12, 19, 26; March 5, 12, 19; April 9
1858	February 11, 18; March 11, 18; April 1
1859	May 5
1860	February 16
1865	February 16, 23
1866	February 22; March 8, 15, 22, 29

Halifax Journal - missing issues

A listing of missing issues is not relevant in this case since we only searched those issues which happened to be microfilmed on reels of the Royal Gazette between July 5, 1781 and June 11, 1849. Only about 105 issues were searched with all but ten being in 1796 to 1799 (Appendix 2).

All other newspapers used in event-specific searches - missing issues

A list of missing issues is not relevant in these cases since only specific issues were searched. Any issues found to be missing are noted in each of the event-specific search sections at the end of the "References and Transcripts" sections under the subtitle, "Newspapers Searched".

APPENDIX 4

LIST OF THOSE ISSUES OF MISCELLANEOUS CAPE BRETON
COUNTY NEWSPAPERS, FOUND ON CAPE BRETON MISCELLAN-
EOUS REELS 1 TO 6, INDEXED BY JOHN MACLEOD, AT THE
PUBLIC ARCHIVES OF NOVA SCOTIA, 1984

APPENDIX 4

A LIST OF THOSE ISSUES OF MISCELLANEOUS CAPE BRETON
COUNTY NEWSPAPERS, FOUND ON CAPE BRETON MISCELLAN-
EOUS REELS 1 TO 6, INDEXED BY JOHN MACLEOD, AT THE
PUBLIC ARCHIVES OF NOVA SCOTIA, 1984

In 1984, John MacLeod of the Public Archives of Nova Scotia staff indexed the following issues of Cape Breton newspapers, generally found between 1842 and 1938, and while he was not specifically looking for earthquakes, he did find the earthquake references below as taken from his index*:

Earthquakes:

"Earthquake felt in Newport", in Cape Breton News, June 22, 1853, p. 2

"Earthquake felt in Antigonish, Pictou and Truro", in Cape Breton News, February 10, 1855, p. 3

"Earthquakes in Nova Scotia, New Brunswick", in Cape Breton News, February 17, 1855, p. 2 (4)

"Earthquake and meteor on New Years Day...", in North Sydney Herald, January 10, 1883, p. 2

"Earthquake in Newfoundland", in North Sydney Herald, March 26, 1884, p. 2

"Earthquake at Baddeck", in the Victoria-Inverness Bulletin, November 23, 1929, p. 2**

* Note: The apparent headlines in quotes in the six items above are not true headlines except in one case (4th item). They are simply an extract of where the event was felt.

** Note: There is a second article on p. 5, col. 1 but the PANS copy is missing some pages which was not noted by MacLeod (1984).

CAPE BRETON MISCELLANEOUS REEL I

The Spirit of The Times

July 19, 1842

Jan. 25, 1846 (filmed on top of Apr. 22, 1846)

Cape Breton Spectator

June 17, 1846

June 24, 1846

Apr. 3, 1847

May 22, 1847

Aug. 14, 1847

Aug. 21, 1847

Nov. 13, 1847

Dec. 18, 1847 → Nov. 27, 1847

Jan. 15, 1848

Jan. 22, 1848

Feb. 5, 1848

May 6, 1848

May 13, 1848

June 3, 1848

July 15, 1848

The Times

Feb. 24, 1849

Mar. 17, 1849

Apr. 21, 1849

June 2, 1849

July 28, 1849

Sept. 1, 1849

The Commercial Herald

Jan. 12, 1850

Feb. 9, 1850

Mar. 23, 1850

May 25, 1850

The Cape Breton News

May 20, 1854

Dec. 2, 1854

June 23, 1855

June 20, 1855

CAPE BRETON MISCELLANEOUS REEL #1

Cape Breton Spectator

Feb. 12, 1847

The Cape Breton News

Sept. 1, 1852
 Sept. 8, 1852
 Sept. 22, 1852
 Sept. 29, 1852
 Oct. 6, 1852
 Oct. 13, 1852
 Oct. 20, 1852
 Oct. 27, 1852 → Nov. 3, 1852
 Nov. 10, 1852
 Nov. 17, 1852
 Nov. 24, 1852
 Dec. 1, 1852
 Dec. 8, 1852
 Dec. 15, 1852
 Dec. 22, 1852
 Dec. 29, 1852
 Jan. 5, 1853
 Jan. 12, 1853
 Jan. 19, 1853
 Jan. 26, 1853
 Feb. 2, 1853
 Feb. 9, 1853
 Feb. 16, 1853
 Feb. 23, 1853
 Mar. 2, 1853
 Mar. 9, 1853
 Mar. 23, 1853
 Mar. 30, 1853
 Apr. 6, 1853
 Apr. 13, 1853
 Apr. 20, 1853
 Apr. 27, 1853
 May 4, 1853
 May 11, 1853
 May 18, 1853
 May 25, 1853

CAPE BRETON MISCELLANEOUS REEL #1

The Cape Breton News

June 1, 1853
June 8, 1853
June 15, 1853
June 22, 1853
July 2, 1853
July 9, 1853
July 16, 1853
July 23, 1853
July 30, 1853
Aug. 6, 1853
Aug. 13, 1853
Aug. 20, 1853
Aug. 27, 1853
Sept. 3, 1853
Sept. 10, 1853
Sept. 17, 1853

CAPE BRETON MISCELLANEOUS REEL #2

The Cape Breton News

Sept. 26, 1853
 Oct. 1, 1853
 Oct. 8, 1853
 Oct. 15, 1853
 Oct. 22, 1853
 Oct. 29, 1853
 Nov. 5, 1853
 Nov. 12, 1853
 Nov. 19, 1853
 Nov. 26, 1853
 Dec. 3, 1853
 Dec. 10, 1853
 Dec. 17, 1853
 Dec. 24, 1853
 Dec. 31, 1853
 Jan. 7, 1854
 Jan. 14, 1854
 Jan. 21, 1854
 Jan. 28, 1854
 Feb. 4, 1854
 Feb. 11, 1854
 Feb. 18, 1854
 Feb. 25, 1854
 Mar. 4, 1854
 Mar. 11, 1854
 Mar. 18, 1854
 Mar. 25, 1854
 Apr. 1, 1854 → April 8, 1854
 Apr. 15, 1854
 Apr. 22, 1854
 Apr. 29, 1854
 May 6, 1854
 May 13, 1854
 May 20, 1854
 May 27, 1854
 June 3, 1854
 June 10, 1854
 June 17, 1854
 June 24, 1854
 July 1, 1854
 July 8, 1854
 July 15, 1854
 July 22, 1854
 July 29, 1854

CAPE BRETON MISCELLANEOUS REEL #2

Aug. 5, 1854
Aug. 12, 1854
Aug. 19, 1854
Aug. 26, 1854
Sept. 2, 1854
Sept. 16, 1854 → Sept. 9, 1854
Sept. 23, 1854
Sept. 30, 1854
Oct. 7, 1854
Oct. 14, 1854
Oct. 21, 1854
Oct. 28, 1854
Nov. 4, 1854
Nov. 11, 1854
Nov. 18, 1854
Nov. 25, 1854
Dec. 2, 1854
Dec. 9, 1854
Dec. 16, 1854
Dec. 23, 1854
Dec. 30, 1854
Jan. 6, 1855
Jan. 13, 1855
Jan. 20, 1855
Jan. 27, 1855
Feb. 3, 1855
Feb. 10, 1855
Feb. 17, 1855
Feb. 24, 1855
Mar. 3, 1855
Mar. 10, 1855
Mar. 17, 1855
Mar. 24, 1855
Mar. 31, 1855
Apr. 7, 1855
Apr. 14, 1855
Apr. 21, 1855
Apr. 28, 1855
May 5, 1855
May 12, 1855
May 19, 1855
May 26, 1855
June 2, 1855
June 9, 1855
June 16, 1855
June 23, 1855
June 30, 1855

CAPE BRETON MISCELLANEOUS REEL #2

July 7, 1855
 July 14, 1855
 July 21, 1855
 July 28, 1855
 Aug. 4, 1855
 Aug. 11, 1855
 Aug. 18, 1855

North Sydney Herald

Nov. 16, 1881
 Nov. 23, 1881
 Nov. 30, 1881
 Dec. 7, 1881
 Dec. 14, 1881
 Dec. 21, 1881
 Dec. 28, 1881
 Jan. 4, 1882
 Jan. 11, 1882
 Jan. 18, 1882
 Jan. 25, 1882
 Feb. 1, 1882
 Feb. 8, 1882
 Feb. 15, 1882
 Mar. 1, 1882
 Mar. 8, 1882
 Mar. 15, 1882
 Mar. 22, 1882
 Mar. 29, 1882
 Apr. 5, 1882
 Apr. 12, 1882
 Apr. 19, 1882
 May 3, 1882
 May 10, 1882 (1st page dated wrong)
 May 17, 1882
 May 24, 1882
 May 31, 1882
 June 7, 1882
 June 14, 1882
 Jan. 10, 1883
 Jan. 17, 1883
 Jan. 24, 1883
 Feb. 7, 1883
 Feb. 14, 1883
 Feb. 21, 1883
 Feb. 28, 1883

Cape Breton Miscellaneous Reel #2
NORTH SYDNEY HERALD

Mar. 7, 1883
Mar. 28, 1883
Apr. 4, 1883
Apr. 18, 1883
Apr. 25, 1883
May 2, 1883
May 9, 1883 → *may 16, 1883*
May 23, 1883
May 30, 1883
June 6, 1883
June 13, 1883
June 20, 1883
June 27, 1883
July 4, 1883
July 11, 1883
July 18, 1883
July 28, 1883
Aug. 1, 1883
Aug. 8, 1883
Aug. 15, 1883
Aug. 22, 1883
Aug. 29, 1883
Sept. 5, 1883
Sept. 12, 1883
Sept. 26, 1883
Oct. 3, 1883
Oct. 10, 1883
Oct. 17, 1883
Oct. 31, 1883
Nov. 14, 1883
Nov. 21, 1883
Nov. 28, 1883
Dec. 5, 1883
Dec. 19, 1883
Dec. 26, 1883
Jan. 23, 1884
Jan. 30, 1884
Feb. 6, 1884
Feb. 13, 1884
Feb. 20, 1884
Feb. 27, 1884
Mar. 12, 1884
Mar. 26, 1884
Apr. 2, 1884
Apr. 9, 1884

Cape Breton Miscellaneous Reel #2

NORTH SYDNEY HERALD

Apr. 16, 1884
Apr. 23, 1884
Apr. 30, 1884
May 7, 1884
May 14, 1884
May 21, 1884
May 28, 1884
June 4, 1884
June 11, 1884
June 18, 1884
June 25, 1884 (includes undated supplement)
July 2, 1884
July 9, 1884
July 16, 1884
July 23, 1884
July 30, 1884
Aug. 13, 1884 → Aug 6, 1884
Aug. 20, 1884
Sept. 3, 1884

CAPE BRETON MISCELLANEOUS REEL #3

North Sydney Herald

Sept. 10, 1884
Sept. 17, 1884
Sept. 24, 1884
Oct. 1, 1884
Oct. 15, 1884
Oct. 22, 1884
Oct. 29, 1884
Nov. 5, 1884
Nov. 12, 1884
Nov. 19, 1884
Nov. 26, 1884

The Port Hood Greetings

Feb. 27, 1924
Mar. 12, 1924
Mar. 19, 1924
Apr. 2, 1924
Apr. 9, 1924
Apr. 16, 1924
Apr. 23, 1924
Apr. 30, 1924
May 7, 1924

Glace Bay Gazette

Feb. 21, 1924
Feb. 22, 1924
Feb. 23, 1924
Feb. 25, 1924
Feb. 26, 1924
Feb. 27, 1924
Feb. 29, 1924
Mar. 13, 1924
Mar. 17, 1924
Mar. 19, 1924
Mar. 20, 1924
Mar. 27, 1924
Mar. 28, 1924
Mar. 29, 1924
Mar. 31, 1924
Apr. 2, 1924
Apr. 3, 1924
Apr. 1, 1924
Apr. 4, 1924
Apr. 5, 1924
Apr. 8, 1924
Apr. 11, 1924
Apr. 12, 1924
Apr. 14, 1924

CAPE BRETON MISCELLANEOUS REEL #3

Glace Bay Gazette

Apr. 15, 1924

Apr. 16, 1924 → April 19, 1924 (p. 9-12)

Apr. 21, 1924

Apr. 23, 1924

Apr. 25, 1924 → April 24, 1924

Apr. 26, 1924

Apr. 28, 1924

Apr. 29, 1924

May 5, 1924

Port Hawkesbury

Eastern Journal

note: many of these are in poor condition

- January 13, 1893
- January 20, 1893
- March 10, 1893
- March 31, 1893
- April 7, 1893
- April 21, 1893
- May 11, 1893 (p.1 only)
- May 18, 1893 → June 9, 1893 (no p.1)
- June 1, 1893
- August 11, 1893
- August 25, 1893
- October 6, 1893
- ~~November 6, 1893~~
- November 10, 1893
- November 17, 1893
- December 1, 1893
- December 8, 1893
- December 29, 1893
- January 5, 1894
- January 12, 1894
- January 19, 1894
- March 2, 1894
- March 16, 1894
- May 11, 1894
- May 25, 1894
- June 1, 1894
- June 8, 1894
- July 13, 1894 → June 22, 1894
- July 20, 1894
- August 10, 1894
- August 17, 1894
- August 31, 1894
- September 7, 1894
- February 1, 1895
- February 22, 1895
- May 15, 1896

Eastern Beacon

August 4, 1880

North Sydney

News Boy

September 16, 1884

Herald

- February 9, 1887
- March 30, 1887
- April 6, 1887
- September 7, 1887
- March 28, 1888
- April 4, 1888
- April 11, 1888
- May 22, 1889

North Sydney

Herald

June 19, 1889 (some pages incomplete)
October 26, 1892
May 24, 1893
October 25, 1893,
December 26, 1894
February 20, 1895
February 27, 1895
January 29, 1896
February 5, 1890 (extra)
June 10, 1896
July 1, 1896

Baddeck

Island Reporter

April 29, 1886
April 26, 1888
May 22, 1889

Port Hood

The Referee

April 16, 1884 (+ supplement)

Antigonish

The Casket

October 9, 1890
December 11, 1890
February 5, 1891
February 12, 1891
February 26, 1891
March 5, 1891 → March 12, 1891
March 26, 1891
July 2, 1891
July 30, 1891
November 10, 1892 (some pages incomplete)

New Glasgow

The Enterprise

August 12, 1893
October 14, 1893
November 18, 1893

Eastern Chronicle

December 17, 1880

The Leader

September 29, 1896

Pictou

Pictou News

October 10, 1884
January 13, 1888

Cape Breton County Miscellaneous Reel # 5

Cape Breton News (Temperance Newspaper)

January 4, 1862
January 11, 1862
January 18, 1862
February 1, 1862
February 8, 1862
February 15, 1862
February 22, 1862
March 15, 1862
March 22, 1862
April 12, 1862
April 19, 1862
April 26, 1862
May 3, 1862
May 17, 1862
May 24, 1862
June 14, 1862
June 28, 1862
July 5, 1862
July 12, 1862
July 19, 1862
July 26, 1862
August 2, 1862
August 16, 1862
August 30, 1862
September 6, 1862
September 13, 1862
September 27, 1862
October 4, 1862
October 11, 1862
October 18, 1862
November 1, 1862
November 22, 1862
November 29, 1862
December 13, 1862
December 27, 1862

Cape Breton County Miscellaneous Reel # 5Cape Breton News

January 3, 1863
January 10, 1863
April 11, 1863
April 18, 1863
May 2, 1863
May 30, 1863
June 6, 1863
June 13, 1863
July 4, 1863
July 25, 1863
August 1, 1863
August 8, 1863
August 22, 1863
September 5, 1863
September 26, 1863
October 10, 1863 (poor condition)
October 24, 1863
November 7, 1863
November 14, 1863
January 2, 1864
February 27, 1864
March 5, 1864
May 6, 1865
May 13, 1865
May 20, 1865
June 3, 1865
June 10, 1865
June 17, 1865
June 24, 1865
July 1, 1865
July 8, 1865
July 15, 1865
July 29, 1865
August 5, 1865
August 12, 1865
August 19, 1865
August 26, 1865
September 2, 1865
September 9, 1865
September 16, 1865
September 23, 1865
September 30, 1865 (poor condition)

Cape Breton County Miscellaneous Reel # 5

The Advocate

October 29, 1885
November 5, 1885
November 12, 1885
November 19, 1885
August 16, 1888
August 30, 1888
September 13, 1888
October 25, 1888
December 13, 1888

(Only the bottom halves of some pages were filmed; the half pages may be from the July 14, August 25²⁶, and September 30 editions of The Advocate, from 1885.)

Island Reporter

March 25, 1886
April 1, 1886
April 8, 1886
April 15, 1886

The Lake Breeze

October 19, 1933

The Victoria Inverness Bulletin

November 23, 1929

Baddeck and Alexander Graham Bell, 1930

CAPE BRETON (ALL COUNTYS) MISCELLANOUS REEL 6

The Heather [Broughton]
 April 8, 1916 (vol. 1 #1) (185th Overseas Battalion C.E.F.)

Dominion News [Dominion] (Semi-monthly)
 June 15, 1906 (vol. 1 #1)
 June 30, 1906 (vol. 1 #2)
 July 14, 1906 ((vol. 1 #3)

The Clanny [Glace Bay]
 September 12, 1903 (vol. 1 #5)

People's voice [Glace Bay] (Labour)
 August 1971 (vol. 1 #1)

Social Justice [Glace Bay]
 Janaury 1935 (vol. 1 #1)
 February 1935 (vol. 1 #2)
 March 1935 (vol. 1 #3)

Standard [Glace Bay]
 September 28, 1909 (vol. 65 #1)
 November 4, 1910 (vol. 2 #254)
 May 25, 1911 (vol. 3 # 128)
 May 27, 1911 (vol. 3 #130)
 June 5, 1911 (vol. 3 #137)
 June 10, 1911 (vol. 3 #142)
 June 14, 1911 (vol. 3 #145)

New Waterford Times [New Waterford]
 January 22, 1931 (vol. 1 #36)
 September 16, 1932 (vol. 3#15)
 March 9, 1934 (vol. 4 #38)

CAPE BRETON (ALL COUNTYS) MISCELLANEOUS REEL 6 (cont'd)

New Waterford Times [New Waterford]

June 13, 1934 (2nd section)
 August 17, 1934 Page 4
 January 1, 1937 (vol. 7 #32)
 January 8, 1937 (vol. 7 #33)

North Sydney Herald [North Sydney]

June 17, 1874 (vol. 2 #32)
 September 9, 1874 (vol. 2 #44)
 October 15, 1884, (vol. 12 #50)
 April 25, 1888 (vol. 16 #24)
 March 11, 1891 (vol. 19 #317)
 June 7, 1893 (vol. 21 #30)
 November 14, 1894 (vol. 23 #1)
 June 18, 1902 (vol. 30 #33) *(only top half of page)*
 June 21, 1911 (vol. 39 #24)
 March 29, 1922 (vol. 50 #13) *(weekly)*
 April 1, 1925 (vol. 53 #13)
 May 4, 1932 (vol. 60 #18)
 April 4, 1932 (vol. 62 #14)
 August 8, 1934 (vol. 62 #32)
 August 14, 1934 (vol. 62 #33)
 August 29, 1934 (vol. 62 #35)
 September 5, 1934 (vol. 62 #36)
 October 24, 1934 (vol. 63 #44)
 October 31, 1934 (vol. 62 #45)
 November 7, 1934 (vol. 62 #45)
 December 5, 1934 (vol. 62 #49) *dec 12, 1934 (pp 3-6)*
 March 6, 1935 (vol. 63 #10)
 October 15, 1935 (vol. 63 #42)
 October 23, 1935 (vol. 63 #43)
 December 3, 1937 (pages 5-6)
 November 25, 1938 (vol. 66)
 December 9, 1938 (vol. 66)

CAPE BRETON (ALL COUNTYS) MISCELLANEOUS REEL 6 (CONT'D)

North Sydney Times (Cape Breton Spectator) [North Sydney]
June 16, 1849 (vol. 3, #25)

An Solus Iuil [Sydney]
Vol. 1 #1

Cape Breton Advocate [Sydney]
May 12, 1841 (vol. 1 #38)

Sydney Express [sydney]
August 31, 1880 (vol. #4) (3rd series)

Sydney Graphic [Halifax]
June 25, 1937 (vol. 1 #1)

Cape Breton Highlander [Sydney]
August 19, 1981 (vol. 2 #33)

Island Reporter [Sydney]
April 29, 1903 (vol. 20 #17)

Morning News [Sydney]
November 28, 1907 (vol. 1 # 21)

Daily Post [Sydney]
June 4 1912 (vol. 12, #55) (poor condition)
March 1, 1924 (vol. 24, #38)
March 16, 1932 (vol. 32, #64) [Sydney Post]
February 3, 1932 (pages 3-4)
January 27, 1939 (vol. 39 #23) [Sydney Post-Record]

Spirit of the times [Sydney]
December 28, 1842 (part)

CAPE BRETON (ALL COUNTYS) MISCELLANEOUS REEL 6 (CONT'D)

Steelworker and Miner [Sydney]

December 30, 1939 (#287)

January 27, 1940 (#291)

August 31, 1940 (#323)

December 15, 1951 (#816)

May 31, 1952 (#840)

August 29, 1953 (vol. 19)

August 22, 1953 (vol. 19)

October 24, 1953 (vol. 19)

The Trumpet [Sydney]

October 25, 1869 (vol 1 #1)

May 2, 1870 (vol. 1 #14)

May 16, 1870 (vol. 1 #?)

Sydney Mines Star [Sydney Mines]

October 18, 1905 (vol. 2 #34)

CAPE BRETON (ALL COUNTYS) MISCELLANEOUS REEL 6 (cont'd)

Bulletin [Port Hawesbury]

April 28, 1893 (Supp.)

June 19, 1896 (vol. 6 # 20) (Hawkesbury Bulletin & Strait of Canso
Shipping Gazette)

February 20, 1925 (vol. 35 #8) (Journal-Bulletin)

April 2, 1927 (vol. 16 #12) (Inverness County Bulletin & Port
Hood Greetings)

August 11, 1934 (vol. 36 #3) (Truro) (title: Victoria-Inverness
Bulletin- amalgamation of Victoria News,
Baddeck Journal; Journal -Bulletin,
Port Hawkesbury; Greetings, Port Hood;
News, Inverness)

News of the Week

December 2, 1873 (vol. 1, sample) (Port Hastings)

August 17, 1875 (vol. 2 #32) (Port Hawkesbury) (& Strait of Canso
Shipping Gazette)

Bras d'Or Gazette [St. Peter's]

April 25, 1900 (vol. 5 #6)

June 20, 1900 (part)

August 8, 1900 (vol. 5 #21)

Richmond Overcast [Grand Anse]

April, 1981 (vol. 1) (2 Copies)

May, 1981 (vol. 2)

June 15-July 15 (vol. 3)

August, 1981 (vol. 4) (ceased publication)

CAPE BRETON (ALL COUNTYS) MISCELLANEOUS REEL 8-(CONT'D)

Baddeck Telephone [Baddeck]

July 13, 1898 (vol.1 #1)

August 3, 1898 (vol. 1 #4)

March 1, 1899 (vol. 2 #9)

August 9, 1899 (vol. 2 #29)

August 8, 1900 (vol. 3 #21)

Victoria News [Baddeck]

Summer Season, 1915, (Special Ed.)

August 30, 1922 (part)

APPENDIX 5

EVENT-SPECIFIC DATA FOUND DURING THE SEARCH OF THE LONG RUN OF NEWSPAPERS FROM 1752 TO 1867 OR FOUND DURING THE EVENT-SPECIFIC SEARCHES; PERIOD COVERED 1755 TO 1915 PLUS ONE EVENT IN 1985. EVENT-SPECIFIC DATA ARE ARRANGED CHRONOLOGICALLY; EIGHT FIVE REPORTS IN ALL

Note: the newspaper articles cited in Appendix 5 are found in chronological order in the compendium of direct copies of articles found in Appendix 8 in Volume 2 of this report. Certain other non-newspaper references cited are found in Appendix 7 at the end of this volume when the reference was not previously known to the Earth Physics Branch; Smith's (1962) references are not duplicated in Appendix 7.

TABLE
 CHRONOLOGICAL LIST OF EIGHTY FIVE EVENT-SPECIFIC REPORTS
 FOUND IN APPENDIX 5

<u>TITLE/DATE</u>	<u>PREVIOUS* INFORMATION</u>	<u>TYPE**</u>	<u>EPICENTRE OR AREA FELT</u>	<u>DETAILED EVENT-SPECIFIC SEARCH</u>
November 18, 1755 Event	P-K	E, TG	Boston to Halifax	Yes
September 30, 1764 Event	P-K	E	Saint John, New Brunswick	Yes
June 25, 1808 Event	N	E, PG	Portland, Maine; Boston, Massachusetts	No
January 19, 1813 Tsunami Event	N	T, E?	Liverpool, Nova Scotia	Yes
November 9, 1816 Event	N	E	Montreal, Quebec	No
May 22, 1817 Event	N-D	E	Passamaquoddy Bay, New Brunswick	Yes
September 11, 1818 Event	N-D	E	Mountain base north of Quebec City, Quebec	Yes
		Remove		
		"ghost"		
		October		
		11, 1818		
"Latter end of November", 1819 Event	N	E	St. Lawrence River Valley, Quebec	No
February 1, 1821 Event	N	E	New London, Connecticut	No
February 27, 1821 Event	N-D	E	Valcartier, Quebec City area, Quebec	No
December 21, 1822 Event	N	E	Isle aux Noix, Quebec	No
July 12, 1823 Event	N	E	Kingston, Massachusetts	No
July 23, 1823 Event	N-D	E	Area north of Boston, Massachusetts	No
July 9, 1824 Event	N-D	E	65 km north of Fredericton in the Central Highlands of New Brunswick	No
? 1827 Event(s)	N	E	New Brunswick or Nova Scotia	Yes
February 7, 1831 Event	N	E	Near Quebec City, Quebec	No
July 14, 1831 Event	N-D	E	Near La Malbaie, Quebec	No
August 12, 1832 Event	N-D	E	Western Nova Scotia	Yes
March 5, 1834 Event	N	E	Lancaster, Pennsylvania	No
February 1(?), 1835(?) Event	N	E	Hartford, Connecticut	No
July 6, 1836 Event	N	E	Wickham, St. Stephen and Milltown, New Brunswick	No
? 1839 Event(s)	N	E	Nova Scotia or New Brunswick	Yes
September 26, 1840 Event	N	E	Hamilton, Ontario	No
January 25, 1841 Event	N-D	E	Long Island, New York City and 60 miles south	No
November 7, 1842 Event	N	E	Montreal, Lachine, Trois Rivières and several other places, Quebec	No
		Remove		
		"ghost"		
		November		
		9, 1842***		

TABLE (Continued)

<u>TITLE/DATE</u>	<u>PREVIOUS* INFORMATION</u>	<u>TYPE*</u>	<u>EPICENTRE OR AREA FELT</u>	<u>DETAILED EVENT-SPECIFIC SEARCH</u>
November 10, 1842 Event***	N(?)	E, PG	Quebec City and Trois Rivières, Quebec	No
February 8, 1843 Event	N	E	Yarmouth County, Nova Scotia	No
April 18, 1843 Tsunami and Possible Earthquake Event	N	T, E?	Off Cook's Harbour near Yarmouth, and at Yarmouth, Nova Scotia	Yes
May 13, 1844 Event***	N	E	25 to 30 kms outside Montreal, Quebec	No
August, 1844 Event	N	E	Montreal Mountain, Quebec	No
November 28, 1844 Event	N-D	E	Montreal, Quebec	No
April 29, 1845 Event	N	E	Montreal, Trois Rivières, Quebec	No
October 26, 1845 Event	N-D	E	Hudson River Valley, Felt in New York City, N.Y. on Long Island, in Brooklyn and in Connecticut	No
January 1, 1847 Event	N-D	G	Yarmouth, Nova Scotia	Yes
January 29, 1847 Event	N	E, PM	Antigonish, Nova Scotia	Yes
January 1, 1848 Event	N-D	G	Between Halifax and Truro??, Nova Scotia	Yes
February 1, 1848 Events	N-D	E	Near Halifax, Nova Scotia	Yes
September 24, 1848 Tsunami Event	N	T	Bonavista and Catalina, Newfoundland	No
Circa early November 1850 Event	N	E	Fredericton, New Brunswick	No
March 19 or March 20, 1853 Event	N?	E, PG	St. Catharines and Niagara, Ontario	No
April 2, 1853 Event	N	E	Halifax, Nova Scotia	No
May 24, 1853 Event	N-D	E	Ottawa, Ontario	No
June 3, 1853 Events	N-D	E	Yarmouth, Annapolis, Bridgetown, Kentville, Brooklyn, Newport, and Windsor, Nova Scotia	Yes
February 8, 1855 Event	N-D	E	Centered on Dorchester, New Brunswick, felt over whole area	Yes
March 13, 1855 Event	N	E	Yarmouth area, Nova Scotia	Yes
April 18, 1855 Possible Tsunami Event	N	T?	Owen Sound, Ontario; on Lake Huron	No
"A Few Months Since", June 1, 1855 Event	N-D	G	Granville Mountain, opposite Digby, Nova Scotia	Yes
January 15, 1856 Event	N	E	Yarmouth area, Nova Scotia	Yes
May 28, 1856 Event	N	E	Yarmouth, Nova Scotia	Yes
March 4, 1858 Events	N	E	Portland, Maine	No
March 30, 1859 Event	N	E	Halifax area, Nova Scotia	Yes
October 26, 1859 Event	N	E	Saint John, New Brunswick	Yes
October 12, 1860 Event	N	E	North-Central New Brunswick	No
October 17, 1860 Event	P-K	E	In the St. Lawrence River north of the mouth of Rivière Ouelle, Quebec	Yes

TABLE (Continued)

DETAILED
EVENT-SPECIFIC
SEARCH

TITLE/DATE	PREVIOUS* INFORMATION	TYPE**	EPICENTRE OR AREA FELI	No
July 11, 1861 Event	N-D	E	Ottawa, Ontario	No
October 30, 1861 Event*****	N	Remove "ghost"		No
March 8, 1862 Event	N	July 12, 1861	St. Croix, New Brunswick	No
June 29, 1862 Event(s)?	N	E	Quebec City, Quebec	No
January 1, 1863 Event	N	E	Grand Lake, New Brunswick	No
Circa mid-March 1863 Event	N	E	St. Andrews, New Brunswick	No
October 6, 1863 Event	N	E	Miramichi, New Brunswick	No
December 21, 1863 Meteorite Event	N	E, M	Montreal, Quebec	No
November 29, 1866 Event	N	E	Amherst and Parrsboro, Nova Scotia	Yes
December 23, 1866 Event	N	E	Saint John, New Brunswick or in the Bay of Fundy	No
September 29, 1867 Event	N	E	Lakeville on the Pugwash River, Nova Scotia	Yes
October 22, 1869 Event	N	E	Huntington, Quebec	No
February 8, 1870 Event	N-D	E	Passamaquoddy Bay area, New Brunswick	Yes
March 17, 1870 Event	P-K	E	Mouth of the Bay of Fundy	No
October 20, 1870 Event	P-K	E	Eastern Maine; west of St. Stephen, New Brunswick	No
July 8, 1873 Event	N-D	E	Baie-St. Paul, Quebec	Yes
March 5, 1874 Event	N-D	E	Halifax, Nova Scotia	Yes
		E	Yarmouth area, Nova Scotia	Yes
December 31, 1882 Events	N-D	Remove "ghost"		
October 6, 1886 Event	N	March 12 1874	Passamaquoddy Bay, New Brunswick	Yes
October 13, 1886 Event	N-D	E, PM E?	Annapolis and Queens Counties, Nova Scotia	Yes
		E	Sydney, Cape Breton, Nova Scotia	Yes
		Remove "ghost"		
		October 14, 1886		

TABLE (Continued)

<u>TITLE/DATE</u>	<u>PREVIOUS* INFORMATION</u>	<u>TYPE**</u>	<u>EPICENTRE OR AREA FELT</u>	<u>DETAILED EVENT-SPECIFIC SEARCH</u>
March 21, 1904 Event	P-K	E	Oak Bay-Passamaquoddy Bay area	No
August 21, 1904 Event	N	E	Offshore French Islands of Saint Pierre et Miquelon	No
May 13, 1908 Event	P-K	E	Western Nova Scotia	No
Circa 1908(?) Tsunami(?) Event	N	T?	Northern Cape Breton, Nova Scotia	Yes
December 20, 1909 Event	N-D	E	West side of Cape Breton Island, Nova Scotia	Yes
December 23, 1909 Event	N	E	Near mouth of Isaacs Harbour, Nova Scotia	Yes
May 1914 Tsunami Event	N	T, E?	Northern Cape Breton Island, Nova Scotia	Yes
January 22, 1915 Event	P-K	E	M/V ALEPO south of Sable Island, Nova Scotia	Yes
July 27, 1915 Event	P-K	E	Southwestern Nova Scotia	No
? 1928 Tsunami(?) Event	N	T?	-At Curling at the head of Humber Arm, Bay of Islands, west coast of Newfoundland	No
July 24, 1985 Event	N	E, T	Ubekendt Island, northwest Greenland	No

* Previous Information: P-K, Previously-known, little or no new information added by this study.
 N-D, Newly-documented, previously-known event to which significant new data has been added by this study
 N, New event, previously-unreported in Smith (1962) or in the Canadian Earthquake Epicentre File (CEEF)

**Type: E, earthquake; E?, possible earthquake
 T, tsunami; T?, possible tsunami
 M, meteorite impact, meteorite termination
 PM, possible meteorite termination?
 G, ghost event
 PG, possible ghost event?
 TG, tsunami ghost event listed in Smith (1962) in his U.S. section for the November 18, 1755 event; this mention of a West Indies tsunami in fact is a ghost of the November 1, 1755 Lisbon Earthquake's tsunami which propagated to the West Indies and to Bonavista, Newfoundland. (See Stevens, personal communication, August, 1984 cited in Adams and Staveley (1985) on p.50.)

*** Note added in proof: This event is now known to be an erroneous report. Pierre Gouin, S. J., Observatoire de Géophysique, Collège Jean-de-Brébeuf, 3200 Chemin Ste-Catherine, Montréal, P.Q., H3T 1C1 (personal communication, February 27, 1987) reports in a letter: "P.S. In Nov. 1842, there was only [one] event or one series of events on the 7th. I have over 20 records of it!"

**** Note added in proof: This event was brought to our attention by Ken Donovan, Historian, Fortress of Louisbourg National Park, Box 160, Louisbourg, N. S., BOA LMO (personal communication, January 27, 1987) very late in the process and has been added to Table 2, Table 5, Appendix 5 and Appendix 8 since it is a previously-unreported new event, not in Smith (1962). Thus we actually have 85 event-specific reports in Table 2 and in Appendix 5 and have 33 new non-Nova Scotian events in Table 5. Pierre Gouin, S. J. (personal communication, February 27, 1987) reports that he has also located his event: "My file shows that the shock was felt more strongly some 25-30 km outside Montreal and really shook people up."

***** Note added in proof: Burke et al. (1987) have firmly established that this date is in fact October 23, 1861 one week earlier. This was found during an event-specific search of the New Brunswick press in southwest New Brunswick for this event around the October 30, 1861 date as provided by our work here.

NOVEMBER 18, 1755 EVENT

EPICENTRE LOCATION:

This event occurred about 200 miles east of Cape Ann, Massachusetts. Smith (1962) lists 41.5° N, 67.0° W.

MAGNITUDE: Smith (1962) lists the intensity as IX on the Modified Mercalli Scale of Intensity of 1931 (Wood and Newman, 1931). This converts to a magnitude of 7.0 on the Canadian Earthquake Epicentre File (CEEF).

DATE: Tuesday, November 18, 1755

TIME: 0412 EST (0912 GMT)*

SUMMARY OF REPORTS:

Occurred under the Atlantic east of Cape Ann. Felt from Halifax to Annapolis Royal to Chesapeake Bay in Maryland. Felt from Lake George, New York on the west to a ship offshore near supposed epicentre.

REFERENCES AND TRANSCRIPTS:

This event was overlooked in the study until near the end and no detailed event-specific search was possible. Only the Royal Gazette was being printed at the time; all the November and December issues are missing at PANS. Thus we are only left with the entry of Smith (1962) in his Canadian section as below:

17. 1755 NOVEMBER 18. 4:12 a.m. IX. 41.5° N, 67.0° W
(47) About 200 miles east of Cape Ann, Massachusetts. Felt at Halifax, Nova Scotia. For details see No. 47 of the United States list. Plotted on map as No. 47 in U.S.A. A7, B3, B4, B5, D2, H1, H10, K1, Pl.1, M3, W1.

Smith (1962) also noted this earthquake in his United States section and credits it with causing a tsunami at St. Martins Harbour in the West Indies as below:

47. 1755 NOVEMBER 18. 4:12 a.m. IX. 41.5° N, 67.0° W
Under the Atlantic Ocean about 200 miles east of Cape Ann, Mass. Accompanied by a tsunami which withdrew the water from St. Martins Harbour [harbour of the Dutch part of St. Maarten] in the West Indies leaving vessels aground. The shock was felt from Halifax, N. S. southward to

* Throughout Appendix 5 (and the full report) the use of Greenwich Mean Time (GMT) is nominal GMT since in general the conversion in early years from local time to GMT was not an integral number of hours (see text on page 18).

NOVEMBER 18, 1755 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Chesapeake Bay in Maryland and from St. George, N. Y., eastward to a ship 200 miles east of Cape Ann. The ship is thought to have been near the epicentre because those on board felt the shock so strongly that they believed the ship had run aground. The greatest damage occurred in Boston. A7, B3, B4, B5, D2, H1, H10, K1, Pl.1, M3, M7, W1.

Brigham (1870) notes in his account, New England Shaken on p. 32, col. 1 quoting Professor John Winthrop of Cambridge, Massachusetts:

"... For the other limit towards the northeast, we are informed that the earthquake was felt at Annapolis Royal in Nova Scotia though in a much less degree than with us [in Cambridge, Massachusetts]. It shook off a few bricks from the tops of some chimneys, but was not perceived by vessels on the water. It was not felt north of Halifax, but our army at Lake George [New York] perceived a slight trembling; and in the Atlantic ten leagues to the east of Cape Ann, the people onboard a vessel supposed they had run aground, so robust was the shock, but their lead showed fifty fathoms of water."

Brigham (1871) used the same material as Brigham (1870). He quotes Professor John Winthrop and cites his material as being in the Philosophical Transactions in 1757.

We have not seen all of Smith's (1962) references but know that Brooks (1960), Dawson (1860) and Kain (1898) add nothing to Winthrop (1757) and Brigham's (1871) careful work.

The Public Archives of Nova Scotia have a family scrapbook (Almon, item circa 1755) which contains a broadsheet entitled, "Earthquakes, Token of God's Wrath"; this poem and sketch probably was "Sold by J. Green opposite Mr. Church's Vendue-House" [store] in Boston(?).

DISCUSSION AND CONCLUSIONS:

Our search has not turned up any new data that was not previously known in much older publications. We believe Winthrop (1757) should be examined in the original and copies of the Halifax Royal Gazette for November 1755 watched for. Other archival sources and diaries must be accessed to examine this earthquake in Nova Scotia in more detail.

NOVEMBER 18, 1755 EVENT (CONTINUED):

DISCUSSION AND CONCLUSIONS (CONTINUED):

The tsunami noted by Smith (1962) in his United States Section is believed to be a ghost of the November 1, 1755 Lisbon earthquake per the reasoning below found on p. 50 of Adams and Staveley (1985):

The great earthquake at Lisbon on November 1, 1755 caused a devastating tsunami. A tsunami was also recorded in November 1755 at St. Martins Harbour in the West Indies where vessels were left aground (Smith, 1962, p. 290). Smith's attribution of the West Indies tsunami to the November 18, 1755 Cape Ann, Massachusetts, earthquake that happened two weeks later represents a mistake in the source cited by Smith.

Anne Stevens, Earth Physics Branch (private communication, August 1984), has analyzed the event as follows: W. T. Brigham reported that the tsunami in the West Indies occurred nine hours after the shock was felt in Boston, that is about 2 p.m. The average velocity of this alleged tsunami would have been about 300 km/hr, well below the typical velocity in the open ocean. If, however, the tsunami in the West Indies occurred about 2 p.m. local time on the day of the earthquake felt in Lisbon about 10 a.m. local time, the average velocity (allowing for the difference in time zones) would be 700 km/hr, a more typical value. Further, a comprehensive compilation of the local effects of the Cape Ann earthquake (Street and Lacroix, 1979) makes no mention of a tsunami either locally or at larger distances. Thus it can be concluded that the Cape Ann earthquake did not produce a tsunami in the West Indies or elsewhere.

SEPTEMBER 30, 1764 EVENT

EPICENTRE LOCATION:

This event was felt in Saint John, New Brunswick. The exact location of the epicentre is not really known at present. The Canadian Earthquake Epicentre File (CEEF) assigns an arbitrary location of 45.3°N, 66.0°W*, just north of the city of Saint John.

MAGNITUDE: Smith (1962) assigned an arbitrary intensity of V on the Modified Mercalli Intensity Scale of 1931 (Wood and Newman, 1931). This converts to a magnitude of 4.4 on the CEEF.

DATE: "30th of September last"; Sunday, September 30, 1764

TIME: "about Twelve o'Clock at Noon"; about 1200 AST (1600 GMT)

SUMMARY OF REPORTS:

There is only one report "that a very severe Shock of an Earthquake was felt there."

REFERENCES AND TRANSCRIPTS:

Smith reports this event in his 1962 compendium per the entry below:

18. 1764 SEPTEMBER 30. "About noon." V. K1.
 "In the Halifax Gazette (Nova Scotia), December 13, 1764, occurs the following news item: 'We hear from St. John's' (New Brunswick, then part of Nova Scotia) "in this province that on the 30th of September last about 12 o'clock noon that a very severe shock of an earthquake was felt there." K1

Smith (1962) cites K1 as his reference which is Kain's (1898) list of New Brunswick earthquakes. Kain, in fact, quotes (as does Smith) the brief report in the Halifax Gazette of Thursday, December 20 (not December 13 as Smith cites), 1764, p. 4, col. 1, which we located and transcribe below:

We hear from St. John's in this Province, that on the 30th. of September last, about Twelve o'Clock at Noon, that a very severe Shock of an Earthquake was felt there.

Note: "in this Province" refers to the province of Nova Scotia which included New Brunswick in 1764. St. John's refers to Saint John, New Brunswick. New Brunswick became a separate province in 1784.

SEPTEMBER 30, 1764 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Robert E. Kroll (1979) in an article in Halifax Magazine (Vol. 1, No. 12, p. 68, col. 1) refers to the 1764 event per the transcript below:

There have always been skeptics. Halifax merchants, in 1764, pooh-poohed the Royal Gazette's September 30th news item that a "severe earthquake" shook the trading settlement at the mouth of the River St. John. It began at 12:00 noon, the newspaper reported, with a low subterranean rumble that preceded the quake. Nothing spectacular, just shaking and rumbling. No fissures, cracked walls, nor broken dishes. Neither Halifax nor Boston reported similar earth tremors. Bah!, the Halifax merchants and government officials scoffed. They attributed the earthquake along the St. John River to a bad batch of Josh Mauger's Halifax rum. (article in Appendix 7).

Note: The Royal Gazette piece was December 20, 1764, not September 30th. The Royal Gazette was then known as the Halifax Gazette (Appendix 1).

Kroll has been twice asked for his source some months ago and has not as yet responded. We do not believe any of the information in this paragraph can be taken at face value. Rather, the whole article should be regarded as light, fanciful reading with a high degree of poetic license applied. We do not believe he saw any other reference than the December 20, 1764, article in the Halifax Gazette. We have seen no other reference.

 DISCUSSION AND CONCLUSIONS:

No further data was found on this earthquake during the study. Sources in southern New Brunswick and in northeast Maine should be examined to see if any other felt reports are recorded. There is, at present, considerable uncertainty as to the event's location and magnitude. No further work was done on this event, at present, since it was beyond the areal scope of the study.

JUNE 25, 1808 EVENT

EPICENTRE LOCATION:

Felt in Boston and Salem, Massachusetts and felt more severly in Portland, Maine. The exact location of the epicentre is not known at present.

MAGNITUDE: not known

DATE: Saturday morning, June 25, 1808

TIME: "about" 0255 EST first shock
(0755 GMT)
0255:30 EST second shock
(0755:30 GMT)

SUMMARY OF REPORTS:

Two shocks of an earthquake awakened "people from a sound sleep by the shaking of their beds".

REFERENCES AND TRANSCRIPTS:

Article found in the Halifax Weekly Chronicle, July 15, 1808, p. 3, col. 4. The transcript of article follows:

BOSTON
June 30

--

EARTHQUAKE

Two shocks of an Earthquake were experienced in this town, about five minutes before three o'clock, on Saturday morning. The first shock agitated houses so much that it awaked people from sound sleep by the shaking of the beds: - The second shock, less violent than the first, followed in the coming half a minute, and both were of about ? seconds duration each. - The earthquake we learn, was more severly felt in Portland than here. - The Salem Gazette, of yesterday mentions the Earthquake to have been perceived by a number of persons in that town.

Note: The right-hand side of this article was lost in the micro-filming and the exact number of seconds cited cannot be read on the microfilm.

DISCUSSION AND CONCLUSIONS:

This event is not reported in Smith (1962); he does report an event at 1451, Sunday, June 26, 1808, that was felt in southern Maine. This event

JUNE 25, 1808 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

appears to be a new event prior to the reported event. It may be that Smith's local time of "2:51 p.m." on Sunday, June 26, 1808, is numerically the same as, or very close to, the newspapers article's time of 2:55 a.m., Saturday, June 25, 1808, and that suggests that one of these events represents a confusion and, hence, may be a "ghost event".

No further research was done on this apparently new event at this point since it was beyond the areal scope of the study. Further historical work should be done to confirm whether or not there are two events.

JANUARY 19, 1813 TSUNAMI EVENT

EPICENTRE LOCATION:

Offshore of Liverpool, Nova Scotia; possibly a local(?) earthquake. The exact location of the epicentre is not known at present.

MAGNITUDE: not known

DATE: Tuesday, January 19, 1813

TIME: tsunami occurred at 1130 AST
(1530 GMT)

SUMMARY OF REPORTS:

This is a previously-unreported Nova Scotia event.

On this day there was some severe wind followed by a calm. An "uncommon bore, or influx of the sea" five or six feet high ran up the harbour very quickly hitting five vessels, stowing in one of their sterns and moving them upstream. These five and three others grounded upstream. Two others broke free and were carried seaward over the bar. Rising ice destroyed a bridge. Haliburton (1829) reported "A rumbling noise, not unlike that of thunder, having been heard a short time previous,...., this phenomenon has been generally attributed to the shock of an Earthquake".

REFERENCES AND TRANSCRIPTS:

The first reference to this event was found in More (1873). The Halifax Weekly Chronicle was searched from Friday, January 22 to Friday, January 29, 1813. An article was found in the Weekly Chronicle on Friday, January 29, 1813, p. 3, col. 4. A transcript of the article appears below:

LIVERPOOL, N. S.
Jan. 20.

--

At six o'clock yesterday morning, three very heavy claps of thunder, preceded by vivid flashes of lightning were heard here, apparently very near. They were followed by a heavy squall of wind, hail and rain, to which succeeded a calm, with rain, which continued until half-past eleven, A.M. when an uncommon bore, or influx of the sea, rising to the height of 5 feet, ran up the harbour very swift, taking in its course the brig Parker & Sons, and prize brig Economy: then struck the prize schr. Polly, and stove in her stern - then the prize ship Factor and schr. New-Forge, and carried them a considerable distance up the river, where the whole at last grounded. The Liverpool Packet, and prize schrs. Edward and Hiram, and Landlady, were driven on an island in the river: brig Ocean broke her

JANUARY 19, 1813 TSUNAMI EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

fastenings, and not grounding before the ebbing of the tide, drifted out of the river: she was however followed by a boat with a cable and anchor, and fortunately brought up under the lee of the fort. - A new ship, owned by Mr. Dewolf, broke adrift, but was saved by great exertions.

The tide continued its rapidity until it reached the Falls, where [it rose] to a great height, and carried [sic] away Salmon Island Bridge.

Though the damage done is considerable, we have reason to be thankful it was not more: for all the vessels, wharves, and stores, at first it was feared would be destroyed. - No lives were lost, though many were much in danger.

The large ship Prince Regent having the day before yesterday moved over the Bar, rode out the storm, and received no injury.

A second article was found in the Halifax Acadian Recorder of January 30, 1813, p. 3, col. 2 and it presents a somewhat different picture of the event, including putting the tsunami or tidal wave on the 21st of January, 1813, at "nearly noon". Transcript of article:

On the Evening of 20th inst.* an extraordinary storm was experienced at Liverpool, N. S.; it commenced with heavy claps of thunder, succeeded by a violent squall[sic] of wind, and afterward by a calm and hard rain which continued till nearly noon of the next day, when the tide rose suddenly five feet, rushing in with a bore, threatening to sweep away wharves and shipping; fortunately the damage sustained was not very considerable, and no lives lost; the bridge at Salmon river was carried away, and some vessels driven on shore, amongst which we are sorry to see the name of the Liverpool Packet. - Such convulsions of nature are generally forboders of greater evil in distant parts.

Thomas C. Haliburton (1829) cites the event as on January 20, 1813, at 1100. The general description is similar to the article in the Weekly Chronicle. The transcript of Haliburton's (1829) reference follows:

In the year 1813 Liverpool was visited by a very extraordinary influx of the sea. On the 19th of January, there was a severe gale of wind from the south-

* instant - of this month

JANUARY 19, 1813 TSUNAMI EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

ward, which terminated at 5 o'clock on the morning of the 20th in a thunder storm. From that time the weather had become moderate, the wind had ceased and the water was calm. At 11 o'clock in the day it began to blow violently from the South East, and immediately afterwards from the Northward, when the sea appeared to have suddenly risen 6 feet above its ordinary level, and to be rushing with prodigious violence into the harbour. The vessels at the wharves were swept away in an instant, some of them having broken their fastenings, and others torn away the piles to which they were attached. Five of them were forced up the river, with as much velocity as if they had been under a press of sail, and on the reflux a large brig and a ship were driven over the bar and carried out to sea. At the falls the Ice was immediately floated, and on its rise destroyed the bridge. In less than an hour the agitation of the water subsided, and was succeeded by a breeze from the North East, attended with sleet and hail. A rumbling noise, not unlike that of thunder, having been heard a short time previous, and no similar influx having been perceived in any harbour on the coast, this phenomenon has been generally attributed to the shock of an Earthquake.

More's (1873) reference at the start of Chapter V in his, The History of Queens County, is simply a verbatim recitation of Haliburton's 1829 description and adds nothing new or different.

DISCUSSION AND CONCLUSIONS:

This tidal event is believed to be real. It is a previously-unreported event which is not in the CEEF. It is not reported in Smith (1962) and no events are cited near it in time. The three descriptions are all somewhat different and indicate different dates. We believe that the Weekly Chronicle article of Friday, January 29, 1813, is the best one to accept; this article is clearly datelined "Liverpool, N.S., Jan. 20" and refers to "yesterday morning".

There is no mention of a prior withdrawal of water prior to the sudden rise as is common with tsunami. The Weekly Chronicle and Acadian Recorder articles do not mention thunder or rumbling just prior to the rapid tidal rise. Only Haliburton refers to, "a rumbling noise, not unlike that of thunder, having been heard a short time previous", and noted that, "this phenomenon has been generally attributed to the shock of an Earthquake" because "no similar influx having been perceived in any harbour on the coast". However, the Acadian Recorder does note "Such convulsions of nature are generally forborders of greater evil in distant parts."

JANUARY 19, 1813 TSUNAMI EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

This reasoning is a bit reversed since one would expect a tsunami from a distant earthquake to have been seen at numerous coastal localities unless Liverpool Harbour has particularly sensitive, resonant dimensions. A very local, nearby earthquake could well cause a very local tsunami and would result in Haliburton's (1829) "rumbling noise....heard a short time previous".

All reports mention an earlier storm or "squal[sic] of wind, hail and rain" followed by a calm with rain; only Haliburton (1829) mentions a violent wind and a sudden reversal of the wind. There is a nagging concern that this tidal event might have been only caused by a severe atmospheric anomaly. However, it does appear to have been a tsunami and should be entered in the Canada Earthquake Epicentre File (CEEF) in the tsunami section, to have been the result of a possible local earthquake. The event deserves further research to locate the other sources and to see if some distant causative earthquake can be defined in the worldwide epicentre file for all the Atlantic.

NOVEMBER 9, 1816 EVENT

EPICENTRE LOCATION:

Near Montreal; the exact location of the epicentre is not known at present.

MAGNITUDE: not known

DATE: Saturday, November 9, 1816

TIME: "about" 1205 EST
(1705 GMT)

SUMMARY OF REPORTS:

"slight shock of an earthquake"

REFERENCES AND TRANSCRIPTS:

Article found in the Halifax Acadian Recorder, December 21, 1816, p. 2, col. 1. A transcript of the article follows:

HALIFAX
Saturday Morning, December 21, 1816

A slight shock of an Earthquake was felt in Montreal about five minutes after mid-day on Saturday the 9th of November.

DISCUSSION AND CONCLUSIONS:

The event is not reported in Smith (1962); this event should be added to the CEEF. No further research was done on this apparently new event at this time since it was beyond the areal scope of the study.

MAY 22, 1817 EVENT

EPICENTRE LOCATION:

Previously located at 46.0°N, 69.0°W in Smith (1962), but recently relocated to the Passamaquoddy Bay area by Leblanc and Burke (in press, 1985) to about 45.1°N, 67.0°W.

MAGNITUDE: Smith (1962) lists an intensity of VII on the Modified Mercalli Intensity Scale of 1931. The CEEF gives a magnitude m_{blg} of 5.0. Leblanc and Burke (in press, 1985) suggest a magnitude range of 4.5 to 5.0 (m_{blg}) using the relationship of Street and Turcotte (1977).

DATE: Thursday, May 22, 1817

TIME: 1500 AST in the CEEF and Smith (1962). This is incorrect and should be changed in the CEEF. The articles we have found suggest, and Leblanc and Burke (in press, 1985) use, 0330 AST (0730 GMT).

SUMMARY OF REPORTS:

Earthquake was felt in the Annapolis Valley from Annapolis through to Digby and in Lunenburg on the Atlantic coast. The earthquake was also felt in southern New Brunswick and down the Maine coast through to Medford, Roxbury and Cambridge in the Boston area.

REFERENCES AND TRANSCRIPTS:

This earthquake is reported in Smith's (1962) compilation of earthquakes in Eastern Canada as:

26. 1817 MAY 22. 3:00 p.m. VII. 46.0°N, 69.0°W.
(94) Central Maine. Felt all over New Brunswick as well. Plotted on the map as No. 94 in U.S.A. K1, M3.

The earthquake is also briefly reported in Monro (1855), DesBrisay (1895), Calnek (1897) and in a fanciful way in Kroll (1979); Kroll's article can not be trusted in that much of it is fanciful invention and fictional amplification. Leblanc and Burke (in press, 1985) do quite exhaustive work on defining some 22 sources of data in relocating the epicentre from central Maine to the Passamaquoddy Bay area. We have found that newspaper reports have been most useful and have added Lunenburg, Nova Scotia, Medford, Roxbury, Cambridge, and Boston, Massachusetts to the lists of places where the event was felt.

A Saint John account dated May 24 is repeated in four papers, at least: Halifax Weekly Chronicle, May 30, 1817, p. 3, col. 3; Acadian Recorder, May 31, 1817, p. 2, col. 7; Nova Scotia Royal Gazette, June 4, 1817, p. 3, col. 4; and Halifax Journal, June 9, 1817, p. 1, col. 2. The transcript of the Weekly Chronicle article follows:

St. John, N.B. May 24. - The shock of an Earthquake was felt here on Thursday morning last, at 31 minutes past 3 o'clock. It was preceded a few seconds by a

MAY 22, 1817 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

noise as if a gale of wind had suddenly sprung up, after which the earth began to shake violently, and there was a rumbling as if some heavy carriages were passing. The trembling continued about 15 seconds - The air was perfectly clear - In about a minute after the shock, deep moanings were heard for a short time, which apparently came from the Southward.

We have heard that the Earthquake was felt at Fredericton about the same time, which was fully as violent as at this place.

By accounts from St. Andrews, we are informed the Earthquake was very severely felt at that place - The alarm was so great as to occasion the soldiers to leave their Barracks, and many inhabitants their dwellings.

Another article reporting the effect of the earthquake in the Digby to Annapolis area also appeared in at least four newspapers: Nova Scotia Royal Gazette, May 28, 1817, p. 3, col. 4; Halifax Weekly Chronicle, May 30, 1817, p. 3, col. 3; Acadian Recorder, May 31, 1817, p. 2, col. 4; and Halifax Journal, May 26, 1817, p. 3, col. 3. A transcript of the article as it first appeared in the Nova Scotia Royal Gazette (citing the Halifax Journal) appears below:

A Gentleman has arrived in Town from Annapolis - he informs us, that three severe shocks of an Earthquake were felt at that place, at Granville, Digby and Wilmot, on Thursday morning last, a little before sunrise: that they took place within the space of 15 minutes, and were accompanied by a roaring noise - the Houses were shaken, and the Inhabitants much alarmed, particularly those of Digby, where the concussions were most violent. - Hal. Jour.

Another article which refers to the event being felt in Boston, Medford, Cambridge and Roxbury, Massachusetts is also found in at least four Nova Scotian newspapers: Weekly Chronicle, May 30, 1817, p. 3, col. 1; Acadian Recorder, May 31, 1817, p. 2, cols. 4 and 5; Nova Scotia Royal Gazette, June 4, 1817, p. 3, col. 4; and Halifax Journal, June 9, 1817, p. 1, col. 2. A transcript of the Halifax Journal article, which is one of two with a clear Boston dateline, appears below:

Boston, May 23. - EARTHQUAKE. - A considerable shock of an Earthquake was noticed by many persons in this town, between two and three o'clock yesterday morning.

The same shock was remarked at Medford, Cambridge, and Roxbury, and probably in other towns from which we have not heard.

MAY 22, 1817 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Three other articles also appear in the subsequent issues of the Acadian Recorder. These articles report on: June 7, 1817 (p. 2, col. 5) that the earthquake was felt in Wiscasset, Maine; June 14, 1817 (p. 2, col. 6) that the event was experienced in Lunenburg, Nova Scotia; and June 28, 1817 (p. 1, col. 2) quoting a June 14, 1817, New Brunswick paper that "The late Earthquake... was felt on the 22d ult.*...over the Island of Grand Manan". These three articles are quoted below.

The transcript of the Acadian Recorder, June 7, 1817, p. 2, col. 5, article is below:

Wiscasset, (Maine,) Thursday, May 22 - One of the heaviest shocks of an Earthquake ever experienced in this vicinity, was felt this morning about three o'clock. The convulsion was sufficient to jar a door, and the noise resembled the explosion of a large quantity of gunpowder unconfined."

The transcript of the Acadian Recorder, June 14, 1817, p. 2, col. 6, article on Lunenburg follows below:

Halifax
SATURDAY MORNING, JUNE 14, 1817

From LUNENBURG, June 4

"On Thursday the 22d ult. about 3 o'clock morning, we experienced here one violent shock of an Earthquake, which took a S.W. direction. The water in the wells seemed a little agitated, depositing a sediment, which on anylization, indicated the presence of carbonate of iron, with sulphur and other unknown substances. The air felt much more unnatural than usual for one hour, being deficient of a great portion of its electrical fluid. The air seemed to contain an overplus of azotic and hydrogen gas."

The transcript of the much later Acadian Recorder, June 28, 1817, p. 1, col. 2, article taken from a June 14, 1817, Saint John paper on the effects felt on Grand Manan Island is found below:

From A New-Brunswick paper of June 14th.

The late Earthquake was felt on the 22d ult. over all the Island of Grand Manan - and has been thus described to us - the Reporter was awakened just after daybreak by the shock of a loud sound, and a violent shaking of the house, at the same inst. The shaking ceased very soon - but the

*ultimo - of last month

MAY 22, 1817 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

sound he thinks continued from 30 to 45 seconds after he awoke, lessening gradually till it entirely died away. Some of the inhabitants say it was perceived much longer, but the best opinions were that it lasted a full minute. - All agree in describing the motion as violent, and the sound to have been very loud. The weather at the moment was fine and serene, with a light breeze of wind from the northward. The previous day it had been uncommonly hot for the season. During the 22d the weather continued very fine and warm - the wind being easterly and light.

An article was found in the Halifax Journal of Monday, August 27, 1832, p. 3, col. 2 in investigating the August 12, 1832 event in Yarmouth, Nova Scotia and it noted at its end:

Some of our old inhabitants affirm that a similar shock was felt here about 15 years ago.

This later article in 1832 confirms a felt report for the May 22, 1817 event in Yarmouth that was "similar" to the August 12, 1832, event. The August 12, 1832, event in Yarmouth was consistently described as "a slight shock", but also as an event which "shook many houses very violently", continued "for about 25 seconds" or "nearly a minute" and "was felt or[sic] several miles round the country, but done[sic] no damage" (Halifax Journal, August 27, 1832, p. 3, col. 2 and Acadian and General Advertiser, August 17, 1832, p. 3, col. 3).

The weekly Free Press was also searched from Tuesday, May 27, 1817, to Tuesday, June 10, 1817, with no articles on the May 22, earthquake found. This was the only one of five newspapers used for this event-specific search that did not yield articles of interest.

W. A. Calnek (1897) mentions the 1817 earthquake in his history of Annapolis County (reprinted 1980) on p. 286 as seen below:

The year 1817 was remarkable for three earthquake shocks, about sunrise of May 22nd, of a severity unusual in this part of the globe. They were felt all over the county, particularly at Digby, where houses were shaken, and the people much alarmed.

Similarly, Mather Byles DesBrisay (1895) cites the 1817 event under his chronological year-by-year section on p. 554 as seen below:

1817.

May 22nd. - The shock of an earthquake was felt at Lunenburg. At the same time houses were shaken, and furniture moved at Digby. Shocks were also felt at Granville, Annapolis, and Wilmont.

MAY 22, 1817 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Both these accounts are probably derivative in nature and do not add new data. They are included here only for completeness.

Newspapers Searched: •

Halifax Acadian Recorder, searched throughout the period; six articles found (see above).

Halifax Free Press, searched May 27, 1817 to June 10, 1817; no articles found.

Halifax Journal, searched May 26 to June 9, 1817; three articles found (see above).

Halifax Nova Scotia Royal Gazette, searched May 28, 1817 to June 4, 1817; three articles found (see above).

Halifax Weekly Chronicle, searched May 23, 1817 to June 13, 1817; three articles found (see above).

DISCUSSION AND CONCLUSIONS:

Leblanc and Burke (in press, 1985) have done quite a complete study of this event. This study has really only added some references to already-known data. A new felt report for Lunenburg has been added, as well as references to the event being felt in Boston and in the Boston area at Cambridge, Medford and Roxbury. A search of the Yarmouth and Hants County (Windsor) papers might extend the felt area.

The time of this event is incorrect in the CEEF. Smith (1962) used "3:00 p.m.", having probably confused the three a.m. reports for three p.m. The reports we have found all are clear that it was a morning event.

In the previously-transcribed articles above, one finds, "Thursday morning last, at 31 minutes past 3 o'clock" in Saint John, New Brunswick; "a little before sunrise" at Annapolis, Granville, Digby and Wilmot, Nova Scotia; "between two and three o'clock yesterday morning." at Boston which would have been one hour earlier on local Nova Scotian and New Brunswick clocks, depending on when Atlantic Standard Time came into practise, vis-a-vis Boston's Eastern Standard Time; "felt this morning about three o'clock" at Wiscasset, Maine (we do not know if this was EST); "about 3 o'clock morning" at Lunenburg, Nova Scotia; and "just after daybreak" on Grand Manan Island, New Brunswick. Calnek (1897) indicated, "about sunrise" for the time.

MAY 22, 1817 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

Leblanc and Burke (in press, 1985) cite 17 sources, including five American sources and they list the time in their Table 8 as, "3:30 L.T.", i.e., 0330 local time. Smith and Bridges (1983) in their Maine Geological Survey Open-File No. 83-10 cite, in the appended computer printout, the May 24, 1817 New Brunswick Courier of Saint John and list, "8:31 A.M."; we believe this is a typo and should be the 3:31 a.m. time as quoted in the Nova Scotia papers, but we have not seen the Saint John Courier of this date. The same authors also cite in the same appendix, the Maine Historical Society manuscript called the "Theodore Lincoln Diary" and it gave, "3:30 A.M." as the time at Dennysville, Maine (Smith and Bridges, 1983).

We believe the various sources listed by Leblanc and Burke (in press, 1985) which are not included here, should be checked directly and if in agreement, then the time of the event in the CEEF should be corrected to 0330 AST (0730 GMT). Care should be taken to check whether the cited 0330 local time in the Dennysville, Maine, and 0331 local time apparently in the May 24, 1817 Saint John Courier are AST or EST so that the correct GMT can be entered in the CEEF.

SEPTEMBER 11, 1818 EVENT

EPICENTRE LOCATION:

Felt "along the base of the mountains north of Quebec" City, Quebec. The exact location of the epicentre is not known at present.

MAGNITUDE: Smith (1962) lists an intensity of IV on the Modified Mercalli Intensity Scale of 1931 which converts to a magnitude of 3.7 on the CEEF.

DATE: Friday, September 11, 1818 (not October 11, 1818)

TIME: not known

SUMMARY OF REPORTS:

"An earthquake sufficiently powerful to shake the windows and furniture of houses."

REFERENCES AND TRANSCRIPTS:

The article was found in the Halifax Acadian Recorder of October 3, 1818, p. 3, col. 3, citing a September 22, 1818, New York dateline. A transcript of the article is below:

NEW-YORK, Sept. 22

An Earthquake, sufficiently powerful to shake the windows and furniture of houses, was felt on the 11th inst. along the base of the mountain north of Quebec.

Smith (1962) cites the event incorrectly in his compendium of Eastern Canadian events as being on October 11, 1818, and cites:

27. 1818 OCTOBER 11. IV. 46.9°N, 71.2°W. North of Quebec City, Que. B4, B5, D2.

"October 11, 1818, strong shocks were felt along the base of the mountains to the north of Quebec. The windows and furniture of the houses were shaken." B4.

DISCUSSION AND CONCLUSIONS:

Smith cannot be correct in the date of October 11, 1818, since our above newspaper source is dated October 3, 1818, and cites a New York dateline of September 22, 1818. In quoting his B4 reference which is Brigham (1871), Smith (1962) quotes it correctly. Brigham (p. 17) only adds a note that the mountains are the "Qu. Watchish Mts." Brigham (1871) cites his source as footnote 4 which reads:

SEPTEMBER 11, 1818 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

Annales de Chimie et de Physique, t. XII, p. 426.
 Quarterly Journal of the Royal Institution, Vol. VI, p.
 370.

We have seen the first French reference cited by Brigham which is an 1819 compilation by Anonymous (1819a). The item appears under the section called, 'tremblemens de terre.', in the first section titled, 'Supplement à la liste donnée, pour 1818, dans le tome IX, page 443.' which runs from page 425 to 426. On page 426, the following item appears:

11 octobre. Nord de Québec. Secousses assez fortes.

We do not know from whence the compiler of the supplementary list picked up the error.

We have also seen Brigham's (1871) second reference which is also an 1819 reference (Anonymous, 1819b); whence the apparent error arose. In this reference in Item 4 called, 'Earthquakes', of a section called, 'Miscellaneous Intelligence', the following note is found:

"An earthquake sufficiently powerful to shake the windows and furniture of houses was felt on the 11th of October, along the base of the mountain north of Quebec."

These words are, but for the date, an exact quote of the September 22, 1818, New York report cited in the Acadian Recorder of October 3, 1818. It is clear that the compiler of newspaper reports for Item 4 in the, 'Miscellaneous Intelligence', section quoted above, noted the month incorrectly and Brigham (1871), probably Dawson in 1860 (see below) and then Brooks (1960 - see below) and finally Smith (1962) were all lead astray by the initial error and none of these later authors went back to check original sources.

Similarly, Smith cites reference B5 which is Brooks (1960) and reference D2 which is Dawson (1860). The Brooks reference simply lists the event on p. 16 as No. 160, "1818 10-11 Quebec", which is October 11, 1818. Again, we do not know from whence the apparent error arose in Brooks. Dawson (1860) reports mainly on the major October 17, 1860, Rivière Ouelle, Quebec, earthquake and includes a list of Canadian earthquakes noting only (p. 369):

The following list taken from the Report above referred to [cited by Dawson only as by Mallet, 'Report of the British Association for 1853'] and [from] other sources, includes all the subsequent earthquakes recorded as having affecting Canada, or the neighbouring parts of America.

1818, Oct. 11, Canada. Felt near Quebec

SEPTEMBER 11, 1818 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

It is clear that Dawson in quoting Mallet's list (and apparently Mallet himself) did not check original newspaper accounts. We have not seen the report of Mallet from 1853. The Canadian Earthquake Epicentre File (CEEF) lists this event as Sunday, October 11, 1818. While we are not exactly certain from whence the error arose, we believe it is clear that the above October 3, 1818, newspaper reference citing a September 22, 1818, New York source, means that the October 11, 1818, date is in error and should be replaced in the CEEF with "on the 11th inst." i.e. the 11th of this month (September). The correct date of this earthquake is Friday, September 11, 1818.

No further work was done on the corrected event at this time since it was beyond the areal scope of the study.

"LATTER END OF NOVEMBER", 1819 EVENT

EPICENTRE LOCATION:

St. Lawrence River Valley? The exact location of the epicentre is not known at present.

MAGNITUDE: not known

DATE: exact date not known; "latter end of November", i.e. late November 1819

TIME: not known

SUMMARY OF REPORTS:

"Several severe shocks of Earthquakes...in various parts of the Canadas...some of them so heavy as to shake violently the houses,...and even to raise a surf in the river..."

REFERENCES AND TRANSCRIPTS:

The article appears in the Halifax Acadian Recorder, January 8, 1820, p. 2, col. 6, noting that Quebec and Montreal papers of December 1819 have been received. A transcript of the article follows:

HALIFAX
SATURDAY, JANUARY 8, 1820.

By the Rambler we received Boston papers to the 28th ultimo - they furnish us with no later European intelligence than those received by the CHERUB. - Quebec and Montreal papers have also been received since our last - their contents are unimportant. Several severe shocks of Earthquakes have been felt in various parts of the Canadas, the latter end of November; some of them so heavy as to shake violently the houses, startle the inhabitants from their sleep, rattle stoves and other articles of furniture, and even to raise a surf in the river, when the air was perfectly calm.

DISCUSSION AND CONCLUSIONS:

Smith (1962) reports a "slight" event at Montreal on November 10, 1819, but this does not appear to satisfy the reported "earthquakes" felt in "the latter end of November" 1819. Some new previously-unreported events may be indicated here. No further research was done on these apparently new events at this time since it was beyond the areal scope of the study.

FEBRUARY 1, 1821 EVENT

EPICENTRE LOCATION:

New London, Connecticut. The exact location of the epicentre is not known at present.

MAGNITUDE: not known

DATE: Thursday, February 1, 1821

TIME: "about three minutes before seven(?) o'clock"
0657 EST (1157 GMT)

SUMMARY OF REPORTS:

"A smart shock...resembling the noise of a waggon[sic] on the frozen earth."

REFERENCES AND TRANSCRIPTS:

The article is found in the Halifax Acadian Recorder, February 17, 1821, p. 2, col. 5. A transcript of the article from a poor microfilm follows with the (?) marks indicating uncertain words:

EARTHQUAKE

A smart shock of an Earthquake was felt(?) in New London on Thursday evening the(?) 1st instant, about three minutes before seven(?) o'clock - resembling the noise of a waggon[sic] on the frozen earth - and according to the(?) best calculation lasted about five seconds.

DISCUSSION AND CONCLUSIONS:

This event is not cited in Smith (1962). No further work was done on this apparently new event at this time since it was beyond the areal scope of the study.

FEBRUARY 27, 1821 EVENT

EPICENTRE LOCATION:

Valcartier - Quebec City area. The exact location of the epicentre is not known at present.

MAGNITUDE: Smith (1962) cites an intensity of III on the Modified Mercalli Intensity Scale of 1931. This converts to a magnitude of 3.0 on the CEEF.

DATE: Tuesday, February 27, 1821

TIME: "about 4 o'clock on Tuesday morning last"
0400 EST
(0900 GMT)

SUMMARY OF REPORTS:

"a smart shock of an earthquake" felt at Valcartier and apparently at Quebec City.

REFERENCES AND TRANSCRIPTS:

The article appeared in the Halifax Acadian Recorder, Sunday, March 17, 1821, p. 3, col. 3. A transcript of the article appears below [March 1, 1821 was a Thursday]:

Quebec, March 1

Earthquake. A smart shock of an Earthquake was felt about 4 o'clock on Tuesday morning last, at Valcartier, about 18 miles N.W. of this city. It was accompanied by a rumbling noise resembling distant thunder.

This event is cited in Smith (1962) as:

30. 1821 FEBRUARY 20-28. III. Quebec City, Que. A slight shock was felt at Quebec City, but not in New England. B4, B5, D2.

DISCUSSION AND CONCLUSIONS:

The Acadian Recorder report would appear to provide a previously-undocumented, exact date and a time, as well as some additional felt report data. This date should be corrected in the CEEF. This article with a Quebec dateline suggests that the event was not felt in Quebec City itself in opposition to Smith's (1962) entry. No further work was done on this event at this time since it was beyond the areal scope of the study.

DECEMBER 21, 1822 EVENT

EPICENTRE LOCATION:

Isle aux Noix, Quebec. The exact location of the epicentre is not known at present.

MAGNITUDE: not known, about 2 to 3

DATE: Saturday, December 21, 1822

TIME: "morning"

SUMMARY OF REPORTS:

"A smart shock of an earthquake was experienced...a distance of nine miles in circumference; its duration was for 5 seconds; commencing with a rumbling noise and ending like the firing of a cannon. The houses and furniture within the above limit were shaken..."

REFERENCES AND TRANSCRIPTS:

The article appeared in the Halifax Acadian Recorder citing the Canadian Courant, on February 8, 1823, p. 3, col. 2. A transcript of the article appears below:

HALIFAX
SATURDAY, FEBRUARY 8, 1823

A smart shock of an earthquake was experienced at the Isle aux Noix, on the morning of the 21st December, and as felt as our informant states, a distance of nine miles in circumference; its duration was for 5 seconds; commencing with a rumbling noise, and ending like the firing of cannon. The houses and furniture within the above limit were shaken by this convulsion of nature, and the inhabitants, who were incapable of accounting for this awful visitation, were placed in a situation by no means agreeable - Canadian Courant.

DISCUSSION AND CONCLUSIONS:

The event is not recorded in Smith (1962) and appears to be a new previously-unrecorded small earthquake; it should be added to the CEEF. No further work was done on this event at this time since it was beyond the areal scope of the study.

JULY 12, 1823 EVENT

EPICENTRE LOCATION:

Probably Boston or area north of Boston. The exact location of the epicentre is not known at present

MAGNITUDE: not known

DATE: Saturday, July 12, 1823

TIME: not known

SUMMARY OF REPORTS:

Only an oblique reference in an article referring to the July 23, 1823 event. There were four shocks felt and a man in Kingston, Massachusetts indicated that the July 23, 1823, event was more violent than the four felt on July 12, 1823.

REFERENCES AND TRANSCRIPTS:

The article was found in the Acadian Recorder of Saturday, August 2, 1823, p. 2, col. 6 and it cited a Boston paper of Saturday, July 26, 1823. A transcript of the article follows:

Earthquake. - A very slight shock of an earthquake was felt in this city and vicinity Wednesday morning, about 7 o'clock.

It was also experienced in Dorchester, Milton, Salem, Gloucester, Reading, Lexington, Newbury and other places. A gentleman in Kingston, after noticing the shock, remarked that it was more violent than either of the four felt on the 12th inst. Several papers mention other slight shocks felt on the 12th.-
Boston paper, 26th July.

DISCUSSION AND CONCLUSIONS:

The four shocks of an earthquake on July 12, 1823, are not reported in Smith (1962) in the American section. They are cited in the article as being less severe than the later event of July 23, 1823; thus, it may not be surprising that they did not get caught by Smith (1962). These four events should be added to the CEEF. No further work was done on these events since they were beyond the areal scope of the study.

JULY 23, 1823 EVENT

EPICENTRE LOCATION:

In area north of Boston. The exact location of the epicentre is not known at present. Smith (1962) does not give a location.

MAGNITUDE: not known

DATE: Wednesday, July 23, 1823

TIME: About 0700 EST
(1200 GMT)

SUMMARY OF REPORTS:

"A very slight shock of an earthquake was felt" in Boston, Salem, Gloucester, Reading, Lexington, Newbury and other places in Massachusetts. Felt in Milton, New Hampshire; also in Dorchester and Kingston (Massachusetts? - possibly New Hampshire?); also in Sanford, southern Maine.

REFERENCES AND TRANSCRIPTS:

The article was found in the Acadian Recorder of Saturday, August 2, 1823, p. 2, col. 6 and it cited a Boston paper of Saturday, July 26, 1823. A transcript of the article follows:

Earthquake. - A very slight shock of an earthquake was felt in this city and vicinity Wednesday morning, about 7 o'clock. It was also experienced in Dorchester, Milton, Salem, Gloucester, Reading, Lexington, Newbury and other places. A gentleman in Kingston, after noticing the shock, remarked that it was more violent than either of the four felt on the 12th inst. Several papers mention other slight shocks felt on the 12th.- Boston paper, 26th July.

Smith (1962) does cite a July 23, 1823, event in his American section, but does not cite a time, an intensity, or an epicentre location; Smith (1962) only has cited one felt locality at Sanford, Maine citing Mather et al. (1927) as seen in the transcript below from his United States section:

101. 1823 JULY 23. Felt at Sanford, Me. M3.

DISCUSSION AND CONCLUSIONS:

Smith (1962) and presumably the CEEF can be altered to include the time of "Wednesday morning about 7 o'clock" July 23, 1823 (1200 GMT) and with relatively little more work on United States' references a reasonable epicentre position and an intensity can be worked out. No further work was done on this

JULY 9, 1824 EVENT

EPICENTRE LOCATION:

Previously located by Smith (1962) at 46.5°N, 66.5°W in the Central Highlands of New Brunswick about 65 km north of Fredericton.

MAGNITUDE: Smith (1962) cites an intensity of V on the Modified Mercalli Intensity Scale of 1931. This converts to a magnitude of 4.3 in the CEEF.

DATE: Friday, July 9, 1824 (Saturday, July 10, 1824 GMT)

TIME: 2115 AST (0115 GMT)

SUMMARY OF REPORTS:

Felt over much of New Brunswick and at Eastport, Maine. It was accompanied by a noise like the discharge of a cannon.

REFERENCES AND TRANSCRIPTS:

The article below appeared in the Halifax Acadian on July 31, 1824, p. 3, col. 1, citing a July 10, 1824, Eastport, Maine dateline. A transcript of the article appears below:

Eastport, July 10.

Earthquake. - Last evening, at 15 minutes past nine o'clock, a very sensible shock of an earthquake was felt in this place. It was accompanied with a loud report, similar to that of a heavy piece of ordnance [sic] fired at a distance. The direction appeared to be from northward to southeast - duration about five seconds.

The Weekly Chronicle was searched from July 9 to 30, 1824. The earthquake is reported in an article in the Halifax Weekly Chronicle of Thursday, July 30, 1824, on p. 3, col. 1. It is a very similar report, but without the typographic error. A transcript of the article appears below:

NEW BRUNSWICK

--

ST. JOHN,
July 22

A smart shock of an Earthquake was felt at Eastport on the evening of the 9th inst. which was accompanied by a loud report similar to that of the discharge of a heavy piece of ordnance - duration about five seconds.

JULY 9, 1824 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Smith (1962) has no 1824 events in his U.S. section. He reports this event (but gives no time) in his Canadian section as:

31. 1824 JULY 9. V. 46.5°N, 66.5°W. Province of New Brunswick, Canada. Severe shock felt all over the province. B4, B5, D2. K1.

Similarly, the Canadian Earthquake Epicentre File (CEEF) lists this event at the same position and with a magnitude M_{blg} of 4.3, but again gives no time. Smith and Bridges (1983) report the event as 'severe', but provide no further data.

Newspapers Searched:

The Halifax Acadian Recorder, searched throughout the period; one article was found (see above).

The Halifax Weekly Chronicle, searched from Friday, July 9 to 30, 1824; one article was found (see above).

The Halifax Nova Scotia Royal Gazette, searched from Wednesday, July 14 to 28, 1824; no articles were found.

DISCUSSION AND CONCLUSIONS:

Smith (1962) and the CEEF do not list the time of this event. This appears to be the first citation of a time for this event and the CEEF should be altered to show 2115 AST (local time on July 9, 1824), or 0115 GMT on July 10, 1824. No further research was done on this event since it was beyond the areal scope of the study. A more detailed historical study of this moderate-sized earthquake might relocate the epicentre somewhat. This event could possibly have been felt in the Digby area of Nova Scotia on the other side of the Bay of Fundy and this possibility should be checked out in Nova Scotian sources.

1827 EVENT(S)

EPICENTRE LOCATION:

Not known, apparently in New Brunswick or Nova Scotia.

MAGNITUDE: not known

DATE: in 1827 some time

TIME: not known

SUMMARY OF REPORTS:

"slight shocks"

REFERENCES AND TRANSCRIPTS:

Smith (1962) reports no 1827 events in his Canadian section. The only reference to this event is in Monro (1855) in his history of "New Brunswick; With a Brief Outline of Nova Scotia and Prince Edward Island":

Slight shocks were also felt in different parts of these Provinces in 1827 and 1839, but they produced no serious effects.

p. 279

Monro is referring to both Nova Scotia and New Brunswick when he refers to "these Provinces".

The search of all the 1827 issues of the Halifax Acadian Recorder was negative. Smith (1962) lists no 1827 events in the Canadian section; Smith does list an August 28, 1827 event as being felt in New London, Connecticut; this was intensity IV on the Modified Mercalli Intensity Scale of 1931 and it would not have been felt in New Brunswick. Smith and Bridges (1983) list no 1827 events in Maine or New Brunswick. The Canadian Earthquake Epicentre File (CEEF) does not list any 1827 events for eastern Canada. The Burke et al. (1985) study of the historical seismicity of northern and eastern New Brunswick did not extend before 1867; hence, no 1827 event was investigated.

DISCUSSION AND CONCLUSIONS:

No 1827 event has been found in the search of one of the newspapers published in Halifax in 1827 (Acadian Recorder). Time did not permit a search of other 1827 newspapers. It will be necessary to search a second newspaper and, hopefully, a southwestern and northern Nova Scotian newspaper for 1827 before one can be certain that Monro's reference to an 1827 event is not referring to a Nova Scotian event.

Similarly, persons doing an extension of the historical seismicity study in New Brunswick prior to 1867 should watch for an 1827 event in New Brunswick or in nearby Maine or Quebec.

FEBRUARY 7, 1831 EVENT

EPICENTRE LOCATION:

Near Quebec City, Quebec. The exact epicentre position is not known at present.

MAGNITUDE: not known

DATE: Monday, February 7, 1831

TIME: Fairly late at night or early in the morning, "when many of our citizen[sic] were asleep". The article implies it was shortly after midnight in the early hours of the morning.

SUMMARY OF REPORTS:

A distinctly felt shock woke up many persons and caused those near the river to have the first impression "that the ice had shoved and was forcing its way up the banks. - Some imagined that the snow had fallen from the roof of their dwelling."

REFERENCES AND TRANSCRIPTS:

The article was found in the Acadian Recorder on February 26, 1831, p. 2, col. 6, with a "Quebec, Feb. 7" dateline. A transcript of the article is below:

COLONIAL.

QUEBEC, Feb. 7.

MONTREAL. - The shock of an earthquake was distinctly felt in this city. The wind had been very high during the night, and until within a few moments of the shock, when it became perfectly calm. After the shaking ceased, the wind again began to blow with a sudden rush as if released from restraint. From the hour at which the phenomenon occurred many of our citizen[sic] were asleep; some were awakened by the shaking of their beds and the noise made by loose articles of furniture. The first impression of many who resided near the river was that the ice had shoved and was forcing its way up the banks. - Some imagined that the snow had fallen from the roof of their dwelling.

DISCUSSION AND CONCLUSIONS:

This event is not reported in Smith (1962). It is a new previously-unreported event and as such, should be added to the Canadian Earthquake Epicentre File (CEEF). The Quebec and Montreal newspapers should be checked to confirm the date; it may be one day earlier. No further work was done on this event at present because it was beyond the areal scope of the study.

JULY 14, 1831 EVENT

EPICENTRE LOCATION:

Reported in Smith (1962) as 47.6°N, 70.1°W in the St. Lawrence River south of La Malbaie, Quebec.

MAGNITUDE: Smith (1962) cites an intensity of VII on the Modified Mercalli Intensity Scale of 1931. This converts to a magnitude of 5.7 on the CEEF.

DATE: Thursday, July 14, 1831 (Friday, July 15, 1831, GMT) (or possibly Thursday, July 7, 1831 [Friday, July 8, 1831 GMT])

TIME: about midnight, 2400 EST (0500 GMT)

SUMMARY OF REPORTS:

Chimneys and walls collapsed at La Malbaie (Smith, 1962). Near Quebec City, animals were disturbed near Beauport and furniture was shaken. In St. Foy, one person's bed was shaken "violently under him".

REFERENCES AND TRANSCRIPTS:

The event was reported in a Saturday, July 30, 1831, article in the Acadian Recorder on p. 2, col. 4, citing a dateline of "Quebec" (with no date) and quoting the Mercury of Quebec City. A transcript of the article is below:

LOWER CANADA

Quebec

Earthquake. - A severe shock of an earthquake was felt on Thursday about midnight in various directions in the neighbourhood of this city. A family living near Beauport felt it sensibly, the tables and chairs being shaken, and the animals in the farm yard appeared by the noise they made to participate to the alarm - Another informant being on the St. Foy road, states that his bed shook violently under him. It does not appear, to have been in the city. - Mercury

DISCUSSION AND CONCLUSIONS:

The Acadian Recorder article seems to suggest that the event was on Thursday night "about midnight", July 29th (unlikely), 21st (possible), 14th or 7th, etc., depending on how long it took the issue of the Mercury to reach Halifax and to reach the editor of the Acadian Recorder to be quoted in the Saturday, July 30, 1831, issue. Thursday, July 14th or 7th, 1831, are likely dates.

JULY 14, 1831 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

Smith (1962) cites an event at La Malbaie on Thursday, July 14, 1831, and this is almost certainly the same event quoted from the Quebec City Mercury in the July 30, 1831, issue of the Acadian Recorder. Smith's citation is as below:

33. 1831 JULY 14. VII. 47.6°N, 70.1°W. In the St. Lawrence River south of La Malbaie, Que. Walls and chimneys were thrown down at La Malbaie. B4, B5, D2.

This study's location of the article in the Acadian Recorder allows a time of "about midnight" or 2400 EST, July 14, 1831 (or 0500 GMT, July 15, 1831) to be entered into the CEEF. No further work was done on this event at present since it was beyond the areal scope of this study.

AUGUST 12, 1832 EVENT

EPICENTRE LOCATION:

Previously located by Smith (1962) at 45.0°N, 64.0°W east of Windsor, Nova Scotia. This position should probably be subject to readjustment.

MAGNITUDE: Smith (1962) cites an intensity of IV on the Modified Mercalli Intensity Scale of 1931. This converts to a magnitude of 3.7 on the CEEF.

DATE: Sunday, August 12, 1832

TIME: 0640 AST (an average of the six times noted in the various articles) (1040 GMT)

SUMMARY OF REPORTS:

This event was felt in Windsor where some plaster was cracked, at Brier Island where rocks were shaken down from the cliffs, in Liverpool, in Shelburne where some plaster was shaken down, and at Annapolis and Yarmouth where houses shook, but no damage was apparently done.

REFERENCES AND TRANSCRIPTS:

Smith records this earthquake in the Canadian section of his 1962 compendium simply as:

34. 1832 IV. 45.0°N, 64.0°W. Nova Scotia. Slight. B4, B5, D2.

Smith has no precise date, no time and little other data. In saying "Nova Scotia. Slight" he is simply quoting Dawson (1860) which is the D2 reference; Dawson has no date. He places the epicentre at 45.0°N, 64.0°W immediately east of Windsor, Nova Scotia. His references cited include Brigham (1871) who only notes under 1831, "The next year a slight shock was felt at Nova Scotia"; Brigham does not even list the 1832 event in his "Tabular View of New England Earthquakes" (p. 27). Smith cites his reference B5 which is Brooks (1960); in fact, this reference has no 1832 events whatsoever in the Part II cited by Smith (1962). It is not immediately clear to us how Smith was able to place the epicentre at 45.0°N, 64.0°W. The CEEF lists this event simply as 1832, 45.0°N, 64.0°W, with a magnitude of 3.7 as taken directly from Smith (1962).

The newspaper reports found to date appear to greatly amplify our information on this event.

AUGUST 12, 1832 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The first article in the Acadian and General Advertiser was found on Friday, August 17, 1832, on p. 3, col. 3; it is exactly the same as that which appeared in the Halifax Journal on Monday, August 20, 1832, on p.3, col. 1. A transcript of the article appears below:

Extract of a letter from Yarmouth dated August 13. -
 "A slight shock of an Earthquake was felt here on Sunday last, [12th] at 25 minutes after 6 A.M. which continued nearly a minute - and at Annapolis, accompanied with considerable noise."

The Halifax Journal of Monday, August 27, 1832, p. 3, col. 2, had another Yarmouth report that was datelined "Yarmouth, August 17" (a Friday) that went as below:

YARMOUTH, August 17. - A slight shock was felt here on Sunday morning at half past six o'clock, it continued for about 25 seconds and shook many houses very violently, it was felt or[sic] several miles round the country, but done no damage. Some of our old inhabitants affirm that a similar shock was felt here about 15 years ago.

The same issue of the Halifax Journal on Monday, August 27, 1832, had a second article on the event which was immediately above the Yarmouth article and described the effects at Liverpool, Nova Scotia on the south coast; this article was an exact copy of one that appeared under the dateline "Port of Liverpool, N.S." in the Wednesday, August 22, 1832, issue of the Halifax NovaScotian on p. 271, col. 1 and in the Halifax Acadian and General Advertiser on Friday, August 24, 1832, p. 3, col. 3. A transcript of this article appears below:

LIVERPOOL, N.S. - On Sunday morning last, about 7 o'clock, the 12th inst. many of our inhabitants felt a shock of an earthquake. I have since been informed that it was more severely felt at Shelburne shaking down the plaistering[sic] in some of their buildings.

The Wednesday, August 22, 1832, issue of the Halifax weekly the Nova Scotian has two quite different articles on p. 270, col. 3. Transcripts of these two articles appear below (in the case of the Brier Island letter, only the relevant portion is quoted):

EARTHQUAKE AT WINDSOR. - The following is an extract from a letter, dated Windsor, August 13, 1832: - "We had a smart shock of an Earthquake here on Sunday morning, at about quarter before 5. It appears to have been very sensibly felt at the College, Academy, and the neighborhood of Spa Spring. I understand at the former place it cracked some of the plaistering[sic]."

AUGUST 12, 1832 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

It was so early that few people in the village felt it, although a few were awakened by it. By some, it is said, that it was not accompanied by any rumbling noise, and by others that it was; but all concur in saying that it occasioned a strong tremulous motion. The Academy was rocked rather alarmingly, and a cottage not far off, was moved in a manner that made the timbers creak, and to suggest the idea of a ship in motion. I cannot ascertain its direction, but should think it was north and south. Did you feel it at Halifax? I am sorry to say I was so fast asleep that I missed it, as I did in 1817.

Extract of a Letter from Brier Island, dated August 16.

On Sunday morning last, about half past seven, we had on Brier Island a very heavy shock of an Earthquake. It lasted the best part of a minute, and was so violent that I could not stand still on my feet in the bedroom, but had to seize the bedpost for support. Many rocks on the cliffs of the island were shaken down.....

Finally, there is a report from Nictaux, Nova Scotia, in the Saturday, August 18, 1832, issue of the Acadian Recorder, p. 3, col. 3. A transcript appears below:

EARTHQUAKE. - We give below an extract of a letter from a gentleman in Nictaux, which informs us of a phenomenon of rare occurrence in Nova Scotia. We understand that the shock was felt at Yarmouth and several other places in the western part of the province. A similar phenomenon was experienced on the morning of May 22, 1817, at Granville, Digby and Wilmot. Three shocks were then felt, in the space of 15 minutes, accompanied by loud noises.

"Nictaux, August 15.

"On Sunday morning about 7 o'clock, A.M. a subterraneous[sic] noise, like the rattling of a heavy coach over a stony street was heard, and a slightly perceptible shock of an earthquake was felt on the highlands in this vicinity. To what distance it extended, I have not yet heard".

AUGUST 12, 1832 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched:

Halifax Acadian Recorder, searched throughout period; one article was found (see above).

Halifax Acadian and General Advertiser, searched throughout the period; two articles were found (see above).

Halifax Journal, searched from Monday, August 13 to Monday, September 3, 1832 (weekly); two articles were found (see above).

Halifax NovaScotian, searched from Wednesday, August 15 to August 22, 1832 (weekly); three articles were found (see above).

Pictou Observer and Eastern Advertiser, searched on Wednesday, August 15 and on Wednesday, September 12, 1832; the weekly issues of August 22, August 29 and September 5, 1832 were missing; No articles were found.

DISCUSSION AND CONCLUSIONS:

This Nova Scotian earthquake is a previously-reported event in Smith (1962) and it appears in the Canadian Earthquake Epicentre File (CEEF). This study, while not exhaustive, will allow the date of Sunday, August 12, 1832 and the local time of 0640 AST (1040 GMT) to be entered in the CEEF to update Smith. The time is an average of six times cited in the articles giving equal weight to all six. If one ignores the two extreme local times of 0545 and 0730, the average time of the remaining four articles is 0644 AST; we will arbitrarily use 0640 AST from the average of the times in the six articles.

Smith (1962) put the epicentre at 45.0°N, 64.0°W, apparently based on the Windsor report. It seems clear that some further work should be done on this event to see if it was, in fact, centred in the Bay of Fundy; the report from Brier Island may suggest this?

The intensity of Smith (1962) on the modified Mercalli Intensity Scale of 1931 was only IV; the CEEF has a magnitude M_{blg} of 3.7 listed. The above information seems to suggest a slightly larger intensity. We would recommend that this event be subject to the type of detailed analysis of Leblanc and Burke (in press, 1985) in an effort to arrive at a truer epicentre position and at a magnitude that will be better documented.

MARCH 5, 1834 EVENT

EPICENTRE LOCATION:

Near Lancaster, Pennsylvania. The exact position of the epicentre is not known, but is approximately the position of Lancaster at 40.1°N, 76.3°W.

MAGNITUDE: not known

DATE: Wednesday, March 5, 1834

TIME: not known

SUMMARY OF REPORTS:

A brief report that indicates that, "the shock was accompanied with a noise similar to that of a powerful explosion, and was preceded by a rumbling noise and perceptible tremor".

REFERENCES AND TRANSCRIPTS:

The brief article was found in the Acadian Recorder of Saturday, April 5, 1834, p. 1, col. 6. A transcript of the article appears below:

The shock of an earthquake was felt at Lancaster, Penn. on the 5th instant. The shock was accompanied with a noise similar to that of a powerful explosion, and was preceded by a rumbling noise and perceptible tremor.

DISCUSSION AND CONCLUSIONS:

This event at Lancaster, Pennsylvania is just inside Smith's (1962) area; it does not appear in his lists. He lists no 1834 events. This event should be entered into the CEEF. No further work was done on this event at present because it was beyond the areal scope of the study.

FEBRUARY 1?, 1835? EVENT

EPICENTRE LOCATION:

Felt at Hartford, Connecticut. The exact position of the epicentre is not known at present.

MAGNITUDE: not known

DATE: Possibly Sunday, February 1, 1835. The dates Sunday, January 25, 18, 11, 4, 1835 and Sunday, December 28, 21, 14, or even 7, 1834 are all possible dates.

TIME: 6 o'clock on Sunday evening, 1800 EST (2300 GMT)

SUMMARY OF REPORTS:

The one brief report indicates that "a shock of an earthquake was felt very sensibly in Hartford...with a noise resembling distant thunder."

REFERENCES AND TRANSCRIPTS:

The one brief article was found in the Acadian Recorder of Saturday, February 7, 1835, p. 2, col. 6. It really only tells us that the event occurred at 1800 on a Sunday prior to February 7, 1835. A transcript of the article appears below:

UNITED STATES

Moible, Dec. 17

The following is an extract from a letter to the editors of the Intelligencer, dated New Orleans, Dec. 27, 1834

Earthquake. - A shock of an earthquake was felt very sensibly in Hartford, Conn. at 6 o'clock on Sunday evening. It continued but a very few seconds, and passed off with a noise resembling distant thunder.

DISCUSSION AND CONCLUSIONS:

Smith (1962) does not record any 1834 or 1835 events in either the Canadian or American sections of his compilation. The apparent column header for the above article implies that one is reading "an extract from a letter to the editors of the Intelligencer, dated New Orleans, Dec. 27, 1834." From the two references in the article immediately above the earthquake reference one might(?) assume that the Hartford earthquake occurred circa Sunday evening, December 7 or 14, 1834. The article immediately below the earthquake reference implies that the Delaware River was covered with ice which probably was unusual in early December.

FEBRUARY 17, 1835? EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

The other assumption one could make was that this was a report of the Sunday previous to publication which would imply that the earthquake was felt Sunday, February 1, 1835, and that the Thursday previous "the Delaware was covered with young and active skating". This assumes that the news could travel to Halifax by ship from Boston in no more than five days (Sunday, February 1 evening to Friday, February 6 evening) in time for the editor to extract it and copy it as a filler for the Saturday edition. A five day voyage is quite reasonable, but perhaps optimistic.

The earlier dates of Sunday, January 4, 11, 18 or 25, 1835 and Sunday, December 28, 21, 14 or 7, 1834, are all possible dates. Further historical work on this event in the archived newspapers of Hartford, Connecticut would probably pin down the exact Sunday evening. No further work was done on this event at present because it was beyond the areal scope of the study.

JULY 6, 1836 EVENT

EPICENTRE LOCATION:

The event was felt at Wickham, Queens County, St. Stephen and Milltown, Charlotte County, New Brunswick. The exact position of the epicentre is not known at this time.

MAGNITUDE: not known

DATE: Wednesday, July 6, 1836

TIME: "about 3 o'clock on that day", 1500 AST (1900 GMT)

SUMMARY OF REPORTS:

The event, "occasioned a heavy rumbling sound", frightened cattle and raftsmen on the river near Milltown, "saw the water much agitated, although it was perfectly calm at the time."

REFERENCES AND TRANSCRIPTS:

An article was found during the search of a long run of the Acadian Recorder in the Saturday, July 30 issue on p. 2, col. 2. A transcript of the article, datelined Saint John, N.B., July 23, 1836, appears below:

COLONIAL

NEW BRUNSWICK

St. John, July 23,
 Earthquake. - On Wednesday the 6th inst. the shock of an earthquake was experienced in this Province. We have been informed that it was very sensibly felt at Wickham, in Queen's County. - At St. Stephen's, County of Charlotte, it occasioned a heavy rumbling sound, not unlike the distant discharge of artillery. It was also observed at Milltown in the same county; two gentlemen who were sitting in a house engaged in conversation at about 3 o'clock on that day, had their attention suddenly arrested by a violent concussion resembling the fall of a very heavy substance upon the building in which they were. The raftsmen on the river near the last mentioned place, saw the water much agitated, although it was perfectly calm at the time. The cattle were seen to run into the woods as if affrighted. We have not learned if this phenomenon has arrested attention in other parts of the Province; if it has, we shall be gratified by having it in our power to lay any additional particulars before the public. - Gaz.

JULY 6, 1836 EVENT

DISCUSSION AND CONCLUSIONS:

The only 1836 event listed in Smith (1962) is in Labrador; there are no American 1836 events listed and Smith and Bridges (1983) do not list the event. This event should be added to the CEEF. No further work was done on this event because it was beyond the areal scope of the study. This event deserves more study and may prove to have been located in the Passamaquoddy - Oak Bay earthquake zone.

1839 EVENT(S)

EPICENTRE LOCATION:

Not known, apparently in New Brunswick or Nova Scotia.

MAGNITUDE: not known

DATE: in 1839 some time

TIME: not known

SUMMARY OF REPORTS:

"slight shocks"

REFERENCES AND TRANSCRIPTS:

The only reference to this event is in Monro (1855) in his history of "New Brunswick; With a Brief Outline of Nova Scotia and Prince Edward Island":

Slight shocks were also felt in different parts of these Provinces in 1827 and 1839, but they produced no serious effects.

p. 279

Monro is referring to both Nova Scotia and New Brunswick when he refers to "these Provinces".

The search of all the 1839 issues of the Halifax Acadian Recorder was negative. Smith (1962) lists no 1839 events in the Canadian or American sections. Smith and Bridges (1983) list no 1839 events in Maine or New Brunswick. The Canadian Earthquake Epicentre File (CEEF) does not list any 1839 events for eastern Canada. The Burke et al. (1985) study of the historical seismicity of northern and eastern New Brunswick did not extend before 1867; hence, no 1839 event was investigated.

DISCUSSION AND CONCLUSIONS:

No 1839 event has been found in the search of one of the newspapers published in Halifax in 1839 (Acadian Recorder). Time did not permit a search of other 1839 newspapers. It will be necessary to search a second newspaper and, hopefully, a southwestern and northern Nova Scotian newspaper for 1839 before one can be certain that Monro's reference to an 1839 event is not referring to a Nova Scotian event.

Similarly, persons doing an extension of the historical seismicity study in New Brunswick prior to 1867 should watch for an 1839 event in New Brunswick or in nearby Maine or Quebec.

SEPTEMBER 26, 1840 EVENT

EPICENTRE LOCATION:

Near Hamilton, Ontario. The exact position of the epicentre is not known at present.

MAGNTIUDE: not known

DATE: Saturday, September 26, 1840

TIME: Exact time not known at present. Early morning, late evening or at night since the report refers to, "those who were in bed at the time".

SUMMARY OF REPORTS:

"There was a rumbling noise in the earth and some buildings were slightly shaken" At the shore of Burlington Bay the noise was reported, "to have been like the roaring of the sea". The event lasted, "about ten seconds".

REFERENCES AND TRANSCRIPTS:

A brief article was found in the Acadian Recorder of Saturday, October 17, 1840, on p. 2, col. 2. The article clearly gives the date as Saturday, September 26, 1840. A transcript of the article appears below:

EARTHQUAKE. - A severe shock of an Earthquake was felt in Hamilton, Upper Canada, on Saturday, 26th Septr. There was a rumbling noise in the earth, and some buildings were slightly shaken. To those who were in bed at the time, it seemed as if some heavy body had rubbed against the wall, followed by a tremulous motion. At the bay shore, the noise is represented to have been like the roaring of the sea, the lake at the same time being unruffled by a ripple. The whole passed off in about ten seconds. Its course apparently was from W. to E. - New York Express.

Smith (1962) lists an event on Thursday, September 10, 1840, as "a violent shock" at Hamilton, Ontario, but Smith lists no event for September 26, 1840. The listed intensity of Smith's September 10, 1840, event is V on the Modified Mercalli Intensity Scale of 1931; he gives no time for the event.

DISCUSSION AND CONCLUSIONS:

This event on September 26, 1840, is not listed in Smith (1962) and it appears that it is not on the CEEF. However, it does appear that it is an aftershock of the Thursday, September 10, 1840, event that was also listed at Hamilton in Smith (1962). Possibly one or the other of these two events is a ghost event; however, at this time, there is no evidence of this.

SEPTEMBER 26, 1840 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

The September 26, 1840, event should be entered into the CEEF. Additional, historical work may well allow the times of both the September 10 and 26 events to be found and the epicentre can possibly be resolved a bit better. No further work was done on this event at present because it was beyond the areal scope of the study.

JANUARY 25, 1841 EVENT

EPICENTRE LOCATION:

Was felt in New York City and the, "the same sound with a trembling sensation prevailed thence 60 miles south". Was also felt at, "Jersey City, Weuhawken and Williamsburgh, on Long Island," N.Y. The exact position of the epicentre is not known at present.

MAGNITUDE: Smith (1962) cites an intensity of III on the Modified Mercalli Intensity Scale of 1931. This converts to a magnitude of 3.0 on the CEEF.

DATE: Monday, January 25, 1841

TIME: "The time, as noted by all, was from 25 to 20 minutes before 6 o'clock", 0540 to 0545 EST (1040 to 1045 GMT)

SUMMARY OF REPORTS:

There was a sound, "with a trembling sensation" and, "furniture in the various houses were shook with considerable vehemence".

REFERENCES AND TRANSCRIPTS:

The brief article was found on the search of the Acadian Recorder for 1841 in the issue of Saturday, February 6, 1841, on p. 3, col. 5. A transcript of the article appears below:

EARTHQUAKE. - On Monday 25th ult., New York was visited with the shock of an Earthquake. Advices by the new Jersey rail road, say, that the same sound, with a trembling sensation prevailed thence 60 miles south. The furniture in the various houses were shook with considerable vehemence, and it may be imagined the circumstance created great alarm. Jersey City, Weuhawken and Williamsburgh, on Long Island experienced the same phenomena. The time, as noted by all, was from 25 to 20 minutes before 6 o'clock - there being all the time a serene and cloudless sky, and mild weather.

Smith (1962) notes the event as only III on the Modified Mercalli Intensity Scale of 1931 and notes it only as felt in New York City per the entry below:

111. 1841 JANUARY 25. a.m. III. Felt for fifteen to twenty seconds at New York City. B4, B5, D2, H1.

JANUARY 25, 1841 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS:

This event was previously-known and was listed in Smith's (1962) American section only as having an intensity of III and only as "a.m." with no precise time. This reference gives a fairly precise time of 0540 to 0545 local time (EST). The one article also suggests that the event was heard and felt over a distance of 60 miles to the south of New York City, at Jersey City and Weuhawken in New Jersey and at Williamsburgh on Long Island, N.Y. These apparent reports suggest an earthquake of a somewhat larger intensity than III or a magnitude of 3.0.

Further historical work on this event should yield a revised intensity and enable a location for the epicentre to be determined. No further work was done on this event at present since it was beyond the areal scope of the study.

NOVEMBER 7, 1842 EVENT

EPICENTRE LOCATION:

In the vicinity of Montreal, Lachine, Trois Rivières, "and several other places", P.Q. Smith (1962) lists 46.0°N, 73.2°W as the epicentre of his November 9, 1842, event. This event is probably related and will have about the same epicentre. However, the exact location of the epicentre is not known at present.

MAGNITUDE: Smith (1962) cites an intensity of VI on the Modified Mercalli Intensity Scale of 1931 for a November 9, 1842, event which may be a ghost of his event. This converts to a magnitude of 3.7 on the CEEF.

DATE: Monday, November 7, 1842

TIME: "Monday morning between the hours of 8 and 6".
0600 to 0800 EST (1100-1300 GMT)

SUMMARY OF REPORTS:

A brief report that indicates that, "the shock was very perceptible, and resembled the heavy rolling of artillery".

REFERENCES AND TRANSCRIPTS:

The brief report was found in the search of the Halifax Acadian Recorder on Saturday, November 19, 1842, on p. 3, col. 1. A transcript of the article follows below:

CANADA

By the Steamship Unicorn.

MONTREAL, November 9.

The shock of an earthquake was felt in this city on Monday morning between the hours of 8 and 6. The shock was very perceptible, and resembled the heavy rolling of artillery. It was also experienced at Lachine. Three Rivers, and several other places.

Note: November 9, 1842, was a Wednesday.

Smith (1962) does not report a November 7, 1842, event, but does report a strong event on November 9, 1842, at Montreal and Trois Rivières per the entry below:

39. 1842 NOVEMBER 9. VI. 46.0°N, 73.2°W. St. Lawrence Valley. Felt at Montreal and Trois-Rivières. The waters of the St. Lawrence were violently agitated. B4, B5, D2, H10.

NOVEMBER 7, 1842 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

As will be seen in the following event-specific search, we have also found an apparent November 10, 1842, event*.

DISCUSSION AND CONCLUSIONS:

We believe Smith's November 9, 1842, event mentioned above, which was felt over the same area as this November 7, 1842, event, is, in fact, the same event as the November 7, 1842, earthquake. Smith's November 9, 1842 event, may possibly represent the November 10, 1842, event seen in the following event-specific report or it or may represent a real intervening event. Presumably, all events between November 7 and 10, 1842, occurred at about the same epicentre.

The November 9, 1842, event should probably be removed from the CEEF and this November 7, 1842, event should probably be entered in the Canadian Earthquake Epicentre File; further work should be done on Quebec documents to sort out the two or three events.*

Further historical work will presumably verify the existence of one, two, or even three events and whether or not Smith's November 9, 1842, event is a real or a 'ghost event' - in effect, an 'inter-event ghost'. (Smith, or his sources, may possibly have taken the newspaper article dateline of November 9, 1842, as the actual date of the event?)

No further work was done on these November 7-10, 1842, events at the present because they were beyond the areal scope of the study.

* Note added in proof: Indeed by the time this report has finally escaped its original word processing disks to be corrected into its final form this work has been done by Pierre Guin, S. J. of the Observatoire de Geophysique at the College Jean-de-Brebeuf, 3200 Chemin Ste-Catherine, Montreal, P.Q., H3T 1C1 (personal communication, February 27, 1987). Guin reports in a letter, "P.S. In Nov. 1842, there was only [one] event or one series of events on the 7th. I have over 20 records of it!"

NOVEMBER 10, 1842 EVENT

EPICENTRE LOCATION:

In vicinity of 46.0°N, 73.2°W which is location Smith (1962) cites for the November 9, 1842 event he lists as being felt in Montreal and Trois Rivières. This event, apparently on November 10, 1842, is cited in this report as being felt at Trois Rivières, Quebec City, William Henry, Berthier, "and throughout the District".

MAGNITUDE: not known

DATE: Thursday, November 10, 1842

TIME: "Yesterday morning at 9 o'clock", 0900 EST (1400 GMT)

SUMMARY OF REPORTS:

"The inhabitants were very much alarmed..., the citizens running generally from their dwellings into the streets." "...the noise accompanying this convulsion of the Earth...was most singular and awful."

REFERENCES AND TRANSCRIPTS:

The report was found in the search of the Halifax Acadian Recorder on Saturday, November 19, 1842, on p. 3, col. 1. A transcript of the article follows below:

CANADA

By the Steamship Unicorn

QUEBEC, November 11.

A smart shock of an earthquake occurred at Three Rivers and throughout the District yesterday morning, at 9 o'clock. - The inhabitants were very much alarmed, and the streets tested the great excitement it engendered, the citizens running generally from their dwellings into the streets. The convulsion of the Earth lasted several seconds, and was followed by a slight snow storm.

A marriage ceremony was being performed in the French Cathedral at the time, and the scene that ensued was ludicrous in the extreme; some said that the church shook from its very foundation, so much that they expected it was tumbling down, and a rush to the door was the consequence. However, the happy knot was tied, and the event no doubt will be long remembered by the bridal party. I cannot describe to you the noise accompanying this convulsion of the Earth; suffice to say, it was most singular and awful.

I understand the Earthquake was felt also at William Henry, Berthier, &c.

Note: November 11, 1842, was a Friday.

NOVEMBER 10, 1842 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Smith (1962) does not report a Thursday, November 10, 1842, event, but does report a strong event on November 9, 1842, at Montreal and Trois Rivières per the entry below:

39. 1842 NOVEMBER 9. VI. 46.0°N, 73.2°W. St. Lawrence Valley. Felt at Montreal and Trois-Rivières. The waters of the St. Lawrence were violently agitated. B4, B5, D2. H10.

DISCUSSION AND CONCLUSIONS:

We may be quite incorrect in suggesting that the November 9, 1842, entry of Smith's above is a ghost of the November 7, 1842 event. Smith lists the November 9, 1842, event as having an intensity of VI on the Modified Mercalli Intensity Scale of 1931. When one reads the two brief Halifax newspaper reports of the November 7 and November 10 events, the latter appears to be the more powerful and felt over a wider area - i.e. "throughout the District". It may well be:

- a) that Smith's (1962) entry for Wednesday, November 9, 1842, is a ghost of this Thursday, November 10, 1842 event or;
- b) that the Halifax newspaper's second-hand report apparently quoting a Quebec, Friday, November 11, 1842, account got the date wrong by one day and that the event actually did occur on Wednesday, November 9, 1842, not on Thursday, November 10, 1842 or;
- c) that Smith's (1962) Wednesday, November 9, 1842, event is a real event between the Monday, November 7 and the Thursday, November 10, 1842 events.

This third option is considered unlikely since the Friday, November 11, 1842, Quebec newspaper account, as quoted by the Acadian Recorder on Saturday, November 19, 1842, does not note that two earthquakes were felt on two successive days.

The Montreal, Trois Rivières and Quebec City newspapers for November 7 to 14, 1842, should be examined to sort out the locations, times and dates of these events and related aftershocks.* At least one new entry to the CEEF can be made and, quite possibly, one ghost event in the CEEF can be eliminated. No further work was done on these events at the present time since they were beyond the areal scope of the study.

* Note added in proof: Indeed by the time this report has finally escaped its original word processing disks to be corrected into its final form this work has been done by Pierre Gouin, S. J. of the Observatoire de Géophysique at the Collège Jean-de-Brébeuf, 3200 Chemin Ste-Catherine, Montréal, P.Q., H3T 1C1 (personal communication, February 27, 1987). Gouin reports in a letter, "P.S. In Nov. 1842, there was only [one] event or one series of events on the 7th. I have over 20 records of it!"

FEBRUARY 8, 1843 EVENT

EPICENTRE LOCATION:

The location of the epicentre is not known at the present time; probably western Nova Scotia.

MAGNITUDE: not certain, small(?)

DATE: Reported as Wednesday, February 8, 1843; apparently on the same day as a major event in the West Indies.

TIME: The article implies that an event occurred, "precisely at the same time in the United States," as the West Indies event ie. between 1000 and 1100 local time and the article implies the same event was felt "in some parts of this township" (ie. Yarmouth Co.), possibly also between 1000 and 1100 local time.

SUMMARY OF REPORTS:

"...was very sensibly felt in some parts of this township"

REFERENCES AND TRANSCRIPTS:

This new, previously-unrecorded, earthquake was brought to our attention by Helen J. Hall, the librarian and archivist at the Yarmouth County Museum (personal communication, letter of April 17, 1986) very late in the report typing as we sought location of Cook's Harbour re the April 18, 1843 tsunami in the Yarmouth area.

The Yarmouth Herald and Western Advertiser of Friday, March 3, 1843 on p. 3, col. 2 contained an article on a, "Great Earthquake in the West Indies", which detailed a February 8, 1843 earthquake. The last seven lines of the article read:

A shock of an earthquake is noticed in the papers as having been experienced precisely at the same time in the United States, and we understand it was very sensibly felt in some parts of this Township.

We shall anxiously await further accounts from the West Indies.

The Yarmouth Herald and Western Advertiser was searched from Friday, February 10 to Friday, March 3, 1843 and only the one article was found (portion of one article in fact).

DISCUSSION AND CONCLUSIONS:

There was a significant gap in the newspaper record of the Acadian Recorder from January 1, 1843 to December 31, 1844 and this event was thus missed in the examination of the long run of newspapers from Halifax. The gap was never filled in with other papers (Figure 4). This event has not been investigated in any further detail since it came to light so late in the study.

FEBRUARY 8, 1843 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

The event's discovery indicates the value in filling the gaps in the long runs. We believe that not only should subsequent work seek to fill the gaps in the long run of the Halifax papers (Figure 4) but, given the number of previously-unrecorded events covered by the editor of the Yarmouth Herald and Western Advertiser and Yarmouth Herald (Lawson), that the earliest years of the Yarmouth papers should be searched from its inception in 1833 to January 1, 1848 when this study covered the next 20 years. Indeed, there may well be merit to searching the Yarmouth papers beyond December 31, 1867 for all of the pre-instrumental period from 1868 to 1915.

This event is not recorded in Smith (1962). It should be added to the CEEF after additional work in local sources in an attempt to confirm its date and other details and to possibly determine an epicentre location.

APRIL 18, 1843 TSUNAMI AND POSSIBLE EARTHQUAKE EVENT

EPICENTRE LOCATION:

Off Cooks Harbour near Yarmouth, Nova Scotia. May be a distant earthquake. The exact epicentre location is not known at this time.

MAGNITUDE: not known

DATE: Tuesday, April 18, 1843

TIME: "about 8 o'clock p.m., it being low water", in Cooks Harbour. "At low water a little before dusk" in Yarmouth Harbour.
2000 AST (2400 GMT)

SUMMARY OF REPORTS:

The tsunami was observed to suddenly cause sealevel to rise, "in the space of a few minutes, to a height of from five to seven feet, and immediately receded with equal rapidity, dragging some craft from their moorings", in Yarmouth Harbour; the event, "took place in about 20 minutes." At Bunker's Island and at the Cove, "the water rose ten feet."

At Cooks Harbour near Yarmouth, the probable relative of the Captain, who was onboard for the event, personally reported that the schooner BEE, "was struck with dreadful shocks", in mid-channel of the harbour entrance, then, "All at once [we] heard [a] loud roaring of the tide coming in", and shortly thereafter the vessel was left, "high and dry at the top of the beach", with, "her keel and rudder split." "The tide rose, as near as we could guess, ten feet and then directly went out to low water mark." The man onboard reported, "there being little or no wind, and a smooth sea", at the time he was entering Cooks Harbour.

REFERENCES AND TRANSCRIPTS:

J. Murray Lawson's Yarmouth, Past and Present in 1902 refers to the event per the transcript of the page 617 reference under his "Miscellaneous" chapter below; his reference is directly from the Yarmouth newspaper account of Friday, April 21, 1843:

At low water, a little before dusk, on Tuesday evening, April 18th, 1843, the tide suddenly rushed in, in the space of a few minutes, to the height of from five to seven feet, and immediately receded with equal rapidity, dragging some small vessels from their moorings, and leaving the flats again bare. The whole took place in about 20 minutes. At Bunker Island and the Cove the water rose 10 feet. The schooner Bee, Capt. Bradford McGray, on entering Cook's harbour, was raised and lowered by the wave, striking the bottom, splitting her keel and rudder, starting one of her butts, and wrenching out a great part of her oakum.

APRIL 18, 1843 TSUNAMI AND POSSIBLE EARTHQUAKE EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Note: Lawson misidentifies the Captain of the schooner BEE as Bradford McGray; the Captain was John McGray, and Bradford McGray was simply one of five named persons onboard the schooner BEE during this event. Bradford McGray later wrote a letter to the editor of the Yarmouth Herald and Western Advertiser describing the event (see below).

The source of all of the other reports appear to be the two articles on p. 3, col. 2 and col. 3 of the Yarmouth Herald and Western Advertiser of Friday, April 21, 1843. These articles report three observations of the event in the Yarmouth area. The first of these April 21, 1843, articles which is found as a transcript below also appeared verbatim, without credit, in the Royal Gazette of Thursday, April 27, 1843, on p. 3, col. 1 and both articles appeared, in part, verbatim in the Halifax Morning Herald of Friday, April 28, 1843 on p.2, col. 5:

SINGULAR PHENOMENON. - At low water, a little before dusk, on Tuesday evening, the tide suddenly rushed in, in the space of a few minutes, to the height of from five to seven feet, and immediately receded with equal rapidity, dragging some small craft from their moorings, and leaving the flats again bare. The whole took place in about 20 minutes.

At Bunker's Island and the Cove we understand the water rose ten feet.

The second article was in the adjacent column 3 on page 3 of the same Friday, April 21, 1843 issue; this letter was quoted verbatim in the Halifax NovaScotian of Monday, May 1, 1843 on p. 142, col. 3. A transcript of this personal account by Bradford McGray (verifiable presumably by the four other named men onboard the Schooner BEE, including the Captain, John McGray) appears below from the Yarmouth Herald and Western Advertiser of Friday, April 21, 1843, p. 3, col. 3:

Mr. Lawson, - You will please give a place to the following account of what I believe to have been the effects of an earthquake on Tuesday evening last.

The schr. Bee, having on board in addition to the master (Capt. John M'Gray) Bradford M'Gray, Samuel Hatfield, Reuben Clements, jr., and Jacob Ring, coming in from fishing, and arriving at the entrance of Cook's harbour about 8 o'clock p.m., it being low water, and there being little or no wind, and a smooth sea, was struck with dreadful shocks, being in mid channel. All at once heard loud roaring of the tide coming in, the vessel shook with great violence as if beating over large rocks - we expected her masts would go over, and that she would crash to pieces, and had great difficulty in keeping ourselves on deck. - The tide rose, as near as we could guess, ten feet, and then directly went out to low water mark, leaving us high and dry at

APRIL 18, 1843 TSUNAMI AND POSSIBLE EARTHQUAKE EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

the top of the beach. We found her keel and rudder split, one of her butts started, and a great part of her oakum wrenched out.

BRADFORD McGRAY

Note: Mr. Lawson was the editor of the Yarmouth Herald and Western Advertiser and his son, J. Murray Lawson, wrote Yarmouth, Past and Present in 1902 wherein this account is again quoted.

There is no report of this event in Smith (1962); he has one March 14, 1843 event in Vermont and no 1843 Canadian events.

Newspapers Searched:

Yarmouth Herald and Western Advertiser, searched from Friday, April 7 to April 28, 1843; the two articles found in the one issue are transcribed above.

Halifax Morning Herald, searched from Monday, April 17 to Monday, May 1, 1843; two articles were found on Friday, April 28, 1843, on p. 2, col. 5 quoting Bradford McGray's letter in the April 21, 1843, issue of the Yarmouth Herald and Western Advertiser and quoting the Herald's second article verbatim.

Halifax Nova Scotia Royal Gazette, searched for the same period from April 20-27, 1843; one article was found quoting the same letter of Bradford McGray in the issue of Thursday, April 27, 1843, on p. 3, col. 1.

Halifax NovaScotian, searched from Monday, April 24 to Monday, May 1, 1843; one article was found quoting the same letter of Bradford McGray on Monday, May 1, 1843, p. 142, col. 3.

The Halifax Acadian Recorder was not available for this period at either the Public Archives of Nova Scotia or the Province House Legislative Library.

DISCUSSION AND CONCLUSIONS:

There is no doubt that this event seen at Yarmouth Harbour, Bunker's Island and the Cove, and at Cooks Harbour was a tsunami. It is not as clear if an earthquake was also experienced immediately before the tsunami. The Yarmouth report of the "Singular Phenomenon" makes absolutely no reference to an earthquake. Cooks Harbour is close enough to Yarmouth that an earthquake that was large enough to cause a tsunami at Cooks Harbour and to be felt at Cooks Harbour should have been felt at Yarmouth.

However, Bradford McGray's letter (who was onboard the Schooner BEE) to the editor of the Yarmouth Herald and Western Advertiser, which was published less than three days after the event, states that, "The schr. Bee,..., it being low water, and there being little or no wind, and a smooth sea, was struck with dreadful shocks, being in mid channel." Then, he implies they heard the tide, i.e. after the "dreadful shocks". He writes, "All at once heard loud

APRIL 18, 1843 TSUNAMI AND POSSIBLE EARTHQUAKE EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

roaring of the tide coming in, the vessel shook with great violence as if beating over large rocks." The men onboard "had great difficulty in keeping ourselves on deck."

This report sounds like the effects of a very local earthquake which caused a local tidal wave. It is also quite possible that the first influx of the tsunami from a distant quake, in fact, did drive the boat over some rocks and that the "dreadful shocks" heard before the tide began to make the "loud roaring" sound as it gained velocity, was the sound of the ship grounding. Then as the tsunami drove the Schooner BEE in over more rocks, it "shook with great violence as if beating over large rocks" and once, "high and dry at the top of the beach", the crew, "found her keel and rudder split, one of her butts started, and a great part of the oakum wrenched out."

However, Bradford McGray's letter makes the point that the schooner BEE was "mid channel" in a "smooth sea" when it, "was struck with dreadful shocks".

We cannot be sure until the Atlantic-wide area is checked for a large, distant event that could have caused this tsunami in the Yarmouth area or until other possible reports in southwest Nova Scotia are researched. At this point, the whole documentation hangs upon only the two articles, transcribed above, from the same issue of the Yarmouth Herald and Western Advertiser on Friday, April 21, 1843. Another independent report would be valuable.

The tsunami event should be entered in the CEEF under the tsunami section and the possible local earthquake should be tentatively entered with a question mark. More issues of the Yarmouth paper (or other local papers) should be searched to see if there are any subsequent reports or to see if the lobster or ground fish fishery was severely affected for a year or more after the tsunami over a wide area of southwestern Nova Scotia. If this was so, then the tsunami was probably from a distant earthquake. Certainly, the groundfish and lobster fishery was severely affected for two or three years by the three or more pulses of the tsunami that struck southern Newfoundland on November 18, 1929. While this has not been formally documented, it is well known to old timers and is reported in Leyton's 1975 book Dying Hard: The Ravages of Industrial Carnage.

Bunker's Island is noted in Campbell's (1876, reprinted 1972) A History of the County of Yarmouth, Nova Scotia on page 20 to be in Yarmouth County and to have the Micmac name 'Menegook', meaning, 'any island'. We are quite certain that Bunker's Island is in the approaches to Yarmouth Harbour.

MAY 13, 1844 EVENT

EPICENTRE LOCATION:

This event was felt most strongly 25 to 30 km outside Montreal, P.Q. The exact epicentre position is not known at present.

MAGNITUDE: not known; certainly III to IV

DATE: Monday, May 13, 1844

TIME: "...two distinct shocks, a quarter of an hour apart." "on Monday, forenoon," 1130-1200 EST
(1630-1700 GMT)

SUMMARY OF REPORTS:

"Two slight shocks were felt on on the Mountain of Montreal... The latter of which was accompanied by a loud rumbling noise." "... the shock was felt more strongly some 25-30 km outside Montreal and really shook people up." (Pierre Gouin, S. J., personal communication, February 27, 1987).

REFERENCES AND TRANSCRIPTS:

This event was brought to our attention by Ken Donovan, Historian, Fortress of Louisbourg National Park, Box 160, Louisbourg, N. S., BOA LMO (personal communication, January 27, 1987) very late in the process and has been added to Table 2, Table 5, Appendix 5 and Appendix 8 since it is a new previously-unreported event not in Smith (1962). Thus we actually have 85 event-specific reports in Table 2 and Appendix 5 and we have 33 new non-Nova Scotian events in Table 5.

Ken Donovan found an article in the Spirit of the Times and Cape Breton Free Press of Sydney, Nova Scotia in the Friday, May 31, 1842 issue on p.?, col.? as noted in Appendix 8. A transcript of the article appears below:

Two slight shocks of an earthquake were felt on Mountain of Montreal on Monday, forenoon, the 13th instant, between half past eleven and twelve o'clock. There were two distinct shocks, a quarter of an hour apart, the latter of which was accompanied by a loud rumbling noise, as of loaded wagons which appeared to come from the South. (transcript courtesy of Ken Donovan)

Pierre Gouin, S. J. (personal communication, February 27, 1987) reports that he has also located this event:

"I am grateful to your friend Ken Donovan for the excerpt on the 1884[sic - should be 1844]/V/13 event in Montreal. My file shows that the shock was felt more strongly some 25-30 km outside Montreal and really shook people up. If he needs the transcripts, I will give them to him."

MAY 13, 1844 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Smith (1962) has no May, 1844 events in the United States or in the Canadian sections of his compendium.

DISCUSSION AND CONCLUSIONS:

This event clearly occurred on Monday, May 13, 1844 near Montreal, P.Q. It is not in Smith (1962) or in the CEEF. It is a previously-unreported event which should be entered into the CEEF.

No further work was done on this event at present since it was beyond the areal scope of this study. This event was added extremely late in the process. Neither Ken Donovan nor Pierre Gouin appear in our list of acknowledgements and we hereby recognize their contribution in this note added in proof on March 7, 1987.

AUGUST, 1844 EVENT

EPICENTRE LOCATION:

Felt on Montreal Mountain. The exact epicentre location is not known at present.

MAGNITUDE: not known

DATE: August ?, 1844, exact day of August is not known

TIME: not known

SUMMARY OF REPORTS:

"A shock was also felt on the Mountain in the month of August last."

REFERENCES AND TRANSCRIPTS:

The latter part of an article in the Acadian Recorder of Saturday, May 17, 1845, p. 2, col. 3, on the Tuesday, April 29, 1845 event cites two other Montreal earthquakes:

This is the second shock felt in Montreal within five months, - the last having taken place on 28th November. A shock was also felt on the Mountain in the month of August last.

DISCUSSION AND CONCLUSIONS:

This small earthquake in August, 1844, is not cited in Smith's (1962) American or Canadian sections. This event should be entered in the CEEF. Further research in Quebec sources should verify a date, magnitude and possibly a time. No further work was done on this apparently new event because it was beyond the areal scope of the study.

NOVEMBER 28, 1844 EVENT

EPICENTRE LOCATION:

Felt in Montreal. The exact location of the epicentre is not known at present.

MAGNITUDE: Smith (1962) lists an intensity of IV on the Modified Mercalli Intensity Scale of 1931. This converts to a magnitude of 3.7 on the CEEF.

DATE: Thursday, November 28, 1844

TIME: not known

SUMMARY OF REPORTS:

"The last [shock] having taken place on the 28th November" [1844].

REFERENCES AND TRANSCRIPTS:

The latter part of an article in the Acadian Recorder of Saturday, May 17, 1845, p. 2, col. 3, on the Tuesday, April 29, 1845 event cites two other Montreal earthquakes:

This is the second shock felt in Montreal within five months, - the last having taken place on 28th November. A shock was also felt on the Mountain in the month of August last.

Smith (1962) notes this event, but does not cite an exact date. His entry is below:

40. 1844 NOVEMBER. IV. Felt at Montreal, Que. D2, H10,
L2.

DISCUSSION AND CONCLUSIONS:

This earthquake is listed in Smith (1962), but no specific date has been attached to the event. This adjustment can be made to the CEEF to list it on November 28, 1844. Further research in Quebec sources may define a better estimate of magnitude and epicentre location. No further work was done on this event because it was beyond the areal scope of the study.

APRIL 29, 1845 EVENT

EPICENTRE LOCATION:

Felt in Montreal. It was also felt at Trois Rivières and some persons felt it at Quebec City. The exact location of the epicentre is not known at present.

MAGNITUDE: not known

DATE: Tuesday, April 29, 1845

TIME: "about half-past four o'clock"
1630 EST (2130 GMT)

SUMMARY OF REPORTS:

"Citizens of Montreal were thrown into a sudden state of alarm by the shock of an earthquake." The quake caused, "the houses to shake and to make stove-pipes and crockery rattle." "To persons standing in the upper floors, it communicated a slight rocking motion, similar to that given by a ship."

REFERENCES AND TRANSCRIPTS:

The event is noted in an article in the Halifax Acadian Recorder on Saturday, May 17, 1845, on p. 2, col. 3 below a "MONTREAL, April 30" dateline (a Wednesday). A transcript of the article appears below:

MONTREAL, April 30.

On Tuesday afternoon, the 29(?) instant, the citizens of Montreal were thrown into a sudden state of alarm by the shock of an earthquake, which took place about half-past four o'clock. It was severe enough to cause the houses to shake, and to make stove-pipes and crockery rattle. It was not attended by a very loud noise. It sounded to us at first as if an avalanche of snow, - such as usually occurs in winter, - were hirstling off the roof, and falling into the street. The noise gradually increased, so that it seemed as if the roof itself were following the chute. To persons standing in the upper floors it communicated a slight rocking motion, similar to that given by a ship. We have not heard of any damage having been sustained. The motion appeared to be from West to East, and lasted about a second. We have not heard how far it extended.

This is the second shock felt in Montreal within five months, - the last having taken place on 28th November. A shock was also felt on the Mountain in the month of August last.

[The shock extended to Three Rivers, and some persons say that they felt it at Quebec.]

APRIL 29, 1845 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS:

This event is not listed in Smith (1962); he has no 1845 events even close to the date in the United States or Canadian sections of his compendium. This previously-unrecorded event should be entered into the CEEF. No further work was done on this apparently new event because it was beyond the areal scope of the study.

OCTOBER 26, 1845 EVENT

EPICENTRE LOCATION:

Smith (1962) lists this event at 42.5°N, 73.7°W in the Hudson River Valley. Felt in New York City, on Long Island, in Brooklyn and in Connecticut.

MAGNITUDE:

Smith (1962) lists this event with an intensity of VI on the Modified Mercalli Intensity Scale of 1931. This converts to a magnitude of about 5.0.

DATE:

Sunday, October 26, 1845

TIME

"precisely fifteen minutes past six o'clock"
1815 EST (2315 GMT)

SUMMARY OF REPORTS:

"the building began to shake with great violence, so that the windows rattled and the rafters cracked." A roaring noise was heard, "people ran out into the yard", "the women and servants uttered shrieks of alarm." The event lasted 2 minutes. " In some streets, it is said, mantel ornaments [of gas street lamps] were broken."

REFERENCES AND TRANSCRIPTS:

Two articles were found in the Acadian Recorder. The first of these gives quite a detailed account in the issue of Saturday, November 8, 1845 on p. 2, col. 2. A transcript of the article is below.

UNITED STATES

NEW YORK, October 27.

AN EARTHQUAKE. - Last evening (Sunday, Oct. 26) the shock of an earthquake was felt in several places on Long Island, and more or less distinctly at different points in this city. It occurred at precisely fifteen minutes past six o'clock. The day had been a most delicious one, the atmosphere clear and balmy, not a cloud on the surface of the sky, and the wind entirely at rest. We were reclining at the time on a couch in a house situated in the village of Rosly, Long Island, when the building began suddenly to shake with great violence, so that the windows rattled and the rafters cracked. Our first impression was that somebody was endeavouring to remove a heavy stove on the floor below; then it was suggested by one of our companions that a violent wind had sprung up; but as the shaking of the house was soon followed by a deep hollow sound like the rolling of thunder under the earth, it became evident that the phenomena were the effects of an earthquake. The trembling and sound must have lasted

OCTOBER 26, 1845 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

two minutes. The movement of the sound was a very deliberate one, and seemed to us to be in a direction from south to north. We afterwards learned that the shock had been felt in all parts of the village, and the persons who spoke of the noise, compared it to the rushing of heavy chariots along a hard stony street. Some of these who were outdoors pretended to say that the shock was accompanied by a brief electrical excitation of the air, but of these appearances we could get no confirmation from others.

Coming along the line of the railroad this morning, we ascertained that the shock was distinctly experienced in several of the towns on Long Island. At Oyster Bay, a friend informed us the agitation was so perceptible that the people in his house ran out into the yard, under an apprehension that the building was falling down, and the woman and servants uttered shrieks of alarm. At Glencove, Hempstead Branch, Hempstead, Jamaica, &c., similar impressions were produced.

In Brooklyn the noise was also heard, though most persons supposed it to be the rattling of carts or heavily laden waggons passing through the streets. We are told also by those who live in the neighborhood of Bleecker and Mulberry streets, that the phenomena we have described, were observed in this city. In some street, it is said, mantel ornaments were broken.

The months of October and November, we believe are the periods of the year when these singular commotions usually occur. The great disaster at Lisbon, in 1755, took place on the 1st of November, and that at Caraccas, if we remember rightly, in which eighty thousand human beings perished, was on the 28th of October. In South America, where these events most often happen, they take place generally in the fall of the year, after a season of unusual heat or dryness. - New York Evening Post.

The second article was in the same Saturday, November 8, 1845 issue of the Acadian Recorder on p. 3, col. 2 and it states:

UNITED STATES. - Boston dates to the 1st inst. were received by the Steamship Hibernia, on Monday.

An alarming earthquake was felt at different places in the States of New York and Connecticut, on Sunday evening, 27th of October. On the previous Thursday the wells dried up in the town of Green Hill, and one of the shocks in Westchester county, N.Y. resembled a subterraneous explosion.

OCTOBER 26, 1845 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Note: There is an error in the date; this event occurred Sunday, October 26, 1845; it is listed in Smith (1962).

Smith (1962) lists this event as:

115. 1845 OCTOBER 26. VI. 42.5°N, 73.7°W. Hudson Valley. Felt at New York and throughout western New England. B4, B5, M3.

However, Smith does not cite the time of 1815 EST (2315 GMT).

DISCUSSION AND CONCLUSIONS:

This event was previously-known; however, the CEEF can be altered to enter a time of 1815 EST (or 2315 GMT). The various felt reports may be valuable to others doing event-specific research on this event. No further work was done on this newly-documented event because it was beyond the areal scope of the study.

JANUARY 1, 1847 EVENT

EPICENTRE LOCATION:

Supposedly near Yarmouth, Nova Scotia. The exact location of the epicentre, if it even exists, is not known. The Canadian Earthquake Epicentre File (CEEF) lists 43.8°N, 66.1°W.

MAGNITUDE: Smith (1962) lists an intensity of IV on the Modified Mercalli Intensity Scale of 1931. This appears as a magnitude of 3.7 on the CEEF.

DATE: Friday, January 1, 1847 (probably a ghost event of the Tuesday, February 1, 1848 event)

TIME: not known

SUMMARY OF REPORTS:

We have only Smith's (1962) entry which reports that the event was "felt at Yarmouth" and cites J. B. Woodworth's Harvard Seismograph Station Sixth Annual Report.

REFERENCES AND TRANSCRIPTS:

Smith (1962) reports the event very briefly citing the Sixth Harvard Seismograph Station Annual Report. Smith's entry is below:

41. 1847 JANUARY 1. IV. Felt in Yarmouth, N.S. W4.4.

The event shows on the Canadian Earthquake Epicentre File as occurring January 1, 1847, at 43.8°N, 66.1°W with a magnitude of 3.7. The CEEF source is Smith's (1962) compilation.

Smith's (1962) only reference "W4.4" to this event is J. B. Woodworth's (1915) Sixth Annual Report of the Harvard Seismograph Station (for 1914). He cites this event in a discussion of an apparent series of, "progression of small shocks" and states (p. 102):

A similar equatorward progression of small shocks is apparent in the records of New England for the years 1842 - 1843. The most striking instances occurred in the year 1847, during which two lines of shocks beginning on the northeast in Nova Scotia on one side and in Ontario on the other seem to have concentrated on Boston and to have been followed by an earthquake on the "fall-line" as far south as Philadelphia. The coastal series comprised a shock at Yarmouth, N.S., on January 1; at Camden, Me., on February 2nd; at Livingston, Me., April 1; from Boston to Nantucket, on August 8; from Newport, R. I. to Philadelphia, Penn. on September 2nd.

JANUARY 1, 1847 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Woodward (1915) gives absolutely no references in this report and thus we do not know where the January 1, 1847 report came from.

Note: re the February 2, 1847 event above: Smith (1962) corrects Livingston to Limington, Maine on the basis of Brigham (1871).

An event-specific search was done around this date and the following newspapers were searched.

Newspapers Searched:

The Halifax Acadian Recorder, searched throughout the period; no reports were found.

The Yarmouth Herald, searched from Monday, January 4 to 11, 1847; no reports were found (published Mondays and Thursdays).

The Halifax Sun, searched from Friday, January 1 to 8, 1847 (published Monday, Wednesday and Friday); no reports were found.

The Pictou Eastern Chronicle, searched from Thursday, January 7 to 14, 1847; no reports were found.

The Halifax NovaScotian, searched from Monday, January 4 to 11, 1847; no reports were found.

The Halifax Royal Gazette, searched from Wednesday, January 6 to 20, 1847; no reports were found.

DISCUSSION AND CONCLUSIONS:

No reports of a January 1, 1847, event were found. This is probably a ghost event of the February 1, 1848 event. It is not a real event. It should be eliminated entirely from the CEEF.

It may be that Woodward (1915) in writing his Sixth Annual Report of the Harvard Seismograph Station (for the year 1914) somehow muddled Brigham's (1871) erroneous January 1, 1848 event as an 1847 event; Brigham (1871) was not certain himself if the January 1, 1848 event he listed was a real event. It may be that ghosts have spawned ghosts in this case?

Woodward (1915) may simply have misdated the January 29, 1847 Nova Scotian event known to have been felt in Antigonish County. If this was the case Woodward's report would suggest a felt report for the January 29, 1847 event in Yarmouth.

JANUARY 29, 1847 EVENT

EPICENTRE LOCATION:

Near Antigonish, Nova Scotia. The exact position of the epicentre is not known at present.

MAGNITUDE: not known

DATE: Friday, January 29, 1847, local time (Saturday, January 30, 1847, GMT)

TIME: At "about half-past nine" in the evening, then "a blazing meteor [was] seen in the heavens immediately after."
2130 AST (0130 GMT, January 30, 1847)

SUMMARY OF REPORTS:

"The shock of an Earthquake, it is said, was felt at Antigonish", and, "over the whole of this County." "Many persons felt their dwellings severely shaken, tins and crockery rattling against each other - others were awakened from their sleep." "The noise was heard in almost every dwelling and portion of the County." The event was experienced variably and was not felt by all persons. One reports suggests that, "the agitation experienced was confined to elevated situations and little or perhaps none felt on the level plain."

REFERENCES AND TRANSCRIPTS:

This event was reported in the Halifax Acadian Recorder of Saturday, February 13, 1847, p. 2, col. 6 citing a Halifax Morning Chronicle report. A transcript of the article is found below:

ANTIGONISH, February 1, 1847.

EARTQUAKE AND SPLENDID METEOR. - On the evening of 29th January, about half-past nine, the shock of an Earthquake was very sensibly experienced over the whole of this County. Many persons felt their dwellings severely shaken, tins and crockery rattling against each other - others were awakened from their sleep by the alarming motion of the house. One house, it is said, was so violently agitated that the doors were thrown open; and very many felt so severe a concussion that they went to another apartment of their dwelling to ascertain whether some heavy body had not fallen. The noise was heard in almost every dwelling and portion of the County, but not by any means so general was the agitation of the earth felt, or noticed at the time. The sounds and motion were not of more than two or three seconds duration. It is supposed to have been very near our surface, and running in veins, but a very slight shock - as at short distances from situations where the most violent agitation was felt, none at all was experienced - and the sounds also at places not far separated appeared very different in excess.

JANUARY 29, 1847 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

About three or four minutes after the shock a splendid meteor appeared to the westward, and passed from South to North, exploding about midway between the zenith and horizon - in brightness it rivalled the moon which was shining in full splendour at the time. At the moment of the shock, and appearance of the meteor, the atmosphere was clear and serene. The agitation experienced was confined to elevated situations and little, or perhaps none, felt on the level plain. - Chronicle

When the event-specific search was initiated, four other newspapers were looked at and only one other article was found in the Halifax Sun on February 10, 1847, p. 3, col. 1. The Halifax Morning Chronicle was not seen and is missing for 1848 both at PANS and at the Legislative Library at Province House in Halifax. A transcript of the Halifax Sun article appears below:

Earthquake

The shock of an Earthquake, it is said, was felt at Antigonish, on the 29th ult, and a blazing meteor seen in the heavens immediately after.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; one article was found (above).

Halifax Sun, searched from Friday, January 29 to Wednesday, February 10, 1847; one article was found (above).

Halifax NovaScotian, searched Monday, February 1 to February 8, 1847; no articles were found.

Pictou Eastern Chronicle, searched from Thursday, February 4 to 10, 1847; no articles were found.

Yarmouth Herald, searched from Thursday, January 28 to Monday, February 15, 1847; no articles were found.

DISCUSSION AND CONCLUSIONS:

This event is not reported in Smith (1962), but the report appears to be quite valid. The event should be entered in the Canadian Earthquake Epicentre File. There does not appear to be much likelihood that this event was caused by a meteorite impact; the meteor appeared too long after the earthquake.

Further event-specific searching may turn up other reports in northern Nova Scotia or even in Prince Edward Island. The Halifax Morning Chronicle article should be found as a check for any new information.

JANUARY 1, 1848 EVENT

EPICENTRE LOCATION:

Smith (1962) lists the epicentre as 45.0°N, 63.5°W at a point about half way between Halifax and Truro. The exact epicentre location is not known at present and there is some doubt as to whether this is a real event.

MAGNITUDE: Smith (1962) lists an intensity of IV on the Modified Mercalli Intensity Scale of 1931. The Canadian Earthquake Epicentre File (CEEF) has converted this to a magnitude of 3.7.

DATE: Saturday, January 1, 1848

TIME: not known, no time is given by Smith (1962)

SUMMARY OF REPORTS:

We have no reports; we have only Smith (1962) who notes, "ice was broken on ponds and doors were opened."

REFERENCES AND TRANSCRIPTS:

Smith (1962) gives the information above in his listing cited below:

45. 1848 JANUARY 1. IV. 45.0°N, 63.5°W. Nova Scotia.
Ice was broken on ponds and doors were opened.
B4, B5.

Smith's B4 and B5 reference are Brigham (1871) and Brooks (1960), respectively. William T. Brigham's reference gives no origin to his information, but clearly this is the source of Smith's (1962) information. Brigham is not certain (p. 19) if this January 1, 1848, event is a real earthquake and suggests that this event and the February 1, 1848, event, "should probably be referred to atmospheric agencies." Having said this in his text, Brigham then lists both events in his, "Tabular View of New England Earthquakes", on p. 28 with no qualification, and therefore, negates his earlier-stated uncertainty.

John Edward Brooks (1960) in his "Part II Earthquakes of Northeastern United States and Eastern Canada" then repeats Brigham's (1871) list as his items No. 208 and 209 and adds no new data and does not repeat Brigham's qualification. We present a transcription of Brigham's (1871) qualification below from his p. 19:

JANUARY 1, 1848 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The beginning of this year, January 1 and 1848. February 1, shocks are reported in Nova Scotia; the first broke the ice on ponds and opened doors, the second occurred at Yarmouth and Sherburne. It is well known that intense cold, as well as intense heat, causes cracking and subterranean rumbling, and it is necessary to guard against mistaking the origin of similar results. These shocks should probably be referred to atmospheric agencies.

While the two shocks, "are reported in Nova Scotia", we are never told by Brigham, "by whom?" In fact, the Acadian Recorder of Saturday, February 5, 1848, p. 3, col. 4, in reporting the Tuesday, February 1, 1848, earthquake in the Halifax area reports, in part:

It is further said that at Dartmouth, at Porter's Lake and Lawrencetown, about the same time, the ice in the lakes was shivered into fragments, and many people were startled by a sudden roaring and disturbance of the earth.

The above report of the February 1, 1848, event almost certainly was the source of Brigham's (1871) report regarding the 'ghost' January 1, 1848, event which he cites as, "the first broke the ice on ponds." The February 1, 1848 event may have been a "frost quake" or "ice quake" (see following event-specific report).

Newspapers Searched:

Halifax Acadian Recorder, searched throughout period; no article was found for a January 1, 1848, event.

Yarmouth Herald, searched from Monday, January 3, to Monday, January 31, 1848. (Published semi-weekly on Mondays and Thursdays; issues of Thursday, January 6 and Thursday, January 13, 1848, were missing at P.A.N.S.); no articles were found.

Pictou Eastern Chronicle, searched from Thursday, January 27, 1848, to Thursday, February 10, 1848. (Published weekly on Thursdays; issues for 1848 missing prior to January 27, 1848.); no articles were found.

Halifax NovaScotian, searched from Monday, January 3, to Monday, January 17, 1848; no articles were found.

North Sydney Cape Breton Spectator, searched by MacLeod (1984) for Saturday, January 15 and 22 and February 5, 1848; no articles were found (Appendix 4).

Halifax Presbyterian Witness and Evangelical Advocate, searched from its inception on Sunday, January 8, 1848 (p. 1) to Sunday, March 25, 1848 (p. 96); no articles were found.

JANUARY 1, 1848 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Halifax Christian Messenger, searched from Saturday, January 7 to Saturday, March 24, 1848; no articles were found.

The Times of Halifax, searched from Tuesday, January 4 to 11, 1848; no articles were found.

Halifax Morning Chronicle is missing for 1848, both at the Public Archives of Nova Scotia and at the Legislative Library at Province House in Halifax.

DISCUSSION AND CONCLUSIONS:

Despite Smith's (1962) citation of Brigham (1871) and Brooks (1960), there appears to be no evidence for this event in the local newspaper record. It appears to be a ghost event for the known real event that occurred on Tuesday, February 1, 1848. It is recommended that this event be eliminated entirely from the Canadian Earthquake Epicentre File.

FEBRUARY 1, 1848 EVENTS

EPICENTRE LOCATION:

Smith (1962) and the CEEF list the location of 43.5°N, 65.5°W which is at Cape Sable Island, Nova Scotia. This epicentre is almost certainly in error and should be subject to readjustment.

MAGNITUDE: Smith cites an intensity of III on the Modified Mercalli Intensity Scale of 1931. The CEEF has this magnitude as 3.7.

DATE: Tuesday, February 1, 1848

TIME: Two shocks, "one of them was just before day break - the other, about 8 o'clock".
0735 AST (1135 GMT) and at
about 0800 AST (circa 1200 GMT)

SUMMARY OF REPORTS:

The earthquake was accompanied by a rumbling noise in Yarmouth. There were two shocks felt and heard at Yarmouth. Smith (1962) indicated it was felt in Shelburne, N.S. A Halifax account cites the earthquake as being felt in the northern parts of the city near Pier's Mill* and more heavily in Porters Lake and Lawrencetown, about 30 km to the east of Halifax.

The earthquake was also felt at Dartmouth, Hammonds Plains and on the Bedford Basin road. "The ice in the lakes [east of Halifax] was shivered into fragments and many people were startled by a sudden roaring and disturbance of the earth."

REFERENCES AND TRANSCRIPTS:

Smith's (1962) compendium lists this earthquake as felt in Yarmouth and Shelburne, but gives no time. His reference is as below:

46. 1848 FEBRUARY 1. III. 43.5°N, 65.5°W. Felt at
Yarmouth and Shelburne, N.S. B4, B5.

J. Murray Lawson in his 1902 book Yarmouth, Past and Present notes these two events as the first earthquake in his 'Earthquakes' section (p. 597).

* Pier's Mill, not Piera' Mill as in the transcript of the March 21, 1848, Royal Gazette and Newfoundland Advertiser article cited in Adams and Staveley (1985) on p. 36. Pier's Mill was probably in the area of the present Piers Avenue, Halifax.

FEBRUARY 1, 1848 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Lawson's reference is as below:

EARTHQUAKES

Two slight shocks of earthquake were felt in Yarmouth, and, in fact, throughout Nova Scotia, on the 1st February, 1848, one of them just before daybreak, the other about 8 o'clock in the morning, both accompanied by a rumbling noise.

The event was also cited in Staveley et al. (1984) and the reference was quoted in Adams and Staveley (1985). A St. John's newspaper reference (St. John's The Royal Gazette and Newfoundland Advertiser of Tuesday, March 21, 1848, p. 2, col. 4) was cited by Adams and Staveley in their Appendix IV on p. 36 quoting the Halifax Morning Chronicle and was transcribed by them (p. 36). It seems to suggest an earthquake event in Nova Scotia on Tuesday, March 14, 1848. This is an erroneous assumption.

While we have not been able to find the Halifax Morning Chronicle, since it is missing, and it is clear from the articles in the NovaScotian and in the Times on Monday and Tuesday, February 7 and 8, 1848, respectively and in the Acadian Recorder of Saturday, February 5, 1848, that the Halifax Morning Chronicle article was published before Saturday, February 5, 1848, and that the "on Tuesday morning" quoted from the Morning Chronicle refers to the Tuesday previous, i.e. Tuesday, February 1, 1848. A transcript of The Royal Gazette and Newfoundland Advertiser of Tuesday, March 21, 1848, p. 2, col. 4 appears below:

EARTHQUAKE IN NOVA SCOTIA. - A slight shock of this wonderful natural phenomenon was felt on Tuesday morning, between the hours of eight and nine o'clock. From the information we have already obtained, we learn that the shock was experienced in some of the houses situated in the Northern part of the city, in the vicinity of Piera' Mill, [sic] and also at Porter's Lake and Lawrencetown it was the most sensibly felt at the two latter places. - Chronicle.

We have been unable to find the original Halifax Morning Chronicle article since all of 1848 is missing, both at the Public Archives of Nova Scotia and at the Legislative Library at Province House in Halifax.

The two Yarmouth Herald articles are transcribed below. The first appeared Thursday, February 3, 1848, on p. 2, col. 4, directly after the event and a transcript appears below:

SHOCKS OF AN EARTHQUAKE

On Tuesday morning there were two slight Shocks of an Earthquake in this Town and vicinity. One of them was just before day break - the other, about 8 o'clock.

FEBRUARY 1, 1848 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

They were accompanied by a rumbling noise. How far they were felt in the interior we have not yet learned.

A second Yarmouth Herald article appeared in the next semi-weekly issue on Monday, February 7, 1848, on p. 2, col. 3. A transcript of this very brief article appears below.

The earthquake was felt at Halifax on Tuesday Morning.

The Halifax felt report is further amplified in a report in the Acadian Recorder of Saturday, February 5, 1848, on p. 3, col. 4. A transcript of this article appears below:

EARTHQUAKE! - A strange phenomenon was observed at Triangle Cottage, on Tuesday morning, at a few minutes past 8 o'clock. Hearing a tremendous rumbling noise, like the near approach of thunder, some of the family imagined that the chimney was on fire, while a little girl, eight years of age, perceived that the boards were all moving under her feet. The shaking and noise dwindled away, however, in less than two minutes. Upon a few moments reflection they concluded that the concussion proceeded from an Earthquake. We have since ascertained that it was likewise experienced at Mr. Leppard's, North West Arm, through the Dutch Village, Bedford Basin road, and up to the head of the colored settlement of Hammond Plains, about the same time of the day. Perhaps some of our Philosophers may be pleased to give us an explanation of the cause of this startling occurrence, and if it is likely to happen again. - Communicated.

It is further said that at Dartmouth, at Porter's Lake and Lawrencetown, about the same time, the ice in the lakes was shivered into fragments, and many people were startled by a sudden roaring and disturbance of the earth.

Both the NovaScotian of Halifax on Monday, February 7, 1848, on p. 43, col. 5 and The Times of Halifax on Tuesday, February 8, 1848, on p. 2, col. 4, quoted the same Halifax Morning Chronicle report cited by Staveley et al. (1984) and quoted by Adams and Staveley (1985) from the St. John's paper of March 21, 1848. We provide a transcript of The Times version below:

EARTHQUAKE IN NOVA SCOTIA. - A slight shock of this wonderful natural phenomenon was felt on Tuesday morning, between the hours of eight and nine o'clock. From the information we have already obtained, we learn that the shock was experienced in some of the houses situated in the Northern part of this city, in the vicinity of Pier's Mill, and also at Porter's Lake and

FEBRUARY 1, 1848 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Lawrencetown. It was the most sensibly felt at the two latter places. - Chronicle

As noted above, we have not been able to locate the original Halifax Morning Chronicle reference, though it must have appeared on one of the three days from Wednesday, February 2 to Friday, February 4, 1848. The Morning Chronicle was a tri-weekly which published on Tuesdays, Thursdays and Saturdays thus the missing article probably is to be found in the missing Thursday, February 3, 1848 issue. We did recover a copy of the Tuesday, March 21, 1848, St. John's The Royal Gazette and Newfoundland Advertiser article (Appendix 8) and it appears in transcript above.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; one article was found (see above).

Yarmouth Herald, searched from Monday, January 31 to Thursday, February 17, 1848. (Published semi-weekly, Mondays and Thursdays); two articles were found (see above).

Pictou Eastern Chronicle, searched from Thursday, January 27 to Thursday, February 10, 1848. (Published weekly on Thursdays; the 1848 issues prior to January 27, 1848, are missing at the P.A.N.S.); no articles were found.

Halifax NovaScotian, searched from Monday, February 7 (p. 41) to Monday, February 14, 1848 (p. 56); one article quoting the Morning Chronicle's report was found on February 7, 1848, on p. 43, col. 5. and was identical to the Times articles of February 8, 1848 (see above).

The North Sydney Cape Breton Spectator, searched by John MacLeod (1984) on February 5, 1848; no articles were found (Appendix 4).

Halifax Presbyterian Witness and Evangelical Advocate, searched from Saturday, January 8 to Saturday, March 24, 1848; no articles were found.

The Times of Halifax, searched from Tuesday, February 1 to 8, 1848; one article was found on Tuesday, February 8, 1848, on p. 2, col. 4 quoting and crediting the Halifax Morning Chronicle article (see transcript above).

Halifax Morning Chronicle is missing for all of 1848 at the Public Archives of Nova Scotia and at the Halifax Provincial Legislative Library.

DISCUSSION AND CONCLUSIONS:

It is not at all clear how Smith (1962), and in his footsteps, the CEEF chose Cape Sable Island in the very southwest of Nova Scotia as the epicentre location (43.5°N, 65.5°W). With this event clearly felt in Yarmouth,

FEBRUARY 1, 1848 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

Shelburne (Smith, 1962), in northern Halifax (at Pier's Mill) and on the North West Arm, at Dutch Village (Western Halifax), on the road to Bedford Basin, at the northern limit of Hammond Plains, at Dartmouth, Lawrencetown and Porters Lake (where ice apparently "shivered into fragments") then there appears to be little reason to put the epicentre at Cape Sable Island. We suspect the epicentre presently listed for the January 1, 1848, ghost event (45.0°N, 63.5°W) is more accurate than a Cape Sable Island position.

This event should be subject to a more complete study similar to that done by Leblanc and Burke (in press, 1985) for four New Brunswick events in an effort to revise the epicentre location and the magnitude. We believe the epicentre location should be subject to revision. We suspect that the CEEF should be revised to show a somewhat higher magnitude for the 0800 AST event. The CEEF can be altered to show two shocks separated by about 25 minutes and the times for both inserted.

An inquiry with the Atmospheric Environment at Bedford, Nova Scotia, and with the National Museum of Science and Technology in Ottawa (Mary W. Grey, personal communication, letter dated November 5, 1985) yielded the estimated time of "daybreak" on February 1, 1848 as 0740 or 0741. Therefore, we would judge the time of, "just before daybreak", to be not more than five minutes earlier i.e. at 0735 AST (1135 GMT). We have entered the first event at 0735 AST (1135 GMT).

It may be that the second shock was that which was felt in the Halifax area since the "about" 0800 time in Yarmouth matches the Halifax reports of "a few minutes past 8 o'clock". The second shock appears to have had a slightly larger magnitude and was felt over much of western Nova Scotia where the first "foreshock" was only felt in the very west, or possibly only in Yarmouth. If the 0800 AST event was felt from Yarmouth to Halifax it should have also been felt in southern New Brunswick; this should be checked in New Brunswick sources.

One should also keep open the possibility that the 0800 AST shocks in Yarmouth and in Halifax were unrelated events (or nearly unrelated). It may be that the Halifax event was a "frost quake" or "ice quake" that fortuitously occurred at the same time or which was triggered by the faintly felt vibrations of the Yarmouth event.

These events may also be from an offshore epicentre; the event clearly requires more careful work with all remaining sources.

SEPTEMBER 24, 1848 TSUNAMI EVENT

EPICENTRE LOCATION:

Not known at present. The tsunami almost certainly resulted from a distant earthquake. The tsunami occurred at Bonavista and Catalina, Newfoundland.

MAGNITUDE: not known

DATE: The tsunami occurred Sunday, September 24, 1848

TIME The tsunami occurred "between the hours of three and four in the afternoon" in one report, and in the second report, simply implies it was "after 12 noon and continued rising and falling alternately every ten minutes or so nearly all the afternoon." We shall use the nominal local time of 1530 NST, but we do not know at present if Newfoundland operated one half hour different from mainland Canada and neither does the Newfoundland Archives (Appendix 6). Nominal 1530 local time (1900? GMT)

SUMMARY OF REPORTS:

The tsunami was seen at Bonavista and Catalina in Newfoundland, prompting recollection by older residents of the November 1, 1755, event at the time of the Lisbon earthquake. While one report seems to suggest an atmospheric cause related to a wind reversal about noon; both reports indicate that event began with, "the sudden receding of the water in this harbour" or, "all at once the tide ran out of the harbours, so that a person may walk out to the stage heads". The water then returned in about ten minutes and, "rose so high that it ran up Walkham's Brook into the pond" and was, "covering the bedding or floor of the fishing stages in the place."

REFERENCES AND TRANSCRIPTS:

This previously-unrecorded event was discovered in the search of the Halifax Acadian Recorder of Saturday, October 21, 1848, on p. 3, col. 2. A copy was sent out to the Newfoundland Archives to see if the time relative to GMT can be sorted out (see Appendix 6); Michael Staveley at Memorial University was also given a copy. A transcript of the article appears below:

ST. JOHN'S, N.F. October 3.

The following is an extract of a letter from Bonavista, dated 26th September: -

"On Sunday last, between the hours of three and four in the afternoon, a most strange phenomenon (if it may be so called) was observed here, namely the sudden receding of the water in this harbour, to such a frightful extent, that some of the boats grounded at their moorings on the collars, and by a return or flow of the water in a few minutes, to a considerable extent, covering the bedding or floor of the fishing stages in the

SEPTEMBER 24, 1848 TSUNAMI EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

place. Nothing of this kind has been known in this quarter since 1755, the time of the destruction of Lisbon by earthquake. I expect this has been observed in other harbours in the "Island."

Another extract, 25th September, from the same place says: -

A most singular occurrence took place here yesterday (Sunday,) 24th. The wind in the morning was from the Southward, a light breeze with very heavy rain; about twelve o'clock it veered suddenly round to North West and blew hard. One boat had come in the evening before from the Bay, with a load of timber, and was at her usual place; all at once the tide ran out of the harbours, so that a person may walk out to the stage heads. One boat lay aground on the collar at her moorings. In about ten minutes more it ran in again and rose so high that it ran up Walkham's Brook into the pond, and continued rising and falling alternately, every ten minutes or so nearly all the afternoon. Some of the old people say it was something like it was the year Lisbon was destroyed. I hear a similar occurrence took place at Catalina, and some damage sustained."

This event is not recorded in Smith (1962) and is not recorded in the CEEF's tsunami section.

DISCUSSION AND CONCLUSIONS:

This newly-discovered tsunami was clearly induced by a distant earthquake and should be recorded in the Canadian Earthquake Epicentre File under the tsunami section. The world epicentre file for the Atlantic should be searched for a large earthquake on September 24, 1848, that could have caused this event; this has not been done. No further work was done on this event at this time since it was beyond the areal scope of the study.

Note added in proof: Michael Staveley was provided the above data and in his 1986 report on DSS Contract OST85-00313 he reports that this tsunami was also seen at Fishing Ships Harbour on the southeast coast of Labrador and possibly in St. John's (p.25-27 of Staveley et al., 1986) but apparently not at Hebron or Hopedale farther north on the Labrador coast, at least it was not noted in the Moravian missionary's diaries (Staveley et al., 1986).

CIRCA EARLY NOVEMBER 1850 EVENT

EPICENTRE LOCATION:

Was felt in Fredericton, New Brunswick. The exact epicentre is not known at present.

MAGNITUDE: not known

DATE: circa early November 1850 (i.e. "was recently felt" as reported November 21, 1850)

TIME: not known

SUMMARY OF REPORTS:

"slight shock of an earthquake"

REFERENCES AND TRANSCRIPTS:

This event was discovered in doing a search of twenty years of the Yarmouth Herald. It was clearly a brief filler item on Thursday, November 21, 1850, on p.3, col. 2, along with items such as Professor Webster's widow and daughter going to Faval, a cholera epidemic in Jamaica, and a 300-home fire in Fredericton. A transcript of the article appears below:

A slight shock of an earthquake was recently felt at Fredericton, N.B.

DISCUSSION AND CONCLUSIONS:

This event is not reported in Smith (1962). Smith has no 1850 events in Canada and his one American event in 1850 was on July 20, 1850, in Portland, Maine; it was an intensity of only III on the Modified Mercalli Intensity Scale of 1931. This apparent early November 1850 event is a previously-unreported event and should be added to the CEEF. Further historical research should be done using New Brunswick sources to better define this event. No further work was done on this event at this time since it was beyond the areal scope of the study.

MARCH 19 OR MARCH 20, 1853 EVENT

EPICENTRE LOCATION:

Event was felt at St. Catherines and Niagara, Ontario. The exact epicentre is not known at present, but may be close to the listed March 13, 1853, event at 43.1°N, 79.4°W.

MAGNITUDE: not known

DATE: "on Sunday morning the 19th ult," which implies that it occurred on Sunday, March 19, 1853. However, March 19, 1853 was a Saturday not a Sunday. This event occurred either on Saturday, March 19, 1853 or Sunday, March 20, 1853.

TIME: "about one o'clock"
0100 EST (0600 GMT)

SUMMARY OF REPORT:

A shock of an earthquake which was, "preceded by a rumbling noise." Some persons, "affirm that they were thrown out of bed by the violence of the concussion."

REFERENCES AND TRANSCRIPTS:

This report comes from a single account found in the Halifax Daily Sun of April 12, 1853, on p. 3, col. 4. A transcript of this article is found below:

The St. Catherines and Niagara papers contain accounts of the shock of an Earthquake that occurred there. It was felt in Niagara about one o'clock, on Sunday morning the 19th ult, preceded by a rumbling noise, as if ten thousand carriages were rattling at some distance, on the pavement. Several persons affirm that they were thrown out of bed by the violence of the concussion.

Smith (1962) has no events on March 19 or 20, 1853, but does list a nearby event one week previous on March 12 at 0200-0300 EST and an event on March 13 in the same locality at 0500 EST. The two Smith (1962) entries are as below:

53. 1853 MARCH 12. 2:00-3:00 a.m. VI. 43.7°N, 75.5°W.
(151) (b). Machinery thrown down at Lowville, N.Y.
Felt also in Canada. Plotted on the map as No.
151 in U.S.A. B4, B5, H1, M7, W4.4.

54. 1853 MARCH 13. 5:00 a.m. V. 43.1°N, 79.4°W.
Shock near St. Catherines, Ont. B5, L2.
"The same day at the same hour at Grimsby,
Jordan, Thorold, Fells[sic], Queenston, Fort
Mississangua[sic] and in all Canada, four
shocks[sic]." L2.

MARCH 19 OR MARCH 20 1853 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS:

We do not know whether the event reported in the Halifax Daily Sun of April 12, 1853, as apparently taken from St. Catherines and Niagara papers actually occurred on March 19 or 20, 1853. Nor do we know if Smith's (1962) event on March 12, 1853, exactly one week previous, is a ghost or visa versa. Similarly, we do not know the relation of Smith's March 13, 1853, event to the above events. There may be three or two events (or possibly even one?).

We recommend that the March 12-31, 1853, newspapers of the Niagara Peninsula and Lowville, New York areas be searched to eliminate or consolidate ghost events. No further work was done on these events since they were beyond the areal scope of the study.

APRIL 2, 1853 EVENT

EPICENTRE LOCATION:

This event was felt in Halifax. The exact location of the epicentre is not known at present.

MAGNITUDE:: Not known; however, it was fairly small. Probably an intensity of III to IV on the Modified Mercalli Intensity Scale of 1931 or 3.0 to 3.7 magnitude.

DATE: Saturday evening, April 2, 1853, local time
(Sunday morning, April 3, 1853 GMT)

TIME: "At midnight" in one report and "at about half-past eleven o'clock" in another. We have split the difference to list it at 1145 AST on April 2, 1853 (0345 GMT on April 3, 1853)

SUMMARY OF REPORTS:

"...there was a slight shock of an earthquake." "Vibrations of an Earthquake were sensibly felt in various parts of the City, accompanied by a noise resembling the rumbling of heavy wheels over the pavement." "The parties who noted the phenomenon were so many that there can be hardly a mistake of the fact."

REFERENCES AND TRANSCRIPTS:

This event was discovered in the search of the long run of the Acadian Recorder published in Halifax; it is not listed in Smith (1962). The very brief report in the Acadian Recorder of Saturday, April 9, 1853, on p. 3, col. 3, appears as a transcript below:

A shock of an earthquake was felt in this city last Saturday night.

The Provincial monthly magazine published in Halifax refers to the April 2, 1853, event in the "Our Monthly Gossip" column in the May issue on p. 200. The article appears to refer to two events, "on the night of the second and morning of the 3rd April." A transcript of the Provincial article is found below:

A slight shock of earthquake was felt in the vicinity of Halifax, on the night of the second and morning of the 3rd April; it is also reported to have been felt in the Upper Provinces as far as Niagara.

Three other articles were found. The Halifax Daily Sun of Tuesday, April 5, 1853, had an article on p. 3, col. 2. A transcript of that article appears below:

On Saturday, at midnight, the vibrations of an Earthquake were sensibly felt in various parts of the City, accompanied by a noise resembling the rumbling of heavy wheels over the pavement. The parties who noted the

APRIL 2, 1853 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

phenomenon were so many that there can be hardly a mistake of the fact.

The article which appeared in the Halifax Morning Chronicle of Thursday, April 7, 1853, on p. 2, col. 3, also appeared on the first page of the Halifax NovaScotian, Monday, April 11 on p. 113, col. 5. A transcript of that brief article appears below:

Many persons concur in opinion that there was a slight shock of an earthquake, in this city, on Saturday night last at about half-past eleven o'clock.

Certain other newspapers were looked at in this event-specific search, but no further articles were found. The list of newspapers searched is below.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; one brief article found on Saturday, April 9, 1853, on p. 3, col. 3 (see above).

Halifax Daily Sun, searched from Saturday, April 2 to Tuesday, April 12, 1853; one article was found on Tuesday, April 5, 1853, on p. 3, col. 2 (see above).

Halifax NovaScotian, searched from Monday, April 4 to Monday, April 18, 1853 (publishes weekly on Mondays); one article was found on the first page of the Monday, April 11, 1853, issue on page 113, col. 5 (see above).

Halifax Morning Chronicle, searched from Saturday, April 2 to Thursday, April 7, 1853 (tri-weekly on Tuesdays, Thursdays and Saturdays); one article was found in the Thursday, April 7, 1853, issue on p. 2, col. 3 (see above).

Halifax Provincial monthly magazine, searched for May; one article found in the "Our Monthly Gossip" column on p. 200.

Halifax British Colonist and North American Railway Journal, searched from Saturday, April 2 to Thursday, April 14, 1853 (issue of Tuesday, April 12, 1853, missing); no article was found.

Sydney Cape Breton News, searched from Wednesday, March 30 to Wednesday, May 4, 1853, by MacLeod (1984); no article was found (Appendix 4).

Pictou Eastern Chronicle, searched from Tuesday, April 5 to Tuesday, April 19, 1853; no article was found.

Yarmouth Herald, searched from Thursday, March 31 to Thursday, June 23, 1853, and throughout this period; no article was found concerning this event.

Antigonish Casket, searched Thursday, April 14, 1853 (issues between March 21 and April 14, 1853 are missing); no article was found.

APRIL 2, 1853 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Dr. Ken Burke at the Department of Geology at the University of New Brunswick kindly checked the following newspapers in the New Brunswick archives (personal communication, Dr. Ken B. S. Burke, Department of Geology, University of New Brunswick, letter of December 10, 1985):

Chatham Gleaner and Northumberland Schediasma; no reports found.

Fredericton Headquarters, most 1853 issues missing; no reports found.

Fredericton New Brunswick Reporter; no reports found.

Saint John Morning Freeman, most 1853 issues missing; no reports found.

Saint John Morning News; no reports found.

Saint Andrews Standard; no reports found.

St. Stephen Provincial Patriot; no reports found.

DISCUSSION AND CONCLUSIONS:

This event is not listed in Smith (1962); it is not in the CEEF. The Saturday, April 2, 1853, event at 1145 AST should be added to the CEEF using a fairly low magnitude of about 3.0 to 3.7. The best estimate of the epicentre location may be that of Halifax.

The report in the May issue of the Provincial that the event, "is also reported to have been felt in the Upper Provinces as far as Niagara" is clearly not referring to this apparently very local event. The magazine may be mixing up the March 12 and 13 events (Smith, 1962) or that on March 19 or 20 (this report), which occurred near Niagara, with the Halifax event. There is no relationship.

MAY 24, 1853 EVENT

EPICENTRE LOCATION:

Near Ottawa, Ontario. The exact location of the epicentre is not known at present.

MAGNITUDE: Smith (1962) lists this event as having an intensity of II on the Modified Mercalli Intensity Scale of 1931 which will convert to a magnitude of about 2.3 in the CEEF.

DATE: Monday, May 23, 1853

TIME: "about two o'clock"
0200 EST (0700 GMT)

SUMMARY OF REPORTS:

"Houses shook and the windows rattled so as to wake several persons."

REFERENCES AND TRANSCRIPTS:

Smith (1962) lists this event, but gives no time. His entry shows:

55. 1853 MAY 24. II. Felt at Ottawa, Ont. B4, B5, W4.4.

We found two identical entries citing the Bytown (Ottawa) Citizen. The Acadian Recorder of Saturday, June 11, 1853, on p. 2, col. 4 and the NovaScotian of Monday, June 13, 1853, on p. 190, col. 5, had the same article. A transcript of the article is found below.

ANOTHER EARTHQUAKE IN CANADA. - On the morning of the 24th May, just about two o'clock, says the Bytown Citizen, the shock of an earthquake was distinctly felt in this town. The houses shook and the windows rattled so as to wake up several persons. We are informed by a gentleman who felt the shock, and who is well competent to give an opinion upon such matters, that the direction of the vibrations was from the west by north. In no period during the last several centuries have those convulsions been so frequent as during the past twelve months.

DISCUSSION AND CONCLUSIONS:

This event is previously-known, but the time has not been listed in Smith (1962) or, we suspect, in the CEEF. The time of "about" 0200 EST (or 0700 GMT) should be entered in the CEEF. No further work was done on this event since it was beyond the areal scope of the study.

JUNE 3, 1853 EVENTS

EPICENTRE LOCATION:

Events were felt in Yarmouth; at Annapolis, Bridgetown, Kentville, Brooklyn, Newport and Windsor, in the Annapolis Valley area; in Hants County; and at East Port Medway on the south shore; it was not felt in southern New Brunswick, apparently. Thus, the epicentre is believed to be located in Nova Scotia, probably closer to the southern coast where damage may have been greatest(?). The exact location of the epicentre is not known at present

MAGNITUDE: Smith (1962) listed this event at an intensity of III on the Modified Mercalli Intensity Scale of 1931 which has been converted to a magnitude of 3.0 in the CEEF. Given the felt area covered, the magnitude is most certainly somewhat larger.

DATE: Friday, June 3, 1853

TIME: One shock at "about 4 P.M."
1600 AST (2000 GMT)
An apparent second shock occurred, "on the evening" or, "during the night".

SUMMARY OF REPORTS:

"A smart shock of an earthquake" was felt "throughout the County" of Kings and at Kentville where it, "shook the whole building and the floor under me trembled very much." In Annapolis, the correspondent reported, "We were visited by 2 or 3 strokes of an earthquake during yesterday and last night. The first shock which took place about 4 o'clock in the afternoon was so severe as to cause houses to shake and the crockeryware on our shelves to rattle." In East Port Medway on the south shore of Nova Scotia, the correspondent called it a "slight shock", but indicates that, "The glass was broken out of houses and the earth was felt to shake."

REFERENCES AND TRANSCRIPTS:

This event is reported in Smith (1962) with no time or epicentral location given, no second evening shock is mentioned and only one felt location is mentioned per the entry below:

56. 1853 JUNE 3. III. Two or three shocks at Bridgetown, N.S. B4, B5, W4.4.

The reference to, "Two or three shocks at Bridgetown, N.S." is a direct quote by Smith (1962) from Brigham (1871) which was essentially parroted by Brooks (1960).

We found no references to the event in our long search of the Halifax Acadian Recorder throughout the period. However, our search of the Yarmouth Herald throughout the period did yield three articles. The first two were found on Thursday, June 9, 1853, on p. 2, col. 3 and on p. 2, col. 5, and are transcribed in this order below:

JUNE 3, 1853 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The shock of an earthquake was felt throughout this County on Friday afternoon last about 4 P.M. We learn that it was also experienced as far as Windsor.

By Telegraph to Yarmouth Herald.
KENTVILLE TELEGRAPH OFFICE,

June 7.

On Friday, 3d inst., whilst in office, felt shock of earthquake about 4 P.M. - appeared to be at front of shop at first - shook the whole building and the floor under me trembled very much - the jar produced by it felt like the striking of a vessel against a wharf. The shock was felt throughout the County - more severely in some parts than in others.

Weather beautiful - and Kings County looking better than for many years at this season.

L.D.C.

The third of the Yarmouth Herald's articles was found two weeks later on Thursday, June 23, 1853, on p. 3, col. 1, and is found below:

The Port Medway* correspondent of the Sun** says. We were visited on the 3rd inst., in the afternoon, with a slight shock of an earthquake, which was very sensibly felt here and also on the opposite side of the harbor. - The glass was broken out of houses and the earth was felt to shake. It appeared to commence at the westward and passed off to the eastward, with a rumbling noise lasting five or seven minutes.

This report of the East Port Medway correspondent to the Halifax Daily Sun was repeated verbatim in the Pictou Eastern Chronicle of Sunday, June 26, 1853, on p. 2, col. 4, and in the Halifax Morning Chronicle of Saturday, June 18, 1853, on p. 2, col. 2, and are not retranscribed here. Lawson (1902) mentions the June 3, 1853, event as felt "in Yarmouth" per the quote below from p. 598:

The shock of an earthquake was felt in Yarmouth, extending eastward as far as Windsor, at 4 p.m. on June 3d, 1853.

It is not clear where Lawson found the felt report regarding Yarmouth at this point since we did not find it stated quite so directly in the Yarmouth Herald. The June 9, 1853, article (p. 2, col. 3 - see above) can

* It was actually East Port Medway; see Halifax Daily Sun article of June 17, 1853, p. 2, col. 5 later in this section.

** The newspaper's full name was Halifax Daily Sun.

JUNE 3, 1853 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

probably be safely taken as a felt report for Yarmouth (ie "throughout this County"). The Halifax Daily Sun in its brief article of Wednesday, June 15, 1853, p. 2, col. 3 (later in this section) clearly does report the event as, "felt on the 3rd inst., at Yarmouth and its vicinity." It may also have been local knowledge at the time which Lawson, Jr. absorbed by living in Yarmouth.

John MacLeod (1984) searched the Sydney Cape Breton News from Wednesday, June 1 to Wednesday, July 2, 1853, and found one article citing the Halifax Daily Sun, in the issue of Wednesday, June 22, 1853, on p. 2, col. 3. This article appears as a transcript below:

A few days since a severe thunder storm passed over a large section of the county of Hants; the lightning struck a venerable oak, on a field in the neighbourhood of Brooklyn New Port, rending the tree, and killing several cattle in its immediate vicinity. On the evening preceding the storm a smart shock of an earthquake was felt over an extensive area of the same Township. - Sun*.

The article above is, in fact, an exact direct quote of the first part of an article in the Halifax Daily Sun of Monday, June 13, 1853, p. 2, col. 4. This article appears in its entirety below on the following page of this event-specific report.

An electrical storm is referred to in the Cape Breton News article above. "A violent thunder storm" is very clearly dated as, "Friday night last" in the same issue of the Sydney Cape Breton News on Wednesday, June 22, 1853, on p. 2, col. 3 (see below) citing the Pictou Eastern Chronicle as the source, but not giving the date of the Eastern Chronicle issue; hence, not defining the date of the major electrical storm. We searched the Eastern Chronicle for the earthquake event, but did not recover the article on the electrical storm (since it did not seem important at the time).

The Eastern Chronicle should be re-searched for this article to determine the storm's exact date; hence, to relate the Halifax Daily Sun's report of an earthquake, "on the evening preceding the storm...". For the sake of the record, the Sydney Cape Breton News article of Wednesday, June 22, 1853, p. 2, col. 3, on the storm appears below in transcript:

A violent Thunder Storm passed over a part of this county on Friday night last. Two spruce trees in Mr. Arnison's grove, near the residence of Wm. Robertson. Esq. Collector of Customs, were struck by the lightning and completely shattered. A house at River John, belonging to Mr. Nelson Langille, was also struck by the lightning and nearly destroyed. The electric fluid

* The Sun refers to the Halifax Daily Sun.

JUNE 3, 1853 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

first passed down the chimney, which is partly thrown down, and from thence it passed to other parts of the house. The windows are all broken, the floors, walls and ceilings all shattered and splintered, and the posts and rafters so much shattered that the roof has partly fallen in. Several stones from the chimney were thrown into a bed in which there were persons sleeping, yet strange to say, neither of the occupants of the bed nor any of the inmates of the house were at all injured. A tannery at the West River, owned by Mr. Joseph McLean, was burnt to the ground the same night - supposed to have been set on fire by the lightning. The building, with all its contents, including a large quantity of hides was totally destroyed. - East. Chron.

The Halifax Morning Chronicle yielded a second article on Thursday, June 16, 1853, on p. 2, col. 4, which appears to be essentially a direct report from the Yarmouth Herald of June 9. It is transcribed below:

Several smart shocks of an earthquake have been felt at Kentville and throughout Kings County, early in the present month, which were so violent as to shake the buildings. The County of Kings is said to be looking better than for many years, and the crops promise a most bountiful return.

The Halifax Daily Sun contained four articles. The first article was on Monday, June 13, 1853, p. 2, col. 4 and refers to, "a smart shock of an earthquake", "On the evening proceeding the storm", but does not give the date of the storm other than to report it as, "a few days since." We transcribed part of the article above as quoted in the Sydney Cape Breton News, but transcribe the article in its entirety below:

A few days since a severe thunder Storm passed over a large section of the county of Hants; the lightning struck a venerable oak, on a field in the neighbourhood of Brooklyn, New Port, rending the tree, and killing several cattle in its immediate vicinity. On the evening proceeding the storm a smart shock of an earthquake was felt over an extensive area of the same Township.

Park Godwin tells a story of a man in London who was quite sure one night he felt an earthquake; but on reading the London Times the next morning, and finding no mention of the earth quake, he concluded there had been none. We chronicle an earth quake, and our readers may rely that quake the earth did.

JUNE 3, 1853 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The two articles in the Halifax Daily Sun of Wednesday, June 15, 1853, both deal with the west end of the province. The first on p. 2, col. 3 is very brief and only gives a felt report for Yarmouth per the transcript below:

The shock of an Earthquake was felt on the 3rd inst.,
at Yarmouth and its vicinity.

The other article in the Daily Sun of Wednesday, June 15, 1853, appeared on p. 2 as well, but in col. 4. It is an exact quote of the June 7, 1853, Kentville telegraph report of "L.D.C." to the Yarmouth Herald and published in the Herald's issue of Thursday, June 9, 1853, p. 2, col. 5. It is not retranscribed here.

The last article found in the Halifax Daily Sun was found on Friday, June 17, 1853, on p. 2, col. 5 and is the article later repeated in all cases without the, "East Port Medway, June 3rd, 1853." dateline in the Halifax Morning Chronicle on Saturday, June 18, 1853, in the Yarmouth Herald of Thursday June 23, 1853 and in the Pictou Eastern Chronicle of Sunday, June 26, 1853. The original of this report is provided for the record as a transcript below:

Mr. Editor,

Dear Sir - We were visited yesterday afternoon with a slight shock of an Earthquake, which was very sensibly felt here and also on the opposite side of the harbour. The glass was broken out of houses, and the earth was felt to shake. It appeared to commence at the westward and passed off to the eastward, with a rumbling noise lasting five or seven minutes.

****H.

East Port Medway, June 3rd, 1853.

Dr. Ken Burke of the University of New Brunswick kindly supplied three other reports of the June 3, 1853 events from New Brunswick papers which suggest that the June 3, 1853, events were not felt in southern New Brunswick along the Fundy coast; hence, that the earthquake was confined to Nova Scotia (personal communication, Dr. Ken B. S. Burke, Department of Geology, University of New Brunswick, Fredericton, New Brunswick, letter of December 10, 1985). He found one article in the Chatham, New Brunswick Gleaner and Northumberland Schediasma of Monday, June 13, 1853, on p. 187, col. 2 (citing a Halifax newspaper as the British American). This article was transcribed by Dr. Burke as:

EARTHQUAKE AT ANNAPOLIS

We were visited by 2 or 3 strokes of an earthquake during yesterday and last night. The first shock which took place about 4 o'clock in the afternoon was so severe as to cause the houses to shake and the crockeryware on our shelves to rattle. During the night a shock was felt and was accompanied by thunder

JUNE 3, 1853 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

and lightning and rain. Halifax British American

At first glance the Gleaner's source was the Halifax British North American however a search of June 3-10, 1853 yielded no articles. the source may have been the British North American Magazine and Colonial Journal which we did not check.

An article was also found in the Saint John, New Brunswick, Morning News of Monday, June 13, 1853, on p. 2, col. 4 (citing the Yarmouth Herald). This article appears below as transcribed by Dr. Burke:

ANNAPOLIS June 8th.

The shock of an earthquake was felt throughout this County on Friday afternoon last about 4.P.M. We learn that it was also experienced as far as Windsor. Yarmouth Herald

June 8, 1853, in this article's dateline, was a Wednesday and yet clearly this citation was a direct quote from the Yarmouth Herald of Thursday, June 9, 1853, which is transcribed above. We do not understand how the Saint John paper could use an, "Annapolis June 8th." 1853, dateline when the Yarmouth Herald article was not even published until the next day and had no dateline? We presume that the Saint John Morning News had an error re the date.

Finally, an article was found in the St. Stephen, New Brunswick Provincial Patriot of Friday, June 17, 1853, on p. 2, col. 5. This article appears below as transcribed by Dr. Burke:

- At Annapolis, N.S., a severe earthquake on 3d inst. was felt. Houses shook and articles within rattled violently.

The NovaScotian report of Monday, February 19, 1855, on the February 8, 1855, earthquake had a correspondent's report from Wilmot in the Annapolis Valley on p. 2, col. 2, wherein the correspondent notes in part, "This is the second shock of the kind which has been felt within these two years, both of which had a striking resemblance in sound, duration and intensity." The first shock was presumably the event(s) of June 3, 1853, and can be taken as a felt report of the June 3, 1853, event(s) at Wilmot similar in intensity to that of the February 8, 1855, earthquake.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; no reports were found.

Halifax NovaScotian, searched from Monday, June 6 to Monday, June 13, 1853 (published weekly); no reports were found.

Halifax British Colonist, searched from Saturday, June 4 to Saturday, June 11, 1853; no reports were found.

JUNE 3, 1853 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Halifax British North American, searched from Friday, June 3 to Friday, June 10, 1853 (tri-weekly); no reports were found.

Halifax Morning Chronicle, searched from Thursday, June 9 to Saturday, June 18, 1853 (published tri-weekly on Tuesday, Thursday and Saturday); two articles were found (see above); the issue of Thursday, June 2, 1853 is missing.

Halifax Daily Sun, searched from Saturday, June 4 to Tuesday, June 21, 1853; four articles were found (see above).

Pictou Eastern Chronicle, searched from Tuesday, June 7 to 21, 1853; one article was found (see above).

Sydney Cape Breton News, searched by John MacLeod (1984) from Wednesday, June 1 to Wednesday, July 2, 1853 (Appendix 4); one article was found (see above).

Dr. Ken Burke at the Department of Geology at the University of New Brunswick kindly checked the following newspapers in the New Brunswick archives (personal communication, letter of December 10, 1985):

Chatham Gleaner and Northumberland Schediasma; one article found on Monday, June 13, 1853, on p. 187, col. 2, citing the Halifax British American (see above). The reference apparently is not to the Halifax British North American since we searched that from June 3 to 10, 1853, with no articles found. It therefore may have been the British North American Magazine and Colonial Journal; we have not checked it and have not found the source of the Chatham Gleaner article of June 13, 1853.

Fredericton Headquarters, most 1853 issues missing; no reports found.

Fredericton New Brunswick Reporter, searched Friday, June 10, 17 and 24, 1853; no articles found.

Saint John Morning Freeman, most 1853 issues missing; no articles found.

Saint John Morning News; one article found on Monday, June 13, 1853, p. 2, col. 4, citing the Yarmouth Herald of June 9, 1853, p. 2, col. 3 (see above).

Saint Andrews Standard, searched Wednesday, June 8, 15 and 22, 1853; no articles found.

St. Stephen Provincial Patriot; one article found on Friday, June 17, 1853, p. 2, col. 5 (see above).

JUNE 3, 1853 EVENTS (CONTINUED)

DISCUSSION AND CONCLUSIONS:

The full suite of Nova Scotia newspaper sources has not yet been searched for this event and it should be. It is clear, however, that the June 3, 1853, event at about 1600 AST is somewhat larger than the intensity of III Smith (1962) lists or the 3.0 listed in the CEEF. The CEEF has no time for this event and no epicentre location and does not list the second event.

A time of about 1600 AST (or about 2000 GMT) should be entered in the CEEF. Once the other Nova Scotian sources are examined, an epicentre location and an upwardly-revised intensity and magnitude should be entered into the CEEF.

The time of the apparent second shock in the evening (along with a thunder and lightning storm) is not certain and, indeed, it is even not clear whether the evening event may have occurred on Thursday, June 2, 1853, as the Sydney Cape Breton News article quoted above seems to suggest when considered in conjunction with its earlier report of a major thunder and lightning storm in Hants County. The storm is clearly cited as a Friday (June 3?, 1853) event.

The Cape Breton News article said, "On the evening preceding the storm a smart shock of an earthquake was felt over an extensive area of the same Township.", which implies that the "sharp shock" occurred on the evening of Thursday, June 2, 1853, if the two storms in the two articles are the same storm, and if the Cape Breton News is citing or quoting the Pictou Eastern Chronicle and the Halifax Daily Sun correctly. We suspect the article quoted just above meant to say "in" the evening preceding the storm; thus, the second event is more clearly on the evening of June 3, 1853.

More work is needed here to confirm the date of the evening shock as June 3, 1853. The evening event appears to have been felt in Hants County and in Annapolis, Annapolis County. It was probably an aftershock, but it may be an atmospheric phenomenon associated with one hell of a clap of thunder during the major thunder and lightning storm? The Eastern Chronicle should be re-searched to locate the article about the electrical storm which was quoted in the Sydney Cape Breton News on June 22, 1853, p.2, col. 3 in an effort to pin down the storm's date. The British North American Magazine and Colonial Journal should be searched to find the source of the June 13, 1853 Chatham Gleaner and Northumberland Schediasma article.

Persons pre-conditioned to a real earthquake earlier in the day at 1600 might well react to a large clap of thunder later that evening as a second earthquake, especially if it woke one up. However, the various newspaper articles imply that this had to be the case in both Annapolis and again some 100 km further east in Hants County during the same evening storm; we conclude that the event was probably an aftershock on the evening of June 3, 1853. Weather reports should be extracted from Annapolis Valley and Hants County newspapers. The second event should be added to the CEEF once any additional reports are searched out and assessed.

FEBRUARY 8, 1855 EVENT

EPICENTRE LOCATION:

Smith (1962) lists 46.0°N, 64.5°W very close to Dorchester, New Brunswick. Earlier Mather et al. (1927) placed it in the Bay of Fundy as a "guess", Heck and Eppley (1958) gave 46.2°N, 64.8°W and Brooks (1960) changed this slightly to 46.5°N and 64.8°W. Leblanc and Burke (in press, 1985) suggest Smith (1962) simply rounded off Brooks' position to give the long-published epicentre of 46.0°N, 64.5°W. When Eppley (1965) revised his listing, he accepted Smith's (1962) coordinates.

Leblanc and Burke have done an exhaustive study of this event (43 references and accounts) and have essentially accepted the Smith (1962) position of 46.0°N, 64.5°W in the Moncton-Dorchester area.

MAGNITUDE:

As Burke and Leblanc (in press, 1985) note the intensity of this event has gone through a bit of an escalation as more data were compiled. They note:

Brigham (1871) described this event as "in Nova Scotia, New Brunswick, and New England, a slight shock". Kain (1898) called the event a moderate shock, quoted Dawson (1868) and gave a description of the effects of the shock in St. John, written by a Dr. Inches who lived there in 1855. The latter also reported that some windows of one house in Dorchester, New Brunswick were broken as a result of the earthquake. Mather, et al. Maine, to Prince Edward Island, on the basis of Brigham (1871). An epicentre of 46.2°N and 64.8°W was given by Heck and Eppley (1958) with an intensity of VI [MM]* ... In his catalog of events in Eastern Canada, Smith (1962) raised the intensity of the 1855 event to VII [MM] ... Stevens (1976) also concluded that the maximum intensity of the February 8th, 1855 earthquake should be no more than V [MM], based on the relatively few reports of damage, instead of the VII of Smith (1962). In spite of this correction, the 1855 event is the only one from New Brunswick to be listed in the catalog of the most significant earthquakes in the world (Ganse and Nelson, 1982).

Leblanc and Burke then drew a map of the felt intensities and based on an 80,000 square kilometre area inside the estimated IV [MM]* isoseismial contour and using the relationship of Street and Turcotte (1977), they define a magnitude (M_{blg}) of 5.2 for this event. Our new felt reports from Nova Scotia may allow this to

* [MM] is the Modified Mercalli Intensity Scale of 1931 proposed by Wood and Newman (1931).

FEBRUARY 8, 1855 EVENT (CONTINUED)

MAGNITUDE (CONTINUED):

be very slightly increased (eg. Antigonish) after more work. Because of the uncertainty of the isoseismal IV area calculation, Leblanc and Burke (in press, 1985) finally suggest a magnitude (M_{blg}) range of 5 to 5.5 for the February 8, 1855 event.

DATE: Thursday, February 8, 1855

TIME: 0630 AST (1030 GMT). This time might better be altered to 0645 AST (1045 GMT); see Discussion and Conclusions.

SUMMARY OF REPORTS:

One can do no better than quote Leblanc and Burke (in press, 1985):

The distribution of the intensity values shows that the earthquake was felt throughout Prince Edward Island, the southern and eastern parts of New Brunswick, central Nova Scotia, and southeastern Maine. There are no reports of it being felt in Quebec in the several newspapers consulted from this province, although one or two of them carry a report of the earthquake from St. John. In an item on the earthquake, in the February 17th, 1855 issue of the Gleaner, it is stated that "our Restigouche correspondents make no mention of it" suggesting that the people living in the northwestern part of New Brunswick were also unaware of the event.

One additional piece of evidence in favor of this epicentral location is the report of more earthquakes being felt in the Moncton region on February 10th, 22nd, 25th, and 28th, 1855 (St. John [sic] Morning News; February 14, 1855 and the Standard, March 7, 1855), probably representing aftershock activity.

In Nova Scotia, the event was felt in at least Halifax, Antigonish, Pictou, Truro, Wilmot, New Glasgow and Windsor from reports found in this study. Antigonish and New Glasgow are not recorded in Leblanc and Burke (in press, 1985). They add Amherst, Dartmouth, and we believe erroneously add Yarmouth (see below). We also feel that the previously-reported "June 1855" event is a ghost of this event and as such "the South-east side of the Granville mountain" opposite Digby, Nova Scotia, can be added to the list of felt localities (see event-specific search for the June 1855 event following in this appendix).

FEBRUARY 8, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS:

The detail of Leblanc and Burke's work (in press, 1855) eliminated the need for a detailed event-specific search and since time was limited, we added only two new newspapers' reports to their coverage; one in Halifax and one in Sydney (those of the Church Times and Cape Breton News, respectively, for a total of four new articles).

The search of the long run of the Halifax Acadian Recorder and of twenty years of the Yarmouth Herald turned up four articles; three in the Acadian Recorder and one in the Yarmouth Herald. A transcript of the Halifax Acadian Recorder of Saturday, February 10, 1885, on p. 3, col. 1, appears below:

EARTHQUAKE. - On Thursday morning, about ten minutes before seven o'clock, the city was startled by the sudden noise and concussion of a violent earthquake. Scarcely any two individuals concur in their comparison of the incident with familiar sounds and vibrations. The noise seemed like the explosion and roar of a blaze in a chimney, and the rumbling of a train of poorly mounted waggons with a load of empty barrels on a hard road. Houses and movables[sic] were violently shaken, and domestic animals suffered extreme fear during the shock, which lasted about a minute. We have heard that instances occurred of sleepers being launched from their bed to the floor, and that a spout was detached from a house. Reports by telegraph state that the shock was experienced simultaneously at Windsor, Truro, Pictou, New Brunswick and Eastport.

The above article was reprinted verbatim in the Quebec Mercury of February 24, 1855 on p.2, col. 4. Two other articles appeared a week later in the Acadian Recorder on Saturday, February 17, 1855, on p. 3, col. 3, and a transcript of these articles appear in sequence below:

EARTHQUAKE AT PRINCE EDWARD ISLAND. - Hanzard's Gazette, of the 10th inst. says: - "At about a quarter past seven o'clock, on Thursday morning, two or as some say, three small shocks of an earthquake were felt in Charlottetown and vicinity, as far as Cove Head in one direction, and New London in another - how much farther we are not at present advised. They were accompanied by a rumbling noise, which is variously described, by some as a short series of repeated knocks, by others, as if a heavy log had been rolled over the floor below. As in all other cases of sudden or unexpected events, imagination has so much to do in the matter, that it is difficult to reconcile the apparent discrepancies of the different relators. It is a long time since we have had any thing of the kind here.

FEBRUARY 8, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

THE LATE EARTHQUAKE. - At the Bend of Petitcodiac, the Westmorland Times informs us that - the outside wall of the Bank building, which is the only brick edifice in the neighbourhood, was considerably shaken, the interior not having suffered in the least. Beyond this, no other harm was done, except the breaking of a considerable quantity of crockery ware, and other accidents of a similar nature. After the first shock there were several others, to the number of six or seven, which followed at various intervals in the course of next hour, but they only seemed like reverberations, rather than successive shocks. On the following morning, between two and three o'clock, three distinct reports were heard resembling distant thunder accompanied with a slight tremulous motion. All was again quiet until Saturday morning, a few minutes before six o'clock, when another very distinct shock was felt, accompanied with the usual rumbling noise.

At St. John, N.B., the News says: - The houses shook, some more and some less according to locality - the vibration may be compared to that which we experience from the blasting of a rock, without hearing a loud report - or to that which we feel when on board of a steamer, from the working of the engine. The general impression among those who heard the noise was that a number of heavy waggons on wheels were passing over a hard road, divested of snow; the windows, stoves, tins and other metal substances, were all in violent agitation, for some seconds. Some thought that their chimneys were on fire from the rumbling noise, and ran into the street much alarmed to ascertain if such were the case. Most people were asleep in their beds, and were suddenly awoke, as if they had received a galvanic shock. The sensation was more perceptible and alarming in stone and brick buildings, which shook as if they would fall to pieces. In the Portland Valley, in the vicinity of the Church, the shock was perhaps the greatest. We are informed that children lying in their beds were aroused and jumped up with fright. It was not a local affair, as is generally the case with earthquakes, but was felt in various parts, perhaps all parts of the Province, at the same time - also in the neighbouring State. At Frederickton[sic] it was very perceptible - the same at the Bend. At Dorchester it was so severe that windows were broken, and "a large stone building shook like a leaf." It was also very severe at Sackville, and at Calais. People walking the streets were brought to a dead halt - they felt the ground quaking under them, and could scarcely stand.

FEBRUARY 8, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Two articles appeared in the Halifax NovaScotian on Monday, February 12, 1855, on p. 2, col. 5 and on Monday, February 19, 1855, on p. 2, cols. 1 and 2; these two articles appear in transcript below with the February 12 article first:

A very perceptible shock of an Earthquake was felt by thousands in this city, on Thursday last at 1/4 to 7 A.[M.]. The oscillation was from East to West, attended with a dull rumbling noise like heavy carriages rolling past. The same was felt in Windsor, Pictou, St. John, and even as far as East Boston.

The Monday, February 19, 1855 reports of the NovaScotian are found on p. 2, cols. 1 and 2 and consist of reports from Saint John, New Brunswick from the Courier, from Fredericton, New Brunswick from the Reporter, a letter from Truro, Nova Scotia, and a letter from Wilmot in the Annapolis Valley of Nova Scotia per the transcript below:

THE EARTHQUAKE

On the 8th inst., was felt simultaneously in New Brunswick, the Northern States and our own Province. At St. John, says the Courier:

"On Thursday morning at about twenty minutes before seven o'clock, two shocks of Earthquake were felt in this City. The first, which was most distinct, was felt very sensibly: in some houses the noise resembled that made by a large quantity of soot burning violently in a chimney, while the shaking of the buildings caused the tins, stoves and crockery ware to rattle, and in some instances the door bells to ring. The vibration and noise lasted from some seconds, and awoke many who were asleep at the time."

The Fredericton Reporter of the 9th inst. says:

"Yesterday morning at about 20 minutes to seven o'clock, we had a shock, or rather two shocks of Earthquakes at Fredericton. As we distinctly heard and felt the whole, we may state that the noise in the first place, can scarcely bear description, embracing the different varieties of sensation which would be occasioned by heavy grinding, thumping and rumbling sounds in connection, and then falling off into a series of quicker but fainter repetitions. Each of these shocks or successions might have occupied about three seconds. The vibrations were violent; the movements being all horizontal, and almost lively enough to throw one out of bed. We cannot describe them better than by a comparison with the sudden

FEBRUARY 8, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

joltings of a rickety house, from the garret of which a large heavy cask would be precipitated down two or three flights of stairs."

The following communications - one from Truro and the other from Wilmot, will give our readers some idea of the sensations produced in eastern and western sections of our own Province.

SIR. - A sharp shock of an earthquake was felt in this Village and the neighbourhood about a quarter before 7 o'clock this morning.

It was the first observed by a low rumbling noise like that of distant Thunder which lasted about ten seconds. The motion was gradual, closing with a sudden jar - my children who were sleeping up stairs ran down trembling and terror stricken.

I have not yet heard how far it has extended but it was felt by persons residing 5 miles from the Village.

COMMUNICATED

Truro, Feby. 8, 1855.

On the morning of Thursday the 8th. inst. a smart shock of an Earthquake was felt in several parts of Annapolis County. The full extent of this subterranean phenomenon has not yet been fully ascertained, but there is no doubt of its having extended from Annapolis town and easterly, through the valley towards Wilmot, along Nctaux[sic] Plains and Mountain, &c. This is the second shock of the kind which has been felt within these two years, both of which had a striking resemblance in sound, duration and intensity. In certain localities however, that of the 8th, has been more severe, occasioning the shaking several buildings to such an extent as to cause the breakage of crockery and other materials of a brittle nature. It is sincerely hoped that such visitations, if repeated, will not prove more dangerous in their consequences.

Two articles appeared in the Halifax Church Times on Saturday, February 10, 1855, on p. 47, col. 1, and on Saturday, February 17, 1855, on p. 54, col. 3. These two articles appear below in transcript with the February 10 article first.

FEBRUARY 8, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

EARTHQUAKE. - A slight shock of earthquake was very sensibly felt, at 7 o'clock, on the morning of Thursday last, by many persons in the city. In some instances the motion was quite decided, accompanied with a hollow noise, and visible to the eye; in others a tremulous vibration, gave ample evidence of internal convulsion. The shock was felt simultaneously in various parts of the Province, also in St. John, N.B.

THE EARTHQUAKE. - The St. John N.B. Chronicle notices that a severe shock of earthquake was felt there on the morning of the 8th inst. "The noise resembled that of several heavy waggons going at a rapid rate over a rugged road, and lasted a considerable time. Those in bed found their beds violently shaking under them, and beheld with dismay a convulsive trembling of the walls and flooring. In the military barracks the entire buildings were observed trembling during the shock. We learn by telegraph to the Reading Room, that the shock was very perceptible at Fredericton and the Bend; at Dorchester it was so severe that windows were broken, and a large stone building shook to its foundation. At Sackville and at Calais it was much felt; in Chatham it was felt severely; it lasted two minutes at Sussex Vale."

The Sydney Cape Breton News had articles on Saturday, February 10, 1855, on p. 3, col. 2 and on Saturday, February 17, 1855, on p. 2, col. 2. The first of these from February 10 is quoted below; the second was simply a copy of the February 10, 1855 Church Times article and has already been transcribed above:

We learn by Telegraph from Antigonish that the shock of an Earthquake was felt in that place, as also at Pictou, Truro, and New Glasgow, on the morning of Thursday last.

The Yarmouth Herald had a report on Thursday, February 15, 1855, on p. 3, col. 1. This article does not actually report that the February 8, 1855, event was felt in Yarmouth; it is silent on this per the transcript below:

Two shocks of an Earthquake were felt throughout this Province and New Brunswick between 6 and 7 o'clock on Thursday morning last. At Sussex Vale and the Bend of Peticodiac[sic] it was very violent, and at Dorchester, it is said, it caused a large stone building to shake like a leaf.

FEBRUARY 8, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The St. John Courier, speaking of the Earthquake, remarks: -

"It is perhaps worthy of remark, that this unusual visitation in this quarter, should have followed immediately after the coldest snap of weather that has been experienced here for the last thirty years, the thermometer on Wednesday morning, in several situations in the City, being down to 26° below zero, and at Miramichi to 35° [below zero Fahrenheit]."

Forty-seven years later Mr. J. Murray Lawson, the son of Mr. A. Lawson, the editor of the Yarmouth Herald, wrote Yarmouth, Past and Present (Lawson, 1902) and under his "Earthquakes" section he noted on p. 598 (bottom):

Two slight shocks were felt throughout the Province on the 8th February, 1855.

Seven of Lawson's eight references to earthquakes note that they were felt "in Yarmouth"; the February 15, 1855, Yarmouth Herald report is silent on this and, clearly, it gave J. Murray Lawson, Jr. no reason to cite the event as felt in Yarmouth. However, Leblanc and Burke (in press, 1985) use the Yarmouth Herald February 15, 1855, article, transcribed above, as a felt report for Yarmouth; this is not at all clear from the article. Our search of the Yarmouth Herald found no other references to the February 8, 1855 event.

Smith (1962) notes this earthquake in some detail in his compendium. His entry reads:

61. 1855 FEBRUARY 8. 6:30 a.m. VII. 46.0°N, 64.5°W.
(b). Near Moncton, N.B. Felt in Montreal and from Prince Edward Island to Bangor, Me., over an area of 85,000 square miles. B4, B5, D2, D4, H1, K1, L2, M3.

"Speaking of this shock in Acadian Geology, pp. 39-40, Sir Wm. Dawson says: 'Its point of greatest intensity appears to have been at the bend of the Petitcodiac (Moncton). At this place there were several shocks, one of them sufficiently severe to damage a brick building.'" K1.

Note: Smith's reference is to Dawson (1868).

Leblanc and Burke (in press, 1985) note that the felt report in Montreal was incorrect and cite Anne E. Stevens' (1976) internal memo in this regard:

FEBRUARY 8, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Stevens (1976) points out that a previous report by Smith (1962) of the February 8th, 1855 event being felt in Montreal was not correct. The report was based on a misunderstanding of a table of barometer readings given by Dawson (1870) for the days of eleven earthquakes, including the 1855 event, which had been felt in various parts of eastern North America. Although Dawson gave the barometer readings taken in the city of Montreal, he did not imply in his article, as subsequent workers seemed to have believed, that all the earthquakes had been felt in the same city.

The June 1, 1855 issue of the Saint John Morning News printed a letter of correspondent on p. 2, col. 4 (top), to Mr. Fenett of the paper which cites apparent breaking of the ground, or at least subsequent landslides on the southeast side of the Granville Mountain opposite Digby, Nova Scotia that may have resulted about two weeks after "the earthquake" cited only as, "A few months since." The correspondent is not identified except as, "P." We believe the letter published June 1, 1855, can be taken to represent a felt report of the February 8, 1855 event on Granville Mountain (on the northwest side of the Annapolis Basin within sight of Digby), Nova Scotia and that the June 1855 event in the CEEF is a 'ghost event' of the major February 8, 1855 earthquake (see transcripts and analysis in the event-specific search for the June 1855 event which follows in this appendix).

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; three articles were found in two issues (see above).

Yarmouth Herald, searched throughout the period; one article found (see above).

Halifax NovaScotian, searched Monday, February 12 to Monday, February 19, 1855; two articles were found (see above).

Halifax Church Times, searched Saturday, January 27 to Saturday, February 24, 1855. Two articles were found (see above).

Sydney Cape Breton News, searched by John MacLeod (1984) at the Public Archives of Nova Scotia for the period of Saturday, February 3 to Saturday, March 31, 1855 (Appendix 4); two articles were found (see above).

Halifax Scotian Sun, searched by Leblanc and Burke (in press, 1985); two articles were found (see above).

FEBRUARY 8, 1855 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS:

We can add little to the detailed study of Leblanc and Burke (in press, 1985); we have only added three felt locations in Nova Scotia; New Glasgow, Granville Mountain opposite Digby, and Antigonish. We do, however, note that by no means has the full suite of Nova Scotian newspapers for this event been examined by ourselves or by the researcher for Leblanc and Burke. While the February 15, 1855, Yarmouth Herald should not be used as proof of a felt report in Yarmouth, as do Leblanc and Burke (in press, 1985), we believe a careful examination of the full suite of Nova Scotian newspapers may well reveal more felt reports over a wider area in Nova Scotia.

Smith (1962), the CEEF and Leblanc and Burke (in press, 1985) give a time of 0630 local time*. Three quite separate Nova Scotia reports from Halifax (two) and Truro give the times of 0650 (Acadian Recorder), 0645 (NovaScotian), "about" 0645 (Truro correspondent to the NovaScotian). The few New Brunswick reports we have seen cite 0640 (in the NovaScotian of February 19, 1855 citing the Fredericton Reporter of February 9, 1855) and 0640 (in the Nova Scotian of February 19, 1855 citing the Saint John Courier). The first Church Times article uses 0700, the Acadian Recorder in citing the Charlottetown Hanzards's Gazette of February 10, 1855 uses 0715 and the Yarmouth Herald of February 15, 1855 uses simply "between 6 and 7 o'clock on Thursday morning last."

None of these reports suggest an 0630 time, save the Yarmouth Herald of February 15, 1855. The first five cited suggest an 0645 AST time (1045 GMT). We believe that after consultation with Leblanc and Burke's collection of 38 additional references, that the time in the CEEF should be altered to be close to 0645, not 0630 AST*.

Leblanc and Burke (in press, 1985) noted (p. 12-13) an apparent ghost event in Smith (1962) on Sunday, February 4, 1855 per the transcript below:

A factor which may have influenced the uncertainty in estimating the position of the February 8th, 1855 event is the report of another [ghost] earthquake on February 4th, 1855 in the Bay of Fundy which was supposed to have been felt throughout New Brunswick and northeast-

* The CEEF has 1130 GMT and appears to have added five hours, not four hours to the local time of 0630 quoted by Smith (1962) (GMT = AST + 4 hours). The correct GMT should be 1030 GMT if one accepts a local time of 0630 AST. We suspect the more correct local time is 0645 AST hence 1045 GMT.

FEBRUARY 8, 1855 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

ern Maine (Smith, 1962). This event was first mentioned by Lancaster (1873), who claimed to improve on Brigham's list of 1871. Mather, et al. (1927), Brooks (1960), and Smith (1962) reported both events, while Kain (1898), Heck and Eppley (1958), and Eppley (1965) did not. It appears that somehow Lancaster may have misled others, because our thorough search of contemporary newspapers has not found any report of a local event on February 4th, 1855.

Smith (1962) reported this possible ghost event at 44.8°N, 66.2°W per the entry below:

60. 1855 FEBRUARY 4. VI. 44.8°N, 66.2°W. Bay of Fundy.
Felt in New Brunswick and northeastern Maine.
B5, L2, M3.

We concur with Leblanc and Burke (in press, 1985); we found no record of this Sunday, February 4, 1855, possible foreshock event in the papers searched and would recommend its removal from the CEEF. One might specifically check some other sources in the Annapolis Valley while looking for other felt reports of the February 8, 1855, event, but we suspect none will be found. The Wilmot report in the NovaScotian did not cite an earlier February 4, 1855, felt event, but did mention an 1853 event.

The CEEF, at present, does not list any of the aftershocks. The article from the Acadian Recorder of Saturday, February 17, 1855, transcribed above cites, "six or seven" in the hour following the main shock on Thursday, February 8, 1855. On Friday, February 9, "between two and three o'clock, three distinct reports were heard resembling distant thunder accompanied with a slight tremulous motion." This aftershock event should be added to the CEEF at 0230 AST (0630 GMT), February 9, 1855. Similarly, Leblanc and Burke (in press, 1985) cite, "more earthquakes being felt in the Moncton region on February 10th, 22nd, 25th, and 28th, 1855 (St. John[sic] Morning News; February 14, 1855 and the Standard, March 7, 1855), probably representing aftershock activity".

Similarly, the same report in the Acadian Recorder reports that "All was quiet until Saturday morning, a few minutes before six o'clock, when another very distinct shock was felt, accompanied with the usual rumbling noise." This event was also an aftershock and as such should be added to the CEEF at 0600 AST (1000 GMT), Saturday, February 10, 1855. The aftershocks noted on February 22, 25 and 28, 1855 by Leblanc and Burke (in press, 1985) should also be added to the CEEF.

MARCH 13, 1855 EVENT

EPICENTRE LOCATION:

Apparently in the western end of the province, possibly in the Yarmouth area. The exact location of the epicentre is not known at present.

MAGNITUDE: We are uncertain as to the felt area at present and the magnitude is also uncertain at present; it will be about 3.0 - 3.5.

DATE: Tuesday, March 13, 1855, local time (Wednesday, March 14, 1855 GMT)

TIME: 2300 AST (0300 GMT)

SUMMARY OF REPORTS:

"Severe shock...lasting 10 seconds...caused houses to shake violently and dishes to rattle...accompanied by a loud rumbling noise."

REFERENCES AND TRANSCRIPTS:

This event is not found in Smith's (1962) compendium of earthquakes. This event is reported in Lawson (1902) in his county history under the 'EARTHQUAKES.' section on p. 598 as:

A severe shock was experienced in Yarmouth on the 13th March, 1855 at 11 p.m., lasting 10 seconds. It caused houses to shake violently and dishes to rattle. It was accompanied by a loud rumbling noise.

No reports were found in the search of the Halifax Acadian Recorder throughout this period; no reports were found when the issues of March 17 and 21, 1855, were rechecked. Similarly, no reports were found when the Yarmouth Herald was searched throughout this period.

However, when the Yarmouth Herald was rechecked for the period from Thursday, March 15 to Thursday, May 3, 1855 one report was found. This is clearly the source of Lawson's data and, indeed, the item is even circled on the original (as was the earthquake item in the issue of February 15, 1855, on p. 3, col. 1 regarding the February 8, 1855, event); we suspect J. Murray Lawson did the circling of items before he wrote his 1902 county history. The brief article from the Yarmouth Herald of March 15, 1855 on p. 2, col. 4 appears in transcript below:

A severe shock of earthquake was experienced here about half-past 11 o'clock on Tuesday night. It made a loud rumbling noise like a heavy carriage in rapid motion over a hard road - and caused houses, furniture, &c. to shake violently. It lasted at least 10 seconds.

MARCH 13, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

At the same time, the Yarmouth Tribune was sought out and found to be missing for this period. The Liverpool Transcript is available and was searched from Thursday, March 15 to Thursday, April 12, 1855, and one article citing the Yarmouth Herald was found on Thursday, March 22, 1855, on p. 3, col. 1, per the transcript below; this report would appear to imply that the event was not felt in Liverpool by virtue of no mention of the local effects:

A severe shock of an earthquake was experienced at Yarmouth about half-past 11 o'clock on Tuesday night the 13th. It is stated by the Herald to have made a loud rumbling noise like a heavy carriage in rapid motion over a hard road - and caused houses, furniture &c. to shake violently. It lasted at least 10 seconds.

There are no other newspapers available for the very western end of Nova Scotia for this period.

Newspapers Searched:

Halifax Acadian Recorder, searched and re-searched throughout the period; no articles were found.

Yarmouth Herald, searched then re-searched throughout the period; one article found (see above).

Yarmouth Tribune, missing for the period at the Public Archives of Nova Scotia.

Liverpool The Transcript, searched from Thursday, March 15 to Thursday, April 12, 1855; one article found (see above).

Halifax British Colonist, searched from Thursday, March 15 to Thursday, March 29; no articles were found.

Halifax Morning Chronicle, searched from Thursday, March 15 to Saturday, March 24, 1855; no articles were found.

Sydney Cape Breton News, searched by John MacLeod (1984) from Saturday, March 17 to Saturday, April 7, 1855 (Appendix 4); no articles were found.

 DISCUSSION AND CONCLUSIONS:

One should search for a copy of the Yarmouth Tribune, which may well be available in the collections resident in Yarmouth, to verify and hopefully amplify this event. Ms. Lynn Murphy is presently documenting and cataloguing all such collections and her report to PANS is to be available soon. The newspapers of southern New Brunswick and the Annapolis Valley may provide more felt reports and allow a determination of the event's epicentre and magnitude to be calculated.

This event should be entered into the CEEF.

APRIL 18, 1855 POSSIBLE TSUNAMI EVENT

EPICENTRE LOCATION:

Not known; it could be almost anywhere offshore or at the edge of Lake Huron in Ontario if it is a tectonically-caused tsunami and not a sudden storm surge related to "the day of the great tornado" as the article implies. The tsunami was seen in Owen Sound bay, Ontario (and, "the same phenomenon was observed in Lake Seneca, New York, out of the sphere of the tornado").

MAGNITUDE: not known

DATE: The article states, "last Wednesday the 18th" in citing the Owen Sound Comet in the Liverpool Transcript of Thursday, June 14, 1855. The first Wednesday prior to June 14, 1855 is Wednesday, April 18, 1855 (and the next is January 18, 1854). The event occurred on Wednesday, April 18, 1855; we do not know the date of the issue of the Owen Sound Comet which was quoted but it must be from April 19 to 25, 1855

TIME: not known, during daylight hours

SUMMARY OF REPORTS:

The tsunami, "commenced by the rising of the water to a height of say nine feet, and immediately falling down - say ten feet. ... an observer could distinctly see the advancing and receding on the shore. When the water commenced to rise it came rushing up the river like a wave three feet high."

REFERENCES AND TRANSCRIPTS:

A possibly related tectonic event is not recorded in Smith (1962) or in the CEEF. We have only one report from the Liverpool Transcript of Thursday, June 14, 1855, p. 4, col. 1 quoting the Owen Sound Comet from April 19 to 25, 1855 per the transcript below:

VARIETIES

PHENOMENON.- The Owen Sound Comet says that "last Wednesday the 18th, a very singular occurrence took place in Owen Sound bay, such as has frequently been witnessed on former occasions, but not in so great a degree. This last freak commenced by the rising of the water to the height of say nine feet, and immediately falling down - say ten feet. - The bottom of the bay was dry when the water went down to within ten or fifteen feet of the end of the wharf, and we are told by Mr. John Boyd, that a man might have waded across to the Indian Village at the time. We are also told by those who were present at the time, that at the bridge crossing on Division street, a man might have jumped across the river. The rising and falling followed in

APRIL 18, 1855 POSSIBLE TSUNAMI EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

quick succession, and it was so very suddenly that an observer could distinctly see the advancing and receding on the shore. When the water commenced to rise it came rushing up the river like a wave three feet high. The phenomenon is doubtless owing to a storm, of which we may hear in a few days, having occurred on the Georgian bay or Lake Huron.

There is something very remarkable in the simultaneous rise and fall in all our Lakes on the day of the great tornado. The same phenomenon was observed in Seneca Lake in the State of New York, out of the sphere of the tornado.

A query arises, did this movement of the water arise from the Tornado, or was the Tornado itself an emanation from some convulsion of nature far down in the depths of Lake Huron where apparently it took its rise? - There is an old opinion that the bed of Lake Ontario is connected with subterranean earthquakes. Do the beds of the other Lakes touch upon the same dangerous territory? The mysterious movements in Lake Ontario have become more frequent of late years. Are the volcanic forces becoming active again? Suppose the bottom of the Lake should brake through, what would be the result? Such an event would be full of interest to the dwellers upon its margin.

DISCUSSIONS AND CONCLUSIONS:

The Owen Sound Comet just assumes that this tsunami is atmospherically caused by the "great tornado". "There is something very remarkable in the simultaneous rise and fall in all our lakes on the day of the great tornado." "The phenomenon is doubtless owing to a storm."

It appears that a similar event had been seen several times before but not to such a degree or with such rapid flooding and ebbing. "... a very singular occurrence took place in Owen Sound bay, such as has frequently been witnessed on former occasions, but not in so great a degree." Owen Sound harbour appears to have such a configuration geometry that it often experiences storm-related surges and recessions (though smaller). No earthquake was reported in the Comet and Smith (1962) does not list an obvious causitive earthquake generally needed for a tectonically-induced tsunami.

This tsunami appears to be non-tectonic in origin but deserves to have other reports and weather or pressure reports documented from newspapers around Lake Huron in the US and Ontario. No further work was done on this event since it was beyond the areal scope of this study.

"A FEW MONTHS SINCE", JUNE 1, 1855 EVENT

EPICENTRE LOCATION:

Smith (1962) lists this as at the location of Granville as 44.7°N, 65.5°W. The exact location of the epicentre is not known at present. We believe that this event is a ghost event of the February 8, 1855 event and as such, the epicentre location would be 46.0°N, 64.5°W.

MAGNITUDE:

Smith lists an intensity of IV on the Modified Mercalli Intensity Scale of 1931, which converts to about 3.7 on the CEEF. As explained below, we believe this event is a ghost of the February 8, 1855, event, and as such, the causative earthquake has a magnitude (M_{blg}) of 5.2 per the analysis of Leblanc and Burke (in press, 1985).

DATE:

The correspondent's letter refers to, "a few months since", June 1, 1855. We believe this to have been on Thursday, February 8, 1855. The slumping event occurred "about a fortnight" after the earthquake presumeably on about Thursday, February 22, 1855.

TIME:

No time is given in the letter. We would use the time of 0645 AST (1045 GMT) as we suggest for the February 8, 1855, event.

SUMMARY OF REPORTS:

There is only one report. The original June 1, 1855, letter in the Saint John Morning News cites an apparent progressive slumping event, "developing itself in Nova Scotia, on the South-east side of the Granville mountain." "A chasam sudden opened", "a fortnight since the ground in the neighbourhood was violently shaken." "A huge fragment of rock, shortly thereafter, percipitated itself down the hill with such velocity as to completely penetrate the side of an inhabited cottage." There was also "Smoke" seen to issue from the chasam and the Morning News correspondent assumes in the letter that the smoke along with the landslide serve as evidence of ongoing volcanic action. It is clear from the letter that "P." has not visited the site of the chasam so he/she has not smelled the smoke or witnessed the events cited as ongoing.

REFERENCES AND TRANSCRIPTS:

All reports of this event stem from the one letter written by a correspondent, identified only as 'P.', to Mr Fenett of the Saint John Morning News and published on Friday, June 1, 1855, on p. 2, col. 4 (top). A transcript of this original article appears below:

CORRESPONDENCE.
EARTHQUAKES IN NOVA SCOTIA.

Mr. Fenett - As a proof that earthquakes are the result of operations going on in the bosom of the earth in consequence of subterranean combustions and

"A FEW MONTHS SINCE", JUNE 1, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

explosions, I beg to call your notice to an extraordinary phenomenon developing itself in Nova Scotia, on the South-east side of the Granville mountain. On the day of the earthquake a few months since its shock was more sensibly and vividly felt in that locality than elsewhere in the neighbourhood; and on the slope of the mountain I do not know the distance from the waters of the basin, - an opening took place, and a large quantity of smoke was seen to issue during the remainder of the day. Supposed, however, to be a mist or vapor arising, it attracted no particular notice, until about a fortnight since the ground in the neighbourhood was violently shaken; a chasm suddenly opened, dust and small stones flew out in great quantity, and a volume of smoke continued to issue for some time. Agitations of the surface kept going on till the sloping ascent for some distance is converted into a level steppe, having from Digby, the appearance of a well ploughed field. Not long after the chasm thus opened there issued with great violence a huge fragment of rock, which precipitated itself down the hill with such velocity as to completely penetrate the side of an inhabited cottage, the occupant of which startled by such an extraordinary visitant, immediately removed to a distance. The chasm still remains open, and similar eruptions have since been going on no person venturing close enough for a minute examination.

Undoubtedly it was some terrible convulsion of nature that first formed the strait connecting the Basin with the Bay of Fundy. These are eventful times. Who knows but that one of these fine days, without the necessity of any Government outlay, a canal may be formed between St. Mary's Bay and the aforesaid basin and "Digby Gut" closed beyond the power of Holloway's pills, while the good people of that quiet village instead of being on the tip-toe of excitement - as might be expected in such a case - will be simply nowhere.

Yours, Etc.,

P.

All other references to this letter seen in the Nova Scotian papers edited the article somewhat and left out the beginning of the second sentence namely, "On the day of the earthquake a few months since its shock was more sensibly and vividly felt in that locality than elsewhere in the neighbourhood; and on the slope of the mountain,". Thus the clear reference to, "the earthquake a few months since" was not available to readers of the Nova Scotian papers; nor was the last full paragraph.

"A FEW MONTHS SINCE", JUNE 1, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The Acadian Recorder was the first to publish the edited version on Saturday, June 9, 1855, p. 2, col. 4 and added a dateline of "St. JOHN, June 2." which is in error by one day; the original letter appeared Friday, June 1, 1855 and the Morning News of Saint John, New Brunswick did not publish again till June 3, 1855. The Halifax Morning Chronicle of Thursday, June 14, 1855,, p. 2, col. 4 then pirated the edited version (without credit to the Acadian-Recorder). Later the Pictou Eastern Chronicle of Thursday June 21, 1855, p. 2, col. 1 also copied the same edited version with an interesting preamble suggesting that the event was not a volcanic eruption but, "is much more likely to have been a land slide." A transcript of the Eastern Chronicle p. 2, col. 1 article appears below with the preamble and the edited article as it appeared in at least three Nova Scotia newspapers beginning with the Acadian-Recorder of June 9, 1855, p. 2, col. 4:

The following notice has been going the rounds of the provincial papers, for the past two weeks, having been originally contributed to the St. John News, by some person residing near the spot where the phenomenon is said to have occurred. There are numerous indications in that section of the country of volcanic action in times long past, but it must be regarded as something wonderful if such a thing should occur at the present day. A gentleman well qualified to judge of such matters says that if the report as given is correct, the occurrence is much more likely to have been a land slide, than an outbreak of any incipient Vesuvius, such events having been known to occur on the Granville mountain and being not unfrequently attended with the phenomena described by the correspondent of the News.

"EARTHQUAKES IN NOVA SCOTIA. - As a proof that earthquakes are the result of operations going on in the bosom of the earth in consequence of subterranean combustion and explosions, I beg to call your notice to an extraordinary phenomenon developing itself in Nova Scotio[sic], on the South east side of the Granville mountain. I know not the distance from the waters of the basin, - an opening took place, and a large quantity of smoke was seen to issue during the remainder of the day. Supposed, however, to be a mist or vapor arising, it attracted no particular notice, until about a fortnight since the ground in the neighbourhood was violently shaken; a chasm suddenly opened and a volume of smoke continued to issue for some time. Agitations of the surface kept going till the sloping ascent for some distance is converted into a level steppe, having from Digby, the appearance of a well ploughed field. Not long after the chasm thus opened there issued with great

"A FEW MONTHS SINCE", JUNE 1, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

violence a huge fragment of rock, which precipitated itself down the hill with such velocity as to completely penetrate the side of an inhabited cottage, the inhabitants of which startled by such an extraordinary visitant, immediately removed to a distance. The chasm still remains open, and similar eruptions have since been going on no person venturing close enough for a minute examination.

Smith (1962) records this apparent event only as June, 1855 in his rather lengthy entry transcribed below:

63. 1855 JUNE. IV. 44.7°N, 65.5°W. Southeast of the Granville Mountains, N.S. The implication of the quotation below that an active volcano existed in Nova Scotia in 1855 is erroneous. B5, L2.

"Under the title 'Volcanic phenomenon' in Nova Scotia one reads in the New York Tribune on the 21st (of June): 'A correspondent of the St. John News says that the people of the vicinity of Digby, N.S. are greatly excited by terrestrial commotions which have taken place to the southeast of Granville Mountains. On the day of the earthquake which took place several months ago[sic], the mountain was strongly shaken and opened up and threw out much smoke for the rest of the day. All was calm until the new shock was felt about a fortnight ago; it formed a new chasm in the mountain and the shocks continue since; the mountain threw out smoke dust and stones. The phenomenon continues without anyone daring to approach it.'" L2.

Smith's references are B5 and L2. Brooks' (1960) event 261 lists only '6' for June (but someone has penned a note on the Earth Physics Branch copy, "several months ago" in striking out the 6; Brigham (1871) does not list the event nor does Dawson (1860). However, Lancaster (1873) in his, 'Note Additionelle' to Brigham's work presents a French translation of an English article from The New York Tribune of June 21, 1855 which paraphrases and edits the letter from the correspondent to the Saint John Morning News. Lancaster's French translation which is a quote supposedly does say, "Le jour du tremblement de terre qui a eu lieu il y a quelques mois...."

Smith (1962) has simply, quite literally, retranslated the French Lancaster version back into English for the citation quoted above. He thus noted, "On the day of the earthquake which took place several months ago [sic],..." but for some reason did not note this when he listed the date as, "1855 June". It is clear that Smith (1962) did not go back to the original

"A FEW MONTHS SINCE", JUNE 1, 1855 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

letter in the Saint John Morning News of Friday, June 1, 1855 p. 2, col. 4 (top).

Newspapers Searched

Halifax Acadian Recorder, searched throughout the period; one article found (see above).

Saint John, New Brunswick Morning News, searched for the immediate period after Friday, June 1, 1855 when the letter appeared; no further information was found (personal communication, Carol Rosevear, Head, Library and Archives Department, The New Brunswick Museum, Saint John, New Brunswick).

Halifax Morning Chronicle, searched from Saturday, June 2 to Thursday, June 14, 1855; one article was found (see above).

Pictou Eastern Chronicle, searched from Thursday, June 7 to Thursday, June 21, 1855; one article was found (see transcript above).

Halifax The British Colonist, searched from Saturday, June 2 to Tuesday, July 3, 1855; no articles were found.

Liverpool Transcript, searched from Thursday, June 7 to Thursday, July 5, 1855; no articles were found.

Yarmouth Herald, searched from Thursday, June 7 to Thursday, July 5, 1855; no articles were found.

Sydney Cape Breton News, searched by John MacLeod (1984) at the Public Archives of Nova Scotia from Saturday, June 2 to Saturday, August 18, 1855 (Appendix 4); no articles were found.

DISCUSSIONS AND CONCLUSIONS:

We believe that had Smith (1962) seen the original letter of 'P.' in the Friday, June 1, 1855 Saint John Morning News he would have realized that the "earthquake", referred to, "a few months since" was probably the major February 8, 1855 event and that this was not a new event. As it was, Smith seems not to have taken note of the clear reference, "il y a quelques mois" in Lancaster (1873) despite translating it correctly. We believe this event is a ghost event and should be removed entirely from the CEEF.

The felt locality of "the South-east side of Granville mountain" within sight of Digby, Nova Scotia, may be added to the list of felt localities for the February 8, 1855 earthquake centred near Moncton and Dorchester. Leblanc and Burke (in press, 1985) do not list this locality (nor this reference in the Saint John Morning News of June 1, 1855).

"A FEW MONTHS SINCE", JUNE 1, 1855 EVENT (CONTINUED)

DISCUSSIONS AND CONCLUSIONS (CONTINUED):

The "smoke" reported was probably the "mist or vapour" originally supposed as reported in P.'s original letter. The observation of steam or vapour is similar to the January 26, 1957 observation of "steam pouring from the ground at Francois, South Coast" of Newfoundland (Staveley et al., 1984; p. 35) first reported on January 28, 1957 in the St. John's Daily News and later expanded upon in Adams and Staveley (1985). In this case a government geologist investigated and verified that the steam was only condensed water vapour forming at the mouth of a hole where warmer ground water was found near the surface. The steam was observed during an exceptionally cold winter. In this case the conclusion was that, "When the warm, damp air from the steam passed up the slope and out through a hold[sic], it hit the outside air and caused steam" (Adams and Staveley, 1985, p. 47 from the St. John's Evening Telegram of February 4, 1957).

We presume the same phenomenon may also have occurred on the southeast side of Granville mountain, Nova Scotia, shortly after the February 8, 1855 earthquake and for several days at least. It was very cold at the time of the Thursday, February 8, 1855 earthquake. The Thursday, February 15, 1855 Yarmouth Herald on p. 3, col. 1 quotes the Saint John Courier, re the Thursday, February 8, 1855 event:

"It is perhaps worthy of remark, that this unusual visitation in this quarter, should have followed immediately after the coldest snap of weather that has been experienced here for the last thirty years, the thermometer on Wednesday morning, in several situations in the City, being down to 26° below zero, and at Miramichi to 35° [below zero Fahrenheit]."

There also appears to have also been some slumping and down-slope movement perhaps in the form of multiple rotation slides on the southeast slope of Granville Mountain after the event. This is suggested by the correspondent's observation that, "Agitations of the surface kept going on till the sloping ascent for some distance is converted into a level steppe, having from Digby, the appearance of a well ploughed field" (Saint John Morning News of Friday, June 1, 1855, p. 2, col. 4). The description and sequence may suggest that there was some liquifaction at the site during the February 8, 1855 event which triggered the slow downslope movement of soil which was apparently reported in the original account. The editor of the Pictou Eastern Chronicle on Thursday, June 21, 1855, p. 2, col. 1 correctly noted that, "the occurrence is much more likely to have been a land slide, than an outbreak of any incipient Vesuvius, such events having been known to occur on the Granville mountain and being not unfrequently attended with the phenomenon described by the correspondent of the [Saint John Morning] News." (underlining of text added) Slumping was not unknown on Granville Mountain.

JANUARY 15, 1856 EVENT

EPICENTRE LOCATION:

Apparently in the area of Liverpool and Yarmouth, Nova Scotia. The exact location of the epicentre is not known at present.

MAGNITUDE: The apparent felt area is relatively small(?); the event appears to have had a magnitude of about 3.0(?).

DATE: Tuesday, January 15, 1856

TIME: "about half-past seven" 0730 AST (1130 GMT)

SUMMARY OF REPORTS:

"A slight shock of an earthquake was felt" in Yarmouth; "it lasted upwards of half a minute, and shook buildings, furniture etc." It was felt, "very sensibly," in Liverpool, "in other parts of the County [Queens] and in several other counties in this Province."

REFERENCES AND TRANSCRIPTS:

This event is not reported in Smith (1962). It is first noted in the Yarmouth Tribune of Wednesday, January 16, 1856 on p. 2, col. 5 as below:

A slight shock of earthquake was felt in Yarmouth yesterday morning, about half-past seven.

It was then reported the very next day in the Thursday, January 17, 1856 issue of the Yarmouth Herald on p. 3, col. 1 in only slightly more detail but incorporating a typographic error. Thursday was written instead of Tuesday - it had to be Tuesday to match the Tribune published the day before (above) and to match the Liverpool Transcript's article of January 24, 1856. The Yarmouth Herald's January 17, 1856, p. 3, col. 1 article noted:

A shock of earthquake was experienced here about 7 1/2 o'clock on Thursday morning. It lasted upwards of half a minute, and shook buildings, furniture, etc.

This exact same article with the same typographic error of 'Thursday' for 'Tuesday' then appeared in the Halifax Morning Chronicle of Thursday, January 24, 1856 on p. 3, col. 1 and in the Halifax Acadian Recorder of Saturday, January 26, 1856 on p. 3, col. 2. It then appeared without the error in the Halifax The British Colonist of Thursday morning, January 24, 1856 on p. 2, col. 3. We have not transcribed these latter three articles.

The Liverpool Transcript of the same day Thursday, January 24, 1856 on p. 2, col. 6, reported some additional details with a felt report for Liverpool and the surrounding Queens County; it also reported the Yarmouth felt report in a separate item below the first. The two articles together imply that the event was felt over a fairly wide area being Yarmouth, Liverpool, Queens County and, "several other Counties in this Province" per the transcript below:

JANUARY 15, 1856 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

EARTHQUAKE. - On the morning of the 15th inst., a shock of an earthquake was very sensibly felt in this place, in other parts of the County and in several other Counties in this Province.

A slight shock of an earthquake was felt in Yarmouth on the 15th inst., about half-past seven o'clock.

Finally, a week later the Pictou Eastern Chronicle of Thursday, January 31, 1856 on p. 2, col. 3 reported the event somewhat imprecisely and with a strong editorial flavour per the transcript below:

The Yarmouth Herald says that another shock of an earthquake which lasted for half a minute, was felt in that town last week. No wonder. What else can people expect who have faith in Killam and don't believe in railways? They should be warned in time before worse come of it. They must be incorrigible if it takes an earthquake to shake a little reason into them. Shocking place Yarmouth.

J. Murray Lawson in his Yarmouth, Past and Present county history (1902) reports this event on p. 598 simply as:

A slight shock of earthquake was felt in Yarmouth on the morning of the 15th January, 1856, at 7.30 o'clock.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; one article found (see above).

Yarmouth Herald, searched throughout the period; one article found (see above).

Yarmouth Tribune (semi-weekly), searched from Wednesday, January 16 to Wednesday, January 23, 1856; one article found (see above).

Halifax Morning Chronicle, searched from Thursday, January 17, to Thursday 24, 1856; one article found (see above).

Halifax The British Colonist, searched from Thursday, January 17 to Saturday, January 26, 1856; one article found (see above).

Liverpool Transcript, searched from Thursday, January 17 to Thursday, January 31, 1856; two articles found in the same issue from Thursday.

Pictou Eastern Chronicle, searched from Thursday, January 17, to Thursday, January 31, 1856 (January 24, 1856 missing); one article found (see above).

JANUARY 15, 1856 EVENT (CONTINUED)

DISCUSSIONS AND CONCLUSIONS:

This previously-unreported event is not in Smith (1962) or on the CEEF. It should be entered into the CEEF. Not all the newspaper sources have been examined. More detailed work should be done to see if the felt area epicentre and magnitude can be better defined.

MAY 28, 1856 EVENT

EPICENTRE LOCATION:

Near Yarmouth, Nova Scotia (?)

The exact location of the epicentre is not known at present.

MAGNITUDE: Not known. Apparently quite small since it was only felt in Yarmouth.

DATE: Wednesday, May 28, 1856

TIME: "about 9 o'clock yesterday morning" 0900 AST (1300 GMT)

SUMMARY OF REPORTS:

"A smart shock of an Earthquake was experienced here"

REFERENCES AND TRANSCRIPTS:

This event is not listed in Smith's (1962) compendium. Only one brief newspaper reference was found in the Yarmouth Herald on May 29, 1856, p. 3, col. 3 per the transcript below:

A smart shock of an Earthquake was experienced here about 9 o'clock yesterday morning.

Six other sources yielded no articles. Lawson (1902) does refer to the event on his p. 598 as:

A smart shock was again felt in Yarmouth at 9 a.m. of May 28th, 1856.

This report is clearly drawn only from the Yarmouth Herald article of May 29, 1856 and adds no new data and is not a confirmation of the Yarmouth Herald report.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; no articles found.

Yarmouth Herald, searched throughout the period; one article found (see above).

Yarmouth Tribune, searched from Wednesday, May 28 to Wednesday, June 4, 1856; no articles found.

Halifax The British Colonist, searched from Tuesday June 3 to Thursday June 12, 1856 (issues from May 28 to May 30, 1856 are missing); no articles found.

Liverpool Transcript, searched from Thursday, May 29 to Thursday, June 12, 1856; no articles found.

Pictou Eastern Chronicle, searched from Thursday, May 29 to Thursday, June 12, 1856; no articles found.

MAY 28, 1856 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Halifax Morning Chronicle, searched from Thursday, May 29 to Saturday, June 7, 1856; no articles found.

DISCUSSION AND CONCLUSIONS:

This is a previously-unreported event that is not listed in Smith (1962) or in the CEEF. There is little room for misinterpretation of this very brief report. We can be confident that Yarmouth newspaper writers or their sources should be familiar with earthquakes in May of 1856; the residents experienced, and the newspapers reported on, an earthquake about 4.5 months and 14.5 months previously.

While more newspapers should be examined to confirm this event's existence and to better determine its epicentre, felt area and magnitude, we believe it can safely be entered into the CEEF as a newly-documented event.

MARCH 4, 1858 EVENTS

EPICENTRE LOCATION:

In the area of Portland Maine. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known.

DATE: Thursday, March 4, 1858 ("on the 4th instant")

TIME: "...at one o'clock, followed by a second and more powerful one at two o'clock." We do not know if it is 0100 and 0200 EST (0600 and 0700 GMT) or 1300 and 1400 EST (1800 and 1900 GMT).

SUMMARY OF REPORTS:

"...largest and heaviest buildings in the city were jarred from foundation to roof." There were two shocks an hour apart; the second was the "more powerful one."

REFERENCES AND TRANSCRIPTS:

This event was noted in the Yarmouth Herald of March 25, 1858 on p. 3, col. 2 and is found as a transcript below:

A distinct shock of earthquake occurred at Portland, Me., on the 4th instant, at one o'clock, followed by a second and more powerful one at two o'clock. The State of Maine says that the largest and heaviest building in the city were jarred from foundation to roof. At first it was supposed that a powder mill, or powder house, had blown up. The concussion resembled the effect which might be produced by such an accident.

The event is not reported in Smith's (1962) American or Canadian sections. No other newspaper articles were searched for other than the thorough search done of the Acadian Recorder and Yarmouth Herald throughout the period.

DISCUSSION AND CONCLUSIONS:

This is a previously-unreported event. It may be entered into the CEEF. No further work was done on this event since it was beyond the areal scope of the study.

MARCH 30, 1859 EVENT

EPICENTRE LOCATION:

Apparently in the Halifax area. The only felt reports found to date are for Halifax. The exact location of the epicentre is not known at present. It may be offshore.

MAGNITUDE: Not known exactly. The event, as presently documented, had a fairly low intensity and probably had a magnitude of about 3.0 to 3.5.

DATE: Wednesday, March 30, 1859

TIME: 0740 AST (1140 GMT)

SUMMARY OF REPORTS:

"slight shock of an earthquake"; "was startled by...loud thunderAt the same time there was a quite perceptible motion of the earth - windows, doors, and articles of furniture in houses, being violently shaken."

REFERENCES AND TRANSCRIPTS:

The Halifax Morning Journal reported the event in the Friday, April 1, 1859 issue on p. 2, col. 5 per the transcript below:

A slight shock of an Earthquake was felt in this city and vicinity early on Wednesday morning last.

The Morning Journal's report was noted the next day in the Saturday morning April 12, 1859 issue of The British Colonist on p. 2, col. 5 giving credit to the Journal; only the words "and vicinity" were left out. However, the Halifax Acadian Recorder of Saturday, April 2, 1859 had a quite different and independent report from a person who personally experienced the earthquake. His account is found on p. 3, col. 1 as below:

VERY LIKE AN EARTHQUAKE. - An extraordinary disturbance of the elements was observed by many persons in this city, on the morning of Wednesday last, which is believed to have been a genuine earthquake. The party from whom we have obtained the most circumstantial account of it states that, at the time alluded to, he was startled by what seemed to him loud thunder commencing nearly overhead, but rather to the South East, and rolling away towards the North West, becoming fainter in the distance. This lasted nearly a minute and took place about 20 minutes before 8 o'clock. The sky was perfectly cloudless. At the same time there was a quite perceptible motion of the earth - windows, doors, and articles of furniture in houses, being violently shaken.

MARCH 30, 1859 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Three other sources were searched and no further references were found.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout period; one article found (see above).

Halifax Morning Journal, searched from Friday, April 1 to Friday April 8, 1859; one article found (see above).

Halifax The British Colonist, searched from Thursday, March 31 to Tuesday, April 5, 1859; one article found (see above).

Halifax Morning Chronicle, searched from Thursday, March 31 to Thursday April 7, 1859; no articles found.

Pictou Eastern Chronicle, searched from Thursday, March 31 to Thursday April 7, 1859; no articles found.

Yarmouth Herald, searched throughout period; no articles found.

DISCUSSION AND CONCLUSIONS:

This event is not listed in Smith (1962); it is not in the CEEF. The event is quite real though it requires more work in an effort to detail the area of felt reports and its intensity. It may be possible to produce an estimate of its magnitude and of its epicentre's location.

This previously-unreported event should be added to the CEEF.

OCTOBER 26, 1859 EVENT

EPICENTRE LOCATION:

Apparently in the Saint John area of southern New Brunswick. The only felt reports found to date are for Saint John "and neighbourhood." The exact location of the epicentre is not known at present.

MAGNITUDE: Not known exactly. The event as presently documented had a fairly low intensity and probably had a magnitude of about 3.0 to 3.5.

DATE: Wednesday, October 26, 1859

TIME: "about half-past 2 o'clock" and in another article "at about a quarter past two o'clock." circa 0220 AST (0620 GMT)

SUMMARY OF REPORTS:

"a slight shock of an earthquake was felt", "Two very distinct shocks of an earthquake", "A noise as if a gigantic vehicle heavily laden was driven rapidly along a paved street, startled a number of our citizens from their slumbers, and induced them to rush to their window to ascertain the cause of the turmoil."

REFERENCES AND TRANSCRIPTS:

This event was first turned up in the search of the Acadian Recorder in the issue of Saturday, November 5, 1859 on p. 2, cols. 2 and 3 per the transcript below:

NEW BRUNSWICK.

On Wednesday morning about half-past 2 o'clock a slight shock of an earthquake was felt in this city and neighbourhood. A noise, as if a gigantic vehicle heavily laden was driven rapidly along a paved street, startled a number of our citizens from their slumbers, and induced them to rush to their window to ascertain the cause of the turmoil. The shock appeared to surge from South to North. The morning was excessively cold, the Thermometer ranging about 20. Ice formed to the thickness of three-fourths of an inch. The atmosphere was still and the stars shone out brightly from a very dark sky.
- St. John Courier.

This article of November 5, 1859 implies that the earthquake occurred, "on Wednesday morning November 2, 1859." This was not the date; it was in fact one week previous on Wednesday, October 26, 1859.

The true date is confirmed in the Tuesday, November 1, 1859 issue of the Halifax Morning Chronicle on p. 2, col. 3 which has a similar time but makes the date clear as, "on the morning of the 26th October" - also a Wednesday. The Morning Chronicle article is found below:

OCTOBER 26, 1859 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Two very distinct shocks of an earthquake are said to have been felt in the city of St. John, at about quarter past two o'clock on the morning of the 26th October.

We believe the Morning Chronicle's article is from a different source than that of the Acadian Recorder because it refers to two shocks.

We checked one other paper in Halifax and found that the Morning Sun had an article on Wednesday, November 2, 1859 on p. 2, col. 2:

A shock of an earthquake was felt at St. John, N.B., on Wednesday morning last.

This article presents no new information. Smith (1962) has no 1859 events in the American section and only one of uncertain date in the Canadian section from Metis, Quebec:

76. 1859 III. Felt at Metis, Que. B4, B5, D2.

The October 26, 1859 event in Saint John is not reported by Smith (1962).

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; one article found (see above).

Yarmouth Herald, searched throughout the period; no articles found.

Halifax Morning Chronicle, searched from Thursday, October 27 to Tuesday, November 1, 1859; one article found (see above).

Halifax Morning Sun, searched from Wednesday, October 26 to Friday, November 4, 1859; one article found (see above).

DISCUSSION AND CONCLUSIONS:

No record of this southern New Brunswick earthquake being felt in northern Nova Scotia was found in three Nova Scotia papers. This event may well have been confined to southern New Brunswick. This event is not reported in Smith (1962) and is not in the CEEF; it should be added to the CEEF. More work is needed to investigate New Brunswick and northern Nova Scotia or Annapolis Valley sources to detail the felt area and to determine intensity of the event and its epicentre location. No further work was done on this event at this time since it was beyond the scope of the study.

OCTOBER 12, 1860 EVENT

EPICENTRE LOCATION:

In north-central New Brunswick(?). The event was felt in Dalhousie and possibly in Bathurst, New Brunswick. The exact location of the epicentre is not known at present.

MAGNITUDE: not known

DATE: "on Friday week" in a Saturday, October 20, 1860 issue of the Miramichi Gleaner. Thus it probably occurred on Friday, October 12, 1860.

TIME: not known

SUMMARY OF REPORTS:

One report in a Halifax paper citing the Miramichi Gleaner wherein a Dalhousie, New Brunswick correspondent reported the event. The original Gleaner article was not seen.

REFERENCES AND TRANSCRIPTS:

We have only found one reference, by chance, while looking for more Nova Scotia reports on the major Wednesday, October 17, 1860 Rivière Ouelle, Quebec event. This report was found in the Thursday, October 25, 1860, issue of the Halifax The British Colonist citing a Saturday, October 20th issue of the Miramichi Gleaner per the transcript below:

A number of persons inform us that a pretty smart shock of an earthquake was felt in Chatham about half-past six on the morning of Wednesday last. A correspondent in Dalhousie states that a similar phenomenon occurred at that place on Friday week. We understand it was also felt in Bathurst.

- Miramichi Gleaner, Oct. 20.

This article makes it quite clear that a Dalhousie, New Brunswick correspondent to the Miramichi Gleaner felt a similar event, "at that place on Friday week" which was before the main event on, "Wednesday last". The article also implies the earlier event was also felt in Bathurst but is not absolutely clear on this. This date was Friday, October 12 (not the 19th), 1860. We did no event-specific search for this event.

The event is not reported in Smith (1962); Smith has no other 1860 events in Canada other than the major October 17, 1860 event that occurred five days later. Smith has two March 1860 events in the United States section but no others.

OCTOBER 12, 1860 EVENT (CONTINUED)

DISCUSSIONS AND CONCLUSIONS:

Some additional research should be done in New Brunswick newspaper sources to confirm the October 12, 1860 event, to get its epicentre location and intensity and to try and determine its time. If the event can be confirmed, it should be entered in the CEEF. No further work was done on this event since it was beyond the areal scope of the study.

OCTOBER 17, 1860 EVENT

EPICENTRE LOCATION:

Smith (1962) reports the epicentre, "In the St. Lawrence River north of the mouth of Rivière Ouelle." at 47.5° N, 70.1° W.

MAGNITUDE: Smith (1962) indicates an intensity of VIII to IX on the Modified Mercalli Intensity Scale of 1931. This converts to a magnitude of about 6.6 on the CEEF.

DATE: Wednesday, October 17, 1860

TIME: 0615 EST (1115 GMT)

SUMMARY OF REPORTS:

This event is previously-known as having been felt from Hamilton, Ontario on the west, to Boston and Newark, New Jersey in the south to New Brunswick in the east. We only examined it for possible Nova Scotia reports and found none. The New Brunswick reports cover Saint John, the western side of the Saint John Harbour, Negro Town Point, near the Asylum in Saint John, Miramichi, Chatham, Fredericton and probably Bathurst.

 REFERENCES AND TRANSCRIPTS:

The Smith (1962) report is not listed here as a transcript since it mainly details the Quebec reports. We only detail here those reports re southern New Brunswick which were sought out in Nova Scotia papers to see if there were any Nova Scotia felt reports. The Halifax Morning Sun of Monday, October 22, 1860 on p. 2, col. 4 had a report and the next issue of Wednesday, October 24, 1860 on p. 2, col. 5 had a brief follow up report. These two articles appear in transcript below with the October 22, 1860 article first:

 BY SATURDAY NIGHT'S MAIL.

There was a slight shock of an Earthquake on the Western side of St. John harbour, on Wednesday morning last. It lasted about 30 seconds.

Two slight shocks of earthquake were felt in Boston on Wednesday last; they were heard and felt at Taunton, Belvidere; at Manchester, N.H., and at Woodstock, Vt. Houses were shaken, beds moved, windows jarred, etc. They were also felt throughout Canada.

 BY LAST NIGHT'S MAIL.

The earthquake spoken of in our last was felt at Chatham, Miramichi, and other places in the northern part of New Brunswick.

OCTOBER 17, 1860 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED)

The Thursday, October 25, 1860 issue of Halifax's The British Colonist had an article on p. 4, col. 2 per the transcript below:

AN EARTHQUAKE - The St. John News of Friday says: -
 "A vibration of the earth, from twenty to thirty seconds in duration, occurred about twenty-five minutes past six o'clock on Wednesday morning, along the line of the western side of the harbor, causing homes to shake quite perceptibly, and in several instances awakening people from their slumbers. We do not know what distance it extended, or whether it was perceived in St. John or not; but parties residing in the vicinity of Negro Town Point felt it very distinctly, as did persons living near the Asylum, so that it certainly extended some distance." - The shock was felt in Fredericton, about the same hour; and in Boston and in other parts of Massachusetts; in Maine, New Hampshire, and Canada.

A second article in The British Colonist of the same date appeared on p. 2, col. 5. This article was earlier cited re the apparent Friday, October 12, 1860 event but is repeated again here for completeness since it suggests that the October 17, 1860 event "was also felt at Bathurst"; this may however be a reference to the October 12, 1860 event:

- A number of persons inform us that a pretty smart shock of an earthquake was felt in Chatham about half-past six on the morning of Wednesday last. A correspondent in Dalhousie stated that a similar phenomenon occurred at that place on Friday week. We understand it was also felt at Bathurst.

- Miramichi Gleaner, Oct. 20.

We also found two articles in the Yarmouth Herald and we found two articles in the Halifax Acadian Recorder during the search of the long runs of these newspapers. The Yarmouth Herald articles were in the Thursday, October 25, 1860 issue on p. 2, col. 4 and much later in the Thursday, December 6, 1860 issue on p. 3, col. 1; we do not transcribe them here since they deal only with American or Quebec reports.

However, we do transcribe the full account in the Saturday, October 27, 1860 Halifax Acadian Recorder on p. 3, col. 2 since it does mention, "No shock, so far as we have learned, was perceived in any part of Nova Scotia;". The second article in the issue of the Saturday, November 3, 1860, on p. 3, col. 1 deals only with Quebec reports and is therefore not transcribed in this report. The October 27 article appears below:

EARTHQUAKE - On Saturday last a rumor reached us from St. John, N. B., that a slight shock of an Earthquake had been experienced in that city. From

OCTOBER 17, 1860 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

papers received during the week, we have a corroboration of the rumor from other quarters and full particulars of the alarming event. No shock, so far as we have learned, was perceived in any part of Nova Scotia; but it was unmistakably felt as far South as St. John and as far East as Miramichi, N. B. The motion was felt, therefore, over all New Brunswick, the greater part - if not all - of Maine, New Hampshire, Vermont, all Lower Canada, and as far West as Belleville in Upper Canada. From different places, the motion is variously mentioned to have commenced at from 3.30 to 6.15 o'clock - i.e. on the morning of Wednesday, October 17. This great difference of time is probably owing as much to inaccuracies of some time-pieces as to difference of longitude and the motion of the earthquake itself. Where the Earthquake was most violent, three distinct shocks were perceived, of which the first was the longest; the second, the most violent; and the third, the weakest. The motion is variously described to have continued from 30 seconds to 5 minutes. It was most violent in Lower Canada and the Northern part of the Eastern States. There, buildings rocked and swayed so as to make it difficult, in some places, to stand erect in them, the bells were rung, glasses and crockery smashed, furniture rattled and danced upon the floors, plastering was thrown down, cracks opened and closed in the walls, and doors opened and shut of their own accord. The vibrations were from South East to North West and were preceded by a low rumbling sound like distant thunder. Nothing of the kind, so violent in its nature, had been experienced in Canada within the memory of any person now living; and the alarm, particularly in Quebec and Montreal, seems to have been intense. People, half dressed, ran out of their houses into the streets; families were hurried together for flight; men fainted and some seemed to become temporarily insane, through terror; and for a short period, dread was universal. Old soldiers at Quebec declared that they had never experienced any earthquake so violent in either the East or West Indies. Yet we hear of no fatal accident and no very serious damage to buildings resulting from it; although all accounts seem to concur in the belief that had it been a verg[sic] little more violent, the principal cities of Lower Canada must have been laid in ruins.

OCTOBER 17, 1860 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

J. W. Dawson's paper (1860) on the October 17, 1860 event delivered a scant 12 days after the event cites no Nova Scotia reports and only notes in a footnote, "It was felt in New Brunswick also" (p. 363). He details Quebec reports then discusses earthquakes more generally with a table of eastern Canadian events.

Samuel Kain (1898) gives a report of this event for New Brunswick but gives no specific non-New Brunswick instances of felt reports for the Maritimes per the transcript below from p. 18:

1860. October 17; 6.25 a.m.

Felt over a large area of Eastern Canada and the New England States. Also felt in this Province. Moderate in New Brunswick, but severe in Quebec and Ontario.

The Morning News of October 19th, 1860, says: "A vibration of the earth from twenty to thirty seconds in duration occurred about twenty-five minutes past six o'clock on Wednesday morning along the western side of the harbour, causing the houses to shake quite perceptibly, and in several cases awakening people from their slumbers. We do not know what distance it extended or whether it was perceived in St. John or not; but parties residing in the vicinity of Negrotown Point felt it very distinctly, as did persons living near the Asylum."

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; two articles were found (see above).

Yarmouth Herald, searched throughout the period; two articles were found (see above).

Halifax Morning Sun, searched from Wednesday, October 17 to Friday, October 20, 1860; two articles were found (see above).

Halifax The British Colonist, searched on Thursday, October 18 and on Thursday, October 25, 1860; two articles were found (see above).

DISCUSSION AND CONCLUSIONS:

To be absolutely sure there were no felt reports in Nova Scotia the Annapolis Valley and Amherst or other northern newspapers should be searched. Otherwise our search has added very little to what was already known of this event. No further work was done on this event at this time since it was beyond the areal scope of the study. The event was at the same epicentre as the October 20, 1870 event but clearly it was not felt over as wide an area; the 1870 event was definitely felt in northern Nova Scotia.

JULY 11, 1861 EVENT

EPICENTRE LOCATION:

Smith (1962) reports the epicentre at 45.4°N, 75.4°W near Ottawa.

MAGNITUDE:

Smith (1962) lists the intensity as VII on the Modified Mercalli Intensity Scale of 1931 which converts to a magnitude of about 5.6 on the CEEF.

DATE:

Thursday, July 11, 1861, EST; not Friday, July 12, 1861, EST (Friday, July 12, 1861 GMT).

TIME:

2100 EST (0200 GMT next day, Friday, July 12, 1861).

SUMMARY OF EVENTS:

Reported to have been felt in Montreal where it frightened people and they, "rushed out of their houses into the street." It was also felt in Brockville, Ontario, Ogdensburg, New York and in Ottawa, Ontario where, "Chimneys were thrown down, and buildings in some instances shattered." and "vessels shattered."

REFERENCES AND TRANSCRIPTS:

Smith (1962) very clearly reports this event on July 12 at 2100 EST per his entry below:

78. 1861 JULY 12. 9:00 p.m. VII. 45.4°N, 75.4°W (b).
Felt at Montreal, Ottawa and Ogdensburg[sic],
N.Y., but most violently at Ottawa where it
overturned chimneys. B4, B5, H1, M7.

However, Smith has somehow become confused. It appears he trusted secondary sources such as Brigham (1871), who clearly used, "July 12, about 9 P.M." in his text (p. 21) and in his table (p. 28) and Brooks (1960) who used, "1861 7-13 0200 ca. 45.0°N, 75.6°W VII" in his table (p. 20). Brooks is citing 0200 GMT on July 13, 1861 which is 2100 EST on July 12, 1861.

Brigham (1871) and Brooks (1960) are incorrect; we have not seen Smith's (1962) other two references H1 (Heck and Eppley, 1958) or M7 (Milne, 1913). The event clearly occurred at 2100 EST Thursday, July 11, 1861 even from only the two secondary newspaper sources we have turned up in our systematic search of long runs of the Halifax Acadian Recorder and the Yarmouth Herald. The two articles found cite four reports and all four indicate a July 11, 1861 date not a July 12, 1861 date.

The Acadian Recorder article was found in the Saturday, July 20, 1861 issue on p. 2, col. 5 and is in transcript below:

COLONIAL.

A severe shock of an earthquake was felt at Montreal on the evening of Thursday the 11th inst., which lasted for several seconds, and seriously

JULY 11, 1861 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

alarmed the inhabitants. It was felt at the same time in various places in Canada West. In Ottawa City chimnies[sic] were thrown down and vessels shattered.

Similarly, the three reports reproduced from Montreal, Ottawa and Brockville papers (all of July 12, 1861) in the Yarmouth Herald of Thursday, July 25, 1861 on p. 3, col. 1 all give a date of July 11, 1861 for the earthquake per the transcript below:

EARTHQUAKE AT MONTREAL. - The Gazette of the 12th inst. says: - A few minutes after nine last evening a shock of an earthquake was felt in this city. It was so violent that many people were alarmed and rushed out of their houses into the street. Its direction seemed to be from South to North. One observer says the resulting vibration, which lasted about four seconds, seemed to him like that caused by a waggon passing over a swing bridge.

OTTAWA, CANADA, JULY 12.

A very severe shock of an earthquake was felt last evening at 9 o'clock. Chimneys were thrown down and buildings in some instances shattered. It lasted about a minute.

BROCKVILLE, JULY 12.

Last night about nine o'clock we experienced a severe shock from an earthquake. It lasted a full minute.

There was no event-specific search done for this event since it was beyond the areal scope of the study.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; one article found (see above).

Yarmouth Herald, searched throughout the period; one article found (see above).

DISCUSSION AND CONCLUSIONS:

The July 12, 1861 event listed in Smith (1962) and in the CEEF is a 'ghost event' and should be removed. The date in the CEEF should be altered to Thursday, July 11, 1861 at 2100 EST (local time) or Friday, July 12, 1861 at 0200 GMT. No further work was done on this event at this time since it was beyond the areal scope of the study.

OCTOBER 30*, 1861 EVENT

EPICENTRE LOCATION:

Near St. Croix, New Brunswick; it may have been in the Passamaquoddy Bay area and/or on the Oak Bay fault. It may also be a Bay of Fundy earthquake? The exact location of the epicentre is not known at present.

MAGNITUDE:

Not known; however it is apparently quite small and it probably had an intensity of about IV on the Modified Mercalli Intensity Scale of 1931 hence a magnitude of about 3.6.

DATE:

Probably on Wednesday, October 30, 1861. There is some uncertainty as to what week is being cited in the article when the words "last week" are used since no dates are cited*. The St. Croix Herald should be checked in New Brunswick sources to confirm this date.

TIME:

"at 8 a.m." 0800 AST (1200 GMT)

SUMMARY OF REPORTS:

"It was the most sensible shock of the kind ever known here on similar occasions. Buildings were shaken and their contents rattled...Persons standing in the street felt the shock very perceptibly."

REFERENCES AND TRANSCRIPTS:

This event is a previously-unreported event. It is not found in the CEEF, in Brigham (1871), in Kain (1898), in Smith (1962), in Smith and Bridges (1983) or in Rand (1977); nor was it on the Chiburis and Ahner (1976) list (or in the edited portion of the Chiburis Catalogue from the Weston Observatory which was provided to project by EPB). The event was found in our general search of the Halifax Acadian Recorder in the Saturday, November 9, 1861 issue on p. 3, col. 2 citing the St. Croix Herald per the transcript below:

GENERAL NEWS SUMMARY.

EARTHQUAKE. - The shock of an earthquake which was felt here on Wednesday morning of last week, was confined to this vicinity. We have not heard of its being experienced elsewhere, or being felt any distance from here. It was the most sensible shock of the kind ever known here on similar occasions. Buildings were shaken and their contents rattled as if some unseen and powerful force were at work. Persons standing in the street felt the shock very perceptibly. It occurred at 8 a. m. - St. Croix Herald.

*Note added in proof: Date is actually Wednesday, October 23, 1861 as discovered by Burke et al., (1987) in doing an event-specific search of the southwest New Brunswick newspapers.

OCTOBER 30, 1861 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; one article found (see above).

Yarmouth Herald, searched throughout the period; no articles found.

Halifax Morning Chronicle, searched from Thursday, October 31 to Tuesday, November 5, 1861; no articles were found.

Halifax Morning Sun, searched from Wednesday, October 30 to Wednesday, November 6, 1861; no articles were found.

Halifax The British Colonist, searched from Thursday, October 31 to Thursday, November 7, 1861; no articles were found.

DISCUSSION AND CONCLUSIONS:

This event should be further researched in Annapolis Valley, Nova Scotia and in southern New Brunswick newspapers to confirm the October 30, 1861 date, to further detail its magnitude and to hopefully determine an epicentre. The event should be added to the CEEF. No further work was done on this event at this time since it was beyond the areal scope of the study.

MARCH 8, 1862 EVENT

EPICENTRE LOCATION:

Near Quebec City, P.Q. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known at present. "A slight shock..."

DATE: "on the 8th inst.[instant]" in a Saturday, March 29, 1862 newspaper, ie on Saturday, March 8, 1862 (there is a slight possibility that it was Saturday, February 8, 1862.)

TIME: not known at present

SUMMARY OF REPORTS:

"A slight shock of an earthquake..."

REFERENCES AND TRANSCRIPTS:

The event is not reported in Smith (1962); it is not in the CEEF. Smith has no 1862 Canadian events and only two events in the United States section in February, 1862; Smith and Bridges (1983) have only one 1862 event in January. This new event was found as a brief filler during our search of the Acadian Recorder in the Saturday, March 29, 1862 issue on p. 3, col. 3 per the transcript below:

A slight shock of an earthquake was felt at Quebec on the 8th inst.

No event-specific search was done for this event beyond the search of the Halifax Acadian Recorder and the Yarmouth Herald since this event was beyond the areal scope of the study. No articles were found in the Yarmouth Herald.

DISCUSSION AND CONCLUSIONS:

This previously-unreported event should be added to the CEEF. Further research should be done in Quebec newspapers. No further work was done on this event at this time since it was beyond the areal scope of this study.

JUNE 29, 1862 EVENT(S?)

EPICENTRE LOCATION:

Near Grand Lake, New Brunswick; possibly in the Central Highlands. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known at present. "The shocks were severe enough to shake the houses."

DATE: "on the morning of the 29th ult., [ultimo]" in a Saturday, July 19, 1862 newspaper, ie on Sunday, June 29, 1862

TIME: Not known exactly at present; "on the morning"

SUMMARY OF REPORTS:

"...two shocks of earthquakes...severe enough to shake the houses."

REFERENCES AND TRANSCRIPTS:

This previously-unreported event is not reported in Smith (1962); it is not in the CEEF. Smith has no 1862 Canadian events and only two events in the United States section in February 1862; Smith and Bridges (1983) have only one 1862 event in January. This new event was discovered as a brief filler during our search of the Acadian Recorder in the Saturday, July 19, 1862 issue on p. 3, col. 1 per the transcript below:

The St. John N B., papers report that on the morning of the 29th ult., two shocks of earthquakes were felt in the vicinity of Grand Lake, N. B. The shocks were severe enough to shake the houses.

No event-specific search was done for this event(s) beyond the search of the Halifax Acadian Recorder and Yarmouth Herald since the event was beyond the areal scope of the study. No articles were found in the Yarmouth Herald.

DISCUSSION AND CONCLUSIONS:

This previously-unreported event(s) should be added to the CEEF. Further research should be done in New Brunswick and Maine newspapers to verify it was one earthquake (as we suspect), or two, to confirm the date, to determine the time in the morning, to try and detail the felt area and to determine a magnitude and epicentre. No further work was done on this event at this time since it was beyond the areal scope of the study.

JANUARY 1, 1863 EVENT

EPICENTRE LOCATION:

Near St. Andrews, New Brunswick; possibly in the Passamaquoddy Bay area or on the Oak Bay fault. It could also be a Bay of Fundy event. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known at present. "It shook the house terribly...and inmates ran downstairs to see if any damage was done." Probably about an intensity of IV to V on the Modified Mercalli Intensity Scale of 1931 which would be a magnitude of about 4.0(?).

DATE: "...on the night of the 1st instant, at 12 o'clock." Thursday, January 1, 1863 midnight local time - AST (Friday, January 2, 1863 - GMT).

TIME: 2400 AST (0400 GMT the next day; Friday, January 2, 1863)

SUMMARY OF REPORTS:

This is a secondary report reporting a Toronto Globe's correspondent's letter which refers to a "very severe shock of an Earthquake...It shook the house terribly, so much so that it was thought some of the bricks were thrown down from the chimney, and the inmates ran downstairs to see if any damage was done."

REFERENCES AND TRANSCRIPTS:

This previously-unreported event is not reported in Smith (1962); it is not in the CEEF. Indeed there are no 1863 events in Smith (1962), in the CEEF, in Smith and Bridges (1983), in Rand (1977), in Brigham (1871), in Kain (1898), in Brooks (1960) or in the edited portion of the Chiburis Catalogue from the Weston Observatory which was provided to the project by EPB.

This event was discovered during our systematic search of the Halifax Acadian Recorder in the Saturday, January 17, 1863 issue on p. 3, col. 1 citing the Toronto Globe as seen in the transcript below:

EARTHQUAKE IN LOWER CANADA. - A correspondent at St. Andrews, Canada East, informs the Toronto Globe, that a very severe shock of an Earthquake was felt there on the night of the 1st instant, at 12 o'clock. It shook the house terribly, so much that it was thought some of the bricks were thrown down from the chimney, and the inmates ran downstairs to see if any damage was done. It was from 12 to 15 degrees below zero at the time.

A brief event-specific search was initiated re this event but was limited by time constraints; three other sources were examined and no other references were located.

JANUARY 1, 1863 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Halifax Acadian Recorder, searched throughout the period; one article found (see above).

Yarmouth Herald, searched throughout the period; no articles found.

Halifax Morning Chronicle, searched from Thursday, January 1 to Tuesday, January 6, 1863; no articles were found.

Halifax Morning Sun, searched from Friday, January 2 to Wednesday, January 7, 1863; no articles were found.

DISCUSSION AND CONCLUSIONS:

This previously-unreported event should be added to the CEEF. Further research should be done in southern New Brunswick, eastern Maine and in Annapolis Valley, Nova Scotia newspapers to confirm the date and time, to try and detail the felt area, and to determine the magnitude and epicentre. No further work was done on this event at this time since it was beyond the areal scope of the study.

CIRCA MID-MARCH, 1863 EVENT

EPICENTRE LOCATION:

Near(?) Miramichi, New Brunswick; possibly in the Central Highlands of northern New Brunswick. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known at present. "A slight shock"

DATE: Not known at present. The very brief article in a March 28, 1863 paper only says "...last week." We would estimate as, "mid-March" ie circa March 18, 1863 to allow some time for the news to reach Halifax.

TIME: Not known at present.

SUMMARY OF REPORTS:

"A slight shock of an earthquake was felt...."

REFERENCES AND TRANSCRIPTS:

This previously-unreported event is not reported in Smith (1962); it is not in the CEEF. Indeed there are no 1863 events in Smith (1962), in the CEEF, in Smith and Bridges (1983), in Rand (1977), in Kain (1898), in Brigham (1871), in Brooks (1960) or in the edited portion of the Chiburis Catalogue from the Weston Observatory which was provided to the project by EPB.

This apparent event in northern New Brunswick was discovered during our systematic search of the Halifax Acadian Recorder in the Saturday, March 28, 1863 issue on p. 3, col. 3 with no source in a New Brunswick newspaper cited, as seen in the transcript below:

A slight shock of an earthquake was felt at
Miramichi, New Brunswick, last week.

No event-specific search was initiated for this event beyond our general search in the Halifax Acadian Recorder and in the Yarmouth Herald because the event was beyond the areal scope of the study. No articles were found in the Yarmouth Herald.

DISCUSSION AND CONCLUSIONS:

The event should be further researched in the February-March, 1863 newspapers of New Brunswick to initially confirm it, to determine the exact date, time, location, felt area and its magnitude. It should be then added to the CEEF. We suspect it occurred in the now-known earthquake zone in the Central Highlands. No further research was done on this event at this time since it was beyond the areal scope of the study.

OCTOBER 6, 1863 EVENT

EPICENTRE LOCATION:

Near Montreal, P.Q. The exact location of the event is not known at present.

MAGNITUDE:

Not known at present. "...and so great was the tremulousness of the house, that a large portion of the mouldings in the hall fell down; and the servants...ran up stairs alarmed." Probably about IV to V on the Modified Mercalli Intensity Scale of 1931 which would be a magnitude of about 4.0(?).

DATE:

Tuesday, October 6, 1863

TIME:

"a few minutes before 3 o'clock" 1455 EST (1955 GMT)

SUMMARY OF EVENTS:

Three shocks of an earthquake were felt that shook down some hallway mouldings and brought frightened servants running up the stairs from the basement as reported by a Montreal family living close to the 'Mountain'. A family near Hochelaga also reported that, "they distinctly felt it."

REFERENCES AND TRANSCRIPTS:

This previously-unreported event is not reported in Smith (1962); it is not in the CEEF. Indeed there are no 1863 events in Smith (1962) or in the CEEF. This event was discovered during our systematic search of the Halifax Acadian Recorder in the Saturday, October 31, 1863 issue on p. 2, col. 3, citing a correspondent of the Montreal Witness (no date of the issue given) as seen in the transcript below:

COLONIAL.
CANADA.

THE EARTHQUAKE IN ENGLAND FELT IN CANADA.

According to a correspondent of the Montreal Witness, the shock of earthquake felt in England on the 6th instant, was felt in Canada on the same day. The writer says - on Tuesday the 6th inst., a few minutes before 3 o'clock in the afternoon, himself and family, residing close to the Mountain, most distinctly felt three shocks of an earthquake; and so great was the tremulousness of the house, that a large portion of the mouldings in the hall fell down; and the servants who were in the basement ran up stairs alarmed. One family, residing near Hochelaga, to whom the writer spoke of the occurrence, at once stated that they distinctly felt it. News from England now confirms his opinion, and proves that the same volcanic disturbance which affected that country on the morning of the 6th of October, was felt here early in the afternoon; allowing for difference of time and latitude.

OCTOBER 6, 1863 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

We did not initiate an event-specific search because this event was beyond the areal scope of the study. No articles were found re this event, in our search of the Yarmouth Herald throughout this period.

DISCUSSION AND CONCLUSIONS:

This previously-unreported event should be added to the CEEF. Further research of the Montreal and area newspapers should help resolve the felt area, epicentre location and magnitude. No further work was done on this event since it was beyond the areal scope of the study.

The writer is quite incorrect in the assumption that the morning earthquake on October 6, 1863 was the same event. Leaving aside the fact that neither event was large enough to be felt worldwide the writer in, "allowing for the difference of time and latitude" went in the wrong direction in time; England is some five hours ahead of Montreal in time not behind it. Thus an earthquake in England, "on the morning of the 6th of October", say at 1100 GMT would have to have occurred at 0600 EST in Montreal, Quebec to have been the same event (ie -5 hours not +5 hours); this event in fact occurred at about 1500 EST in Montreal about 9 hours after the English event, "on the morning of the 6th of October".

The Acadian Recorder of Saturday, November 21, 1863 cites an October 6, 1863 related tsunami, or a possible tsunami or tsunami-like event in Carmarthen Bay, in England, at 1100 local time. If this was about the time of the earthquake in England then it was only 0600 EST in Montreal.

DECEMBER 21, 1863 METEORITE EVENT

EPICENTRE LOCATION:

It is unlikely that this south to north-moving (or southwest to northeast-moving) meteorite actually struck the ground with enough energy to cause an earthquake-like event - if any fragment even struck the ground. More likely, the noise heard in Amherst and Parrsboro (but not in Halifax and probably not in Saint John and Miramichi, New Brunswick), was the result of the meteorite's interaction with the lower levels of the atmosphere. At Amherst there was, "no tremulous motion of the ground", and the thunder-like sound took, "as variously estimated from one to three minutes ..." to travel to observers in that town after the flash had disappeared and the sound came from the north from where the meteor had disappeared.

At Parrsboro, Nova Scotia there were three distinct bursts of energy and the sound took, "about one minute and a half", to arrive and then, "awoke people from their sleep and shook houses like an earthquake." If there was an impact it may have been closer to Parrsboro than Amherst especially in view of, "a strong smell of brimstone [that] pervaded the atmosphere producing a suffocating feeling." The meteorite may have broken into several pieces one of which entered the atmosphere and even impacted near Parrsboro, and one of which entered the atmosphere well north of Amherst.

MAGNITUDE: Not really applicable. The sensations at Parrsboro were somewhat akin to an intensity of IV on the Modified Mercalli Intensity Scale of 1931 or a magnitude of 3.7.

DATE: Monday, December 21, 1863, local time (Tuesday, December 22, 1863 GMT)

TIME: "About ten minutes past 11 o'clock last night"
2310 AST (0310 GMT)

SUMMARY OF EVENTS:

See the above section on 'Epicentre Location' in part. The meteor burned with, "more than a flash, for the brightness continued about two or three seconds," at Amherst. At Parrsboro, Nova Scotia, "it threw out brilliant sparks of fire, in every direction, causing, at the same time, three distinct intense illuminations." that were so bright that, "the moon could be scarcely discerned."

At Amherst, "...the flash was more startling bright than the most vivid lightning on a dark night." and, "...for miles around the interior of a very[sic = every?] house was lit up as if by a noonday sun."

At Amherst the sound took "one to three minutes" to arrive as, "a crash of sounds from the North, ...succession of sounds continued about three minutes, and appeared to some as a distant cannonade, to others as a fue de jete of musketry, to others again, the

DECEMBER 21, 1863 METEORITE EVENT (CONTINUED)

SUMMARY OF REPORTS (CONTINUED):

rumble of heavily laden carriages over a hard road or bridge, suggesting the idea of an earthquake. There was, however, no tremulous motion of the ground." At Parrsboro after the light disappeared, "In about one minute and a half, there was a report sounding very much like a heavy cannon. It awoke people from their sleep, and shook houses like an earthquake. A strong smell of brimstone prevailed the atmosphere, producing a suffocating feeling."

"At Minudie the report was more like thunder rumbling in the distance." In Halifax, "There were one or two quick and brilliant flashes. ...No sound was noticed." It was also seen in Saint John, Miramichi and, "In several portions of New Brunswick".

REFERENCES AND TRANSCRIPTS:

This event is not reported in Smith (1962); it is not in the CEEF. Indeed there are no 1863 events in Smith (1962) or in the CEEF for this area. The event was first discovered during the search of a long run of the Halifax Acadian Recorder which cited the report, "Cnmmunicated[sic] to Colonist" referring to the Tuesday, December 29, 1863 issue of Halifax's The British Colonist on p. 2, col. 3 where there are three reports; one is from Amherst and the others are from Parrsboro and Halifax. These all appeared under the headline, "A STRANGE VISITOR." These three reports appear as a transcript, in sequence, below:

A STRANGE VISITOR

MR. EDITOR. - About ten minutes past 11 o'clock last night, a Meteor of unusually vivid appearance passed over this village, and its disappearance was followed by a succession of singular sounds.

It crossed the zenith from South to North, about two seconds elapsing before its disappearance. The nucleus appeared to the eye of a spectator, to be the size of a barrel and to have a tail like a comet or a rocket, the rapidity of whose flight it about equalled. The sky was cloudless, except at the South, where a small cloud appeared extending a few degrees above the horizon. Altho' the moon was at the full, and snow covered the ground, such was the intense brilliancy of the meteor that for miles around the interior of very house was lit up as if by a noonday sun, and the flash was more startlingly bright than the most vivid lightening on a dark night. It was more than a flash, for the brightness continued about two or three seconds, the color being described in some instances as red, white and blue intermixed. In ancient times would not this have been deemed a warlike portent?

DECEMBER 21, 1863 METEORITE EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

After an interval, variously estimated from one to three minutes, came a crash of sounds from the North, similar to the passage of electricity from one cloud to another over a partially clear sky, as sometimes heard overhead on a summer day. Here, the sound, or rather succession of sounds continued about three minutes, and appeared to some as a distant cannonade, to other as a fue de jete of musketry, to others again, the rumble of heavily laden carriages over a hard road or bridge, suggesting the idea of an earthquake. There was, however, no tremulous motion of the ground. Thermometer 3° above zero; barometer steady at 29 1/2 for several hours before, and up to this present writing, although the weather yesterday was bright and clear, and today it has been cloudy and slightly snowy since daylight.

As this remarkable phenomenon has doubtless attracted the attention of intelligent observers elsewhere, it may conduce[sic] to the general benefit to describe its prominent features at this northern extremity of the Province. I was not fortunate enough to be an eyewitness, but I have carefully collated the slightly varying impressions of several reliable persons who saw and heard what I have described; others there were, indeed, too terrified and amazed at the strange sights and sounds, to be able, intelligibly, to describe anything.

Your constant reader,
PHILO.

Amherst, Tuesday, Dec. 22, 1863.

On the evening of the 21st Dec., 1863 the inhabitants of Parrsboro village were considerably alarmed by an extraordinary and most beautiful and brilliant meteoric phenomenon, appearing in the heavens. It was seen a little after eleven o'clock, and those who were fortunate enough to see it, describe it as being extremely beautiful. The meteor itself, it appears, was similar to an immense ball of fire, and for three several times it threw out brilliant sparks of fire in every direction, causing at the same time, three distinct intense illuminations. The sky, during these flashes, was entirely overspread with a bluish flame, through which the moon could be scarcely discerned. When the illumination had ceased, so great had been the light, that the sky appeared to be almost pitch dark. In about one minute and a half, there was a report sounding very much like a heavy cannon. It awoke people from their sleep, and shook houses like an

DECEMBER 21, 1863 METEORITE EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

earthquake. A strong smell of brimstone pervaded the atmosphere, producing a suffocating feeling. At Minudie the report was more like thunder rumbling in the distance. Several superstitious persons consider this meteor a warning of some disaster about to happen soon.

A somewhat similar spectacle as that described above by our correspondents was witnessed by many persons in this city on the same evening, and at about the same hour. There were one or two quick and brilliant flashes, and a meteor extended across the zenith from about south-west to east. No sound was noticed.

The report in the Halifax Morning Chronicle of Thursday, December 31, 1863 on p. 2, col. 6 was essentially a rewrite of The British Colonist's articles of two days previous thus we do not transcribe it here. Similarly the first two thirds of the Halifax Acadian Recorder's article of Saturday, January 2, 1864 on p. 3, col. 1 was a rewrite from The British Colonist but the latter part of the article presented new data citing the Saint John, New Brunswick Freeman. This portion of the Acadian Recorder's article appears in transcript below:

The same appearance was observed in the city by a number of citizens. In several portions of New Brunswick, too, it was plainly visible. The St. John Freeman says that on the evening alluded to a large and brilliant meteor shot from S.W. to North East. At the same time, and also on the following evening, a similar occurrence took place at Miramichi, creating considerable talk among the inhabitants.

No reports were found in the Yarmouth Herald which was searched throughout the period and none were found in the Thursday, December 24, 1863 issue of the Pictou Eastern Chronicle.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; one article found (see above).

Yarmouth Herald, searched throughout the period; no articles were found (searched from Wednesday, December 23 to Wednesday, December 30, 1863 and on Wednesday, January 6, 1864).

Halifax The British Colonist, searched from Tuesday, December 22 to Tuesday, December 29, 1863; one article in 3 parts found (see above).

DECEMBER 21, 1863 METEORITE EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Halifax Morning Chronicle, searched from Tuesday, December 22 to Thursday, December 31, 1863; one article found.

Pictou Eastern Chronicle, searched on Thursday, December 24, 1863; no articles were found.

DISCUSSION AND CONCLUSIONS:

We can probably never know if any fragments of this meteorite actually hit the ground in Nova Scotia. Certainly the event caused earthquake-like sensations at Parrsboro and to a lesser degree in Amherst. It is not however a tectonically-caused earthquake but rather is known as a 'meteorite termination'. If it is put in the CEEF it should be flagged to indicate its meteorite origin and it should not be plotted on any epicentre maps.

NOVEMBER 29, 1866 EVENT

EPICENTRE LOCATION:

Near Saint John, New Brunswick in southern New Brunswick or in the Bay of Fundy. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known at present; "a slight tremor in the ground". Probably an intensity of III and a magnitude of about 3.0.

DATE: Thursday, November 29, 1866, local time (Friday, November 30, 1866, GMT)

TIME: "about 12 o'clock" 2400 AST (0400 GMT the next day on Friday, November 30, 1866)

SUMMARY OF REPORTS:

"A shock of an earthquake...a slight tremor in the ground which lasted for a few seconds."

REFERENCES AND TRANSCRIPTS:

Two articles were found in the course of other searches in the Halifax Morning Chronicle and the Pictou Eastern Chronicle; no articles were found in the course of the ongoing search of the Halifax Acadian Recorder and the Yarmouth Herald. The Morning Chronicle's article in the Thursday, December 6, 1866 issue on p. 2, col. 5 is identical to the first sentence of the Eastern Chronicle's article of the same day. It is clear that both papers were quoting another source.

The Pictou Eastern Chronicle article of Thursday, December 6, 1866 on p. 2, col. 5 is transcribed below:

A shock of an earthquake was felt in St. John, N.B. on Thursday night last, about 12 o'clock. There was a slight tremor in the ground which lasted for a few seconds.

This event is not reported in Smith (1962) and is not in the CEEF for Eastern Canada. The event is not listed in Smith and Bridges (1983), Brigham (1871), Kain (1898), Brooks (1960) or Rand (1977).

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; no articles were found.

Yarmouth Herald, searched throughout the period; no articles were found.

Halifax Morning Chronicle, searched from Thursday, November 29 to Thursday, December 6, 1866; one article found (see above).

NOVEMBER 29, 1866 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Pictou Eastern Chronicle, searched from Thursday, November 29 to Thursday, December 6, 1866; one article found (see above).

DISCUSSION AND CONCLUSIONS:

This previously-unreported event should be added to the CEEF. Further research in southern New Brunswick, eastern Maine and Annapolis Valley newspapers may allow one to detail the felt area, to locate an epicentre and to define a magnitude. No further work was done on this event at this time since it was beyond the areal scope of the study.

DECEMBER 23, 1866 EVENT

EPICENTRE LOCATION:

This event occurred near Lakeville on the Pugwash River, Nova Scotia. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known at present. It probably is about an intensity of III on the Modified Mercalli Intensity Scale of 1931 which is a magnitude of about 3.0.

DATE: Sunday, December 23, 1866

TIME: 0045 AST (0445 GMT)

SUMMARY OF REPORTS:

A letter of Edwin Clay, M.D. recounts feeling the earthquake in the rooms of Mr. and Mrs. Alexander McLane. The furniture shook and, "The shock was preceded by a sound resembling a very heavy wagon going rapidly over a hard, frozen, smooth road." To another person the earthquake seemed to paralyze him and it sounded, "as if a heavy wagon had been driven over the bridge near his house."

REFERENCES AND TRANSCRIPTS:

The first and only firsthand report is that of Dr. Edwin Clay's December 28, 1866 letter in the Amherst Gazette of Friday, January 4, 1867 on p. 2, col. 3. The full letter appears as a transcript below:

CORRESPONDENCE

FOR THE AMHERST GAZETTE

MR. EDITOR, - Dear Sir, - On Sabbath morning last, at a quarter to one o'clock, while standing in the middle of one of Mr. Alexander McLane's rooms at Lakeville [on the], Pugwash River, I felt quite a severe shock, but said nothing until Mr. McLane asked his wife if she felt anything strange? to which she replied that her chair was shaking very much. I then saw the couch on which Mr. McLane was sitting shaking or trembling violently, while the chair upon which my hand was resting shook so much that it felt as if some one was forcing it from under my hand, at the same time stunning me and producing a sensation resembling the shock of a powerful galvanic battery.

The shock was preceded by a sound resembling a very heavy wagon going rapidly over a hard, frozen, smooth road. The trembling continued over two minutes. At a house near by, one of my patients, Mr. David Howard, felt as if the shock had paralyzed him; while to himself and wife it appeared as if a heavy wagon had been driven over the bridge near his house.

DECEMBER 23, 1866 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

On starting for home, I found the atmosphere has passed through a great change; the clear, sharp, cold, bright moonlight had suddenly changed to a thick, warm, hazy sky, which, by daylight, had changed to a rapid thaw.

Should the above be of any interest, or worthy of a piece in your paper, it is at your service.

EDWIN CLAY, M. D.

Pugwash, Dec. 28, 1866.

All the other articles found are derived from the original letter of Dr. Clay and credited to him and to the Amherst Gazette. There are similar, shorter derived articles in the Monday, January 7, 1867 issue of the Halifax Morning Chronicle on p. 2, col. 5 and a similar article in the Yarmouth Herald of Thursday, January 17, 1867 on p. 2, col. 4. Neither of these two articles add new data and we do not transcribe them in this report. No reports were found in the Halifax Acadian Recorder. This earthquake is not found in Smith (1962); it is not listed in Brigham (1871) or in Brooks (1960) and is not in the CEEF.

Newspapers Searched:

Halifax Acadian Recorder, searched throughout the period; no articles were found.

Halifax Morning Chronicle, searched from Saturday, December 1, 1866 to Monday, January 7, 1867; one article found (see above).

Pictou Eastern Chronicle, searched from Sunday, December 6, 1866 to Saturday, January 19, 1867; no articles were found.

Yarmouth Herald, searched throughout the period; one article found (see above).

Pictou Colonial Standard, searched from Tuesday, December 4, 1866 to Tuesday, January 8, 1867.

Amherst Gazette, searched from Friday, December 28, 1866 to Friday, March 1, 1867; one article found (see above).

Antigonish Casket, not available for these dates at the Public Archives of Nova Scotia.

DISCUSSION AND CONCLUSIONS:

This is a previously-unreported Nova Scotian event. It should be added to the CEEF. If the Antigonish Casket could be found it would be worth examining as would the Moncton or Sackville, New Brunswick newspapers.

SEPTEMBER 29, 1867 EVENT

EPICENTRE LOCATION:

In the area of Huntington, Quebec. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known at present.

DATE: Sunday, September 29, 1867

TIME: Not known at present.

SUMMARY OF REPORTS:

"A shock of an earthquake was experienced..."

REFERENCES AND TRANSCRIPTS:

This earthquake is not reported in Smith (1962) and is not in the CEEF. We found one brief reference in the Halifax Acadian Recorder of Wednesday, October 23, 1867 on p. 1, col. 6 per the transcript below:

- A shock of an earthquake was experienced at Huntington C.E., on the 29th ult.

Huntington C.E. is Huntington, Canada East; ult. is ultimo, ie the 29th of the previous month; September 29, 1867.

No articles were found in the Yarmouth Herald when it was searched throughout this period.

DISCUSSION AND CONCLUSIONS:

This previously-unreported event should be added to the CEEF. Research in various Quebec newspapers should determine the event's time, felt area, epicentre location and magnitude. No further work was done on this event at this time since it was beyond the areal scope of the study.

OCTOBER 22, 1869 EVENT

EPICENTRE LOCATION:

Relocated by Leblanc and Burke (in press, 1985) as being close to the March 21, 1904 earthquake at 45.0°N, 67.2°W. The CEEF still lists it at 45.0°N, 66.2°W in the Bay of Fundy and still incorporates a probable typographic error of Smith (1962) wherein he placed the event exactly 1° east of the Heck and Eppley (1958) position.

MAGNITUDE: Recalculated by Leblanc and Burke (in press, 1985) from the relationship of Street and Turcotte (1977) as having a magnitude ^{m_{blg}} of 5.73 compared to 5.0 in the CEEF.

DATE: Friday, October 22, 1869

TIME: 0545 AST (0945 GMT) Note: This is the time used by Leblanc and Burke (in press, 1985) in their Table 4. The CEEF presently has a time of 1100 (GMT?) which is incorrect and it should be changed.

SUMMARY OF REPORTS:

Leblanc and Burke (in press, 1985) list 86 references in their Table 3 and note that the event was felt in Amherst, Annapolis, Arichat, Dartmouth, Halifax, Kentville, Lunenburg, New Glasgow, Pictou, Windsor, Wolfville and Yarmouth in Nova Scotia.

REFERENCES AND TRANSCRIPTS:

We did not attempt to expand upon the rather complete work of Leblanc and Burke (in press, 1985). No event-specific search was initiated; our search of the long runs of newspapers ended with 1867 in this study. Leblanc and Burke (in press, 1985) did not record Lawson (1902) on p. 598 as one of their references and we cite it below for completeness though we suspect Lawson's report is taken directly from the Yarmouth Herald of Thursday, October 28, 1869 which Leblanc and Burke do record:

About a quarter before 6 o'clock on Friday morning, October 22d, 1869, a violent shock of earthquake was experienced in Yarmouth. It was preceded by a rumbling noise, and lasted several seconds, making buildings tremble, dishes rattle, etc. The shock was felt throughout the Province and also in New Brunswick.

Similarly, Leblanc and Burke did not record Adolphus Gaetz's diary entry which gives a Lunenburg, Nova Scotia, account of this event, as published by Ferguson (1965), in their Tables 3 and 4 though they do list DesBrisay (1895) in their Table 3 as reference 28 but do not seem to use it in Table 4. DesBrisay quotes the Gaetz diary item verbatim (but not completely). The original diary entry from Ferguson (1965, p. 100) is found below:

OCTOBER 22, 1869 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

October 1869

Friday, 22nd, - Earthquake. About 10 Minutes before 6 o'clock this morning, the end of an Earthquake was very sensibly felt by most of persons of this town; scarcely a house but what rolled like a ship on the ocean; the whole of my house cracked and cracked as though it was tumbling to pieces; the pictures swung on the walls and for the short time it lasted was truly frightful. Nearly all the families in town, who were sleeping at the time, were aroused from their slumbers. The Church Bell toll'd once or twice from the shaking of the tower. One person whose Bedstead stood on Castors, and was ~~was~~ placed against the Wall roll'd two feet away; every house felt it more or less.

We also heard of a diary by an anonymous spinster who was probably aged 72 in 1869 and she is believed to have lived at or near Mochelle, about 3 miles east of Annapolis Royal on the south side of the Annapolis River. "The daily records appear to indicate that the writer was a woman of considerable intelligence, some education, a shrewd observer of the world around her." (Personal communication, Lou W. Collins, 6443 London St., Halifax, Nova Scotia, Letter of February 4, 1987.) The diary was searched by Lou Collins from Sunday, September 30, 1860 to Tuesday, December 28, 1870. The anonymous diarist was probably born in 1797 and thus had felt seven (see transcript below) earthquakes between circa 1807 (age 10) and October 22, 1869 (age 72). The transcript of the October 22, 1869 entry is below:

October 22, 1869

Mild, This morning we were visited with the heaviest shock of an Earthquake I ever felt being the seventh I have felt (warm and pleasant).

Thus one may add Mochelle near Annapolis, Nova Scotia to Leblanc and Burke's (in press, 1985) list of felt localities for this event.

DISCUSSION AND CONCLUSIONS:

The CEEF should be altered to reflect the work of Leblanc and Burke on location, magnitude and the time should be corrected. No additional work was done on this event at this time since it was beyond the scope of this study.

FEBRUARY 8, 1870 EVENT

EPICENTRE LOCATION:

Smith (1962) gives a location of 44.1°N, 67.1°W; "in the Bay of Fundy." In fact this location is at the mouth of the Bay of Fundy. The CEEF, as provided by EPB, lists the epicentre as 44.1°N, 69.8°W which would put the epicentre in the very south of Maine; this is Rand's (1977) position. There may be an error here on the CEEF.

MAGNITUDE: Smith (1962) gives an intensity of VI on the Modified Mercalli Intensity Scale of 1931 which was converted to a magnitude of 3.7 on the CEEF.

DATE: Tuesday, February 8, 1870

TIME: 1200 AST (1600 GMT)

SUMMARY OF REPORTS:

Smith (1962) notes only, "Felt in the Maritime Provinces of Canada and in Maine."

REFERENCES AND TRANSCRIPTS:

Time did not permit an event-specific search of this event in Nova Scotian newspapers. Hence, we are left only with Smith's (1962) entry:

89. 1870 February 8. VI. 44.1°N, 67.1°W. In the Bay of Fundy. Felt in the Maritime Provinces of Canada and in Maine. B5, L2, M3.

We are left with Smith's references; Brooks (1960), no. 290 which says, "felt in Me. and in Canada"; but gives no epicentre; Lancaster (1873) which says, "1870. Février. Le 8, à Richmond [Maine] et dans le voisinage, sur la côte du Maine, une secousse." We have not seen the Mather et al. (1927) reference cited by Smith (1962); it is available at EPB. Smith and Bridges (1983) and Perkins (1930) do not list this event; nor did the edited version of the Chiburis Catalogue of Weston Observatory as provided to the project by EPB. Rand (1977) lists the event at 44.1°N, 69.8°W and as felt in Richmond, Maine as does the current listing of the CEEF provided by the EPB. This position contrasts with that of Smith (1962) by being 2.7° further west.

DISCUSSION AND CONCLUSIONS:

This moderate-sized event should be subject to an event-specific search in the newspapers of at least western Nova Scotia. It was not possible in this study because of the time limitations.

FEBRUARY 8, 1870 EVENT (CONTINUED)

DISCUSSIONS AND CONCLUSIONS (CONTINUED):

The epicentre position as presently in the CEEF should be confirmed at 44.1°N , 69.8°W as in Rand (1977) and not as in Smith (1962). It may be that a search of southern New Brunswick and Nova Scotian newspapers combined with any available Maine work from studies such as Boston Edison Company (1976a; b), Chiburis and Ahner (1976) and Weston Geophysical Research, Inc. (1976) would permit a more accurate determination of the epicentre location and magnitude and allow the time to be determined. There should be a re-assessment of the epicentre location over and above the confusion over longitude (at least in our minds). However, no further work was done on this event at this time since it was beyond the areal scope of this study.

MARCH 17, 1870 EVENT

EPICENTRE LOCATION:

Smith (1962) gives a location of 45.5° N, 66.5° W in eastern Maine just west of St. Stephen, New Brunswick. This coincides with that listed in the current CEEF. We suspect that the exact epicentre location is not really known at present.

MAGNITUDE:

Smith (1962) gives an intensity of IV on the Modified Mercalli Intensity Scale of 1931 which was converted to a magnitude of 3.7 on the CEEF. (Note both the events of February 8, 1870 and March 17, 1870 which Smith (1962) lists with intensities of VI and IV, respectively, are listed on the CEEF as having the same magnitude of 3.7). Rand (1977) does not list this event in his intensity IV section presumably because it is not in Maine.

DATE:

Thursday, March 17, 1870

TIME:

Smith (1962) lists, "6:00 - 8:00 a.m."; the CEEF lists 1100 (presumably an average in GMT?). The edited version of the Chiburis Catalogue of Weston Observatory as provided to the project by EPB also uses 1100 GMT. Smith and Bridges (1983) have two references in their appendix of newspaper citations and the time is only, "a.m." Kain (1898) gives a time of "6 to 8 a.m." We suspect the exact time is not really known at present.

SUMMARY OF REPORTS:

Smith (1962) notes only that Kain (1898) records the event as, "Felt at St. John and Fredericton, N.B...It was at this time that a landslide occurred at Sand Point, carrying the end of the point out into the deeper water of the harbour." [of Saint John, N.B.]. Smith and Bridges (1983) give three newspaper references that confirm this material from Kain (1898).

REFERENCES AND TRANSCRIPTS:

Time did not permit an event-specific search of this event in western Nova Scotian or Annapolis Valley newspapers thus we are left with Smith's (1962) listing. Smith's (1962) full entry in the Canadian Section is reported below in transcript for completeness:

91. 1870 MARCH 17. 6:00-8:00 a.m. IV. 45.5°N, 66.5°W. Felt at St. John and Fredericton, N.B. K1.

"It was at this time that a landslide occurred at Sand Point, carrying the end of the point out into the deeper water of the harbour." K1.

Brigham (1871) and Dawson (1894) did not record this event; nor did Lancaster (1873) or Brooks (1960). Perkins (1930) and Rand (1977) restricted themselves to only Maine epicentres. Kain (1898) however, does note the

MARCH 17, 1870 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

event per the transcription below (p. 19):

1870. March 17; 6 to 8 a. m.

Felt at St. John and Fredericton. Light. It was at this time that a landslide occurred at Sand Point, carrying the end of the Point out into the deeper water of the harbour. Sand Point is a gravel deposit formed by the meeting of the harbour tides and the river, and is underlaid by clay. This clay had probably been eroded by the action of water, and a heavy storm the day before had hastened a condition of instability which, even without a slight earth movement, would soon have caused the landslide.

Smith and Bridges (1983) cite two newspaper references to this event in their appendix which we have not examined:

Saint John Daily Telegraph, Friday, March 18, 1870
 Eastport Sentinel, Wednesday, March 30, 1870

DISCUSSION AND CONCLUSIONS:

This event should have an event-specific search in southern New Brunswick and eastern Maine newspapers as well as those of western Nova Scotia and the Annapolis Valley to verify it was, or was not, felt in Nova Scotia. This was not possible in this study. Such a search might refine the epicentre location and give a better estimate of its time and its magnitude.

Note: There are a number of other southern New Brunswick and Grand Manan Island events noted in Kain (1898) in the late 1800s (ie. January 26, 1884; middle of June, 1885; March 22, 1896; January 26, 1897; January 28, 1897; February 14, 1897; October 12, 1897; January 11, 1898; December 11, 1912; January 13, 1914) which all may have had their origin in the Bay of Fundy and all of which may have been felt in Nova Scotia. All these dates should be searched for in Nova Scotian papers in western Nova Scotia and in the Annapolis Valley.

We have just not been able to put in event-specific searches as part of this study because of time limitations and we do not include such sections in this appendix. February 8 and March 17, 1870 were only included as examples to show the type of work needed. There were a good number of Annapolis Valley and western Nova Scotian newspaper sources available during the later part of the 19th century and early 20th century and most are generally found at the Public Archives of Nova Scotia. It was also felt that these southern New Brunswick or Bay of Fundy events listed in Kain (1898) and in Smith (1962) as New

MARCH 17, 1870 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

Brunswick events were really beyond the areal scope of this study; hence, event-specific searches were not in order at this time; they should be done however.

OCTOBER 20, 1870 EVENT

EPICENTRE LOCATION:

Centred near Baie-St.-Paul, Quebec at 47.4°N, 70.5°W (Smith 1962)

MAGNITUDE: Smith (1962) lists an intensity of IX on the Modified Mercalli Intensity Scale of 1931; this converts to a magnitude of about 7.0 on the CEEF.

DATE: Thursday, October 20, 1870

TIME: 1130 EST (1630 GMT)

SUMMARY OF REPORTS:

The greatest damage occurred in areas of Quebec near Baie-St.-Paul. Felt from Iowa to Nova Scotia and from Virginia to Quebec over a million square miles. In Nova Scotia the event was felt in Windsor, Lunenburg, Hopewell, "Kentville and other places", and in the western counties of Nova Scotia. It probably was not felt in Yarmouth, Pictou or Halifax.

REFERENCES AND TRANSCRIPTS:

Smith (1962) reports this event as, "Felt throughout eastern Canada", per the entry below:

92. 1870 OCTOBER 20. 11:30 a.m. IX. 47.4°N, 70.5°W.
 (b) Centred near Baie-St-Paul, Que., where the greatest damage occurred. Felt throughout eastern Canada and in the United States westward to Iowa and southward to Virginia, a total area of over 1,000,000 square miles. A8, B4, B5, D4, H1, H9, H10, H11, K1, L1, M3, M7.

Samuel Kain (1898) also noted this event in his, List of Recorded Earthquakes in New Brunswick per the entry below (p. 18):

1870. OCTOBER 20; 11.40 a. m.
 Felt all over the Province. In the lower part of the St. Lawrence Valley it was much more violent than in New Brunswick.
 Dr. Jack, of the Provincial University, at Fredericton, in a despatch to the St. John Daily Telegraph (October 21st, 1870), thus describes it:
 "It was at seventeen minutes before noon that the first shock was felt here. This lasted perhaps two seconds, and was shortly followed by another of about the same severity, which may have been the return stroke, as the interval between was not over half a minute. The motion was vibratory, and seemed to be from south to north. It was not as strong as the earth-

OCTOBER 20, 1870 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

quake of last year. There was violent wind all of Tuesday afternoon and night, and this afternoon we have a heavy rain and lowering darkness." The time at St. John was accurately noted to be 11.40; at Fredericton it was 11.43.

Adolphus Gaetz who kept a diary in the town of Lunenburg from May 1, 1855 to March 18, 1873 noted the earthquake. His diary has been published by the Public Archives of Nova Scotia (Ferguson, 1965) and the full entry (p. 101) appears in transcript below:

October 1870

Thursd. 20th, - Earthquake. At noon an Earthquake was experienced which was considerably felt through the greater part of this town, in my house the family rocked on their chairs; the servant girl in the kitchen hearing a rumbling noise as if waggons were passing the house, looked out of the door but seeing nothing she became quite alarmed. In the Academy, near my dwelling, the walls were cracked in several places.

DesBrisay later quoted the entry almost completely in his 1895 History of the County of Lunenburg.

This earthquake has not been well detailed in Nova Scotia thus an event-specific search was initiated in Nova Scotian newspapers. The day after the event on Friday, October 21, 1870, the Halifax Citizen on p. 3, col. 1 reported the event being felt in Windsor, Nova Scotia per the transcript below:

EARTHQUAKE. - A shock of an earthquake was experienced in Windsor about half-past twelve o'clock yesterday. The motion, which was noticed by a great many persons, was from east to west.

The Halifax Morning Chronicle of the next day (Saturday, October 22, 1870) reported the event on p. 3, col. 1 as being, "felt in the Western counties", of Nova Scotia per the transcript below:

EARTHQUAKE. - A sharp shock of an earthquake was felt in the Western counties on Thursday about noon. In some places the doors and windows were observed to shake.

The same newspaper of the following Monday, October 24, 1870 on p. 3, col. 1 reported the event again as:

THE EARTHQUAKE. - The earthquake on Friday was felt in New Brunswick at 11.40 o'clock.

OCTOBER 20, 1870 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Here it is quite clear that New Brunswick is on Eastern Standard Time, where two articles above Nova Scotia appears to be on Atlantic Standard Time (ie "half-past twelve o'clock" in Nova Scotia and "11.40 o'clock" in New Brunswick).

The Halifax Citizen of Monday, October 24, 1870 on p. 3, col. 1 reported that Kentville also felt the earthquake:

EARTHQUAKE. - The shock of earthquake noticed in our last issue as having been felt in Windsor on Thursday was also experienced at Kentville and other places.

The Yarmouth Tribune had four articles but none noted the event as being felt in Yarmouth. Similarly, Lawson (1902) does not cite this earthquake as having been felt in Yarmouth or Yarmouth County; he is silent with respect to the October 20, 1870 event. The following Yarmouth Tribune articles were found:

- Wednesday, October 26, 1870, p. 2, col. 1 - cites Boston Paper
- Wednesday, November 2, 1870, p. 1, col. 5 - cites Halifax Citizen of October 21, 1870
- Wednesday, November 9, 1870, p. 1, col. 5 - cites New York Tribune
- Wednesday, November 9, 1870, p. 3, col. 1 - cites a Boston report

None of the Yarmouth Tribune articles contribute new Nova Scotia data re this earthquake and we do not transcribe them here. We take a lack of a Yarmouth mention to indicate that the Thursday, October 20, 1870 event was probably not felt in Yarmouth.

The Pictou Eastern Chronicle of Thursday, October 27, 1870 adds a Hopewell, Nova Scotia felt location as well as indicating that the earthquake was felt in, "other parts of this Province." (Nova Scotia) and we deduce that it was not felt in Pictou from the article (see last sentence of quote below). We reproduce the Thursday, October 27, 1870 Eastern Chronicle article on p. 2, col. 4 below:

AN EARTHQUAKE. - Mother Earth has been shaking again. A shock of an earthquake was distinctly felt in various parts of Canada, the United States, and Lower Provinces on Thursday last. It was felt at Windsor and other parts of this Province. A correspondent at Hopewell informs us that it was distinctly experienced there, about 12 o'clock on that day, in a succession of short, quick shocks, which lasted nearly a minute and was accompanied by a rumbling noise resembling that of a light wagon drawn along a pavement. After the undulatory motion had passed a strong tremor was felt for a few seconds. The shocks were violent in Montreal, and altogether occupied about 30 seconds. No damage was done but Church Towers were observed to sway to and fro from

OCTOBER 20, 1870 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

the perpendicular. We have not heard of any one in this locality observing the earthquake.

The Halifax Citizen of Friday, October 28, 1870 on p. 2, col. 4 cited the New York Tribune which reported on the earthquake's effects in New York City. This very same article, right down to the half set of quotation marks, is what was reproduced in the Yarmouth Tribune of Wednesday, November 9, 1870. We do not transcribe the Halifax Citizen article of Friday, October 28, 1870, p. 2, col. 4 since it does not present any new data on Nova Scotia felt reports. It is worth noting that none of the Halifax newspapers examined reported the event as felt in Halifax; it probably was not felt there.

We also heard of a diary by an anonymous spinster who was probably aged 72 in 1869 and she is believed to have lived at or near Mochelle, about 3 miles east of Annapolis Royal on the south side of the Annapolis River. "The daily records appear to indicate that the writer was a woman of considerable intelligence, some education, a shrewd observer of the world around her." (Personal communication, Lou W. Collins, 6443 London St., Halifax, Nova Scotia, Letter of February 4, 1987.) The Diary was searched by Lou Collins from Sunday, September 30, 1860 to Tuesday, December 28, 1870. The anonymous diarist was probably born in 1797 and thus had felt seven (see transcript below) earthquakes between circa 1807 (age 10) and October 22, 1869 (age 72). The transcript of the October 21, 1870 entry plus Lou Collins' comment on the date is below:

October 21*, 1870
dul[sic] but warm a heavier shock of an earthquake than I ever heard of in this place, but only in some places

[*Lou Collins states; 'This report may be incorrectly dated. Diarist recorded nothing between October 18 and 20th. For October 20th, 1870 she noted: "dul[sic] rainy but warm"']

(personal communication, Lou W. Collins, Halifax Civic Historian, 6443 London St., Halifax, Nova Scotia, Letter of February 4, 1987)

One thus may add Mochelle, near Annapolis, Nova Scotia to the list of felt localities for this event.

Newspapers Searched:

Yarmouth Tribune, searched from Wednesday, October 26 to Wednesday, November 9, 1870; four articles were found (see above).

Yarmouth Herald, searched from Thursday, October 27 to Thursday, November 3, 1870; no articles were found.

OCTOBER 20, 1870 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Halifax Citizen, searched from Friday, October 21 to October 28, 1870; three articles were found (see above).

Halifax Morning Chronicle, searched from Friday, October 21 to Tuesday, October 25, 1870; two articles were found (see above).

Halifax NovaScotian, searched from Monday, October 24 to Monday, October 31, 1870; no articles were found.

Pictou Eastern Chronicle, searched from Thursday, October 20 to Thursday, November 3, 1870; one article was found (see above).

There were no other papers available for the 'Western counties' of Nova Scotia.

DISCUSSION AND CONCLUSIONS:

This event appears to have been felt in Hopewell, South of Pictou, Nova Scotia and in Kentville, Windsor and "in other places" in the 'Western counties' of Nova Scotia. It appears to have not been felt in Yarmouth or Pictou and there are no felt reports for Halifax despite the large number of newspapers and articles on the October 20, 1870 event, found in the Halifax papers, from other places. This event was clearly felt more widely than the October 17, 1860 earthquake located at the same epicentre.

Not all the Nova Scotian newspapers extant at the time of this event have been examined and more research could be done here to try and further document the felt area. Time did not permit further research on this event which was really beyond the areal scope of this study.

JULY 8, 1873 EVENT

EPICENTRE LOCATION:

Presumably if this is a real event then the epicentre is near Halifax, Nova Scotia. The CEEF lists 44.65°N, 63.6°W. The exact location of the epicentre is not really known at present.

MAGNITUDE: Smith (1962) lists its intensity as II on the Modified Mercalli Intensity Scale of 1931. The magnitude on the CEEF is 2.4.

DATE: Tuesday, July 8, 1873

TIME: Not known at present. Smith (1962) and the CEEF list no exact time. Smith lists only "a.m.". The Yarmouth Tribune of January 3, 1883, p. 2, col. 4 refers to, "about one or two o'clock at night, some time in the year 1873." while discussing the December 31, 1882 events. Rockwood (1874) refers to "on the same forenoon." 0100-0200 AST (0500-0600 GMT)

SUMMARY OF REPORTS:

We have only Smith's (1962) report which says, "Felt at Halifax" or Rockwood (1874) who says, "A slight shock at Halifax".

REFERENCES AND TRANSCRIPTS:

This event was known only from Smith's (1962) listing as follows:

108. 1873 JULY 8. a.m. II. Felt at Halifax, N. S.
R4.5

This is still the only reference after a search of eight Nova Scotian newspapers. Smith's R4.5 reference is C. G. Rockwood Jr.'s Notices of Recent Earthquakes in volume 7 of the American Journal of Science and Arts in 1874. We were able to locate this reference and a transcription of Professor Rockwood's entry on p. 385 is found below:

July 8, 1873. A slight shock at Halifax, Nova Scotia, on the same forenoon.

Professor Rockwood gives no references other than to acknowledge and give thanks to an E. L. Gaul of the New York Times for information received. At this point we can only say no other sources have been found and that the event certainly has not been confirmed.

Newspapers Searched:

Halifax NovaScotian, searched from Monday, July 14 to Monday, July 21, 1873; no articles were found.

Halifax Morning Chronicle, searched from Thursday, July 10 to Saturday, July 12, 1873; no articles were found.

JULY 8, 1873 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (continued):

Halifax Acadian Recorder, searched from Wednesday, July 9 to Saturday, July 12, 1873; no articles were found.

Halifax The British Colonist, searched from Thursday, July 10 to Tuesday, July 15, 1873; no articles were found.

Pictou Eastern Chronicle, searched from Thursday, July 10 to Thursday, July 17, 1873; no articles were found.

Pictou Colonial Standard, searched from Tuesday, July 15 to Tuesday, July 22, 1873; no articles were found.

Yarmouth Herald, searched from Thursday, July 10 to Thursday, July 24, 1873; no articles were found.

Yarmouth Tribune, searched from Wednesday, July 9 to Wednesday, July 16, 1873; no articles were found.

DISCUSSION AND CONCLUSIONS:

This supposed Halifax event cannot be confirmed at present. It may even be a 'ghost' event. There may well be concern that the event-specific searches of the eight sources were too narrow in time and this may be a legitimate concern. We recommend that the search period be expanded. We also recommend that the New York Times be examined for a report, in the same period or later, since the E. L. Gaul whom Prof. Rockwood credits for information received was from the New York Times.

While writing up the event-specific search for December 31, 1882 events we discovered the following reference extracted from the Yarmouth Tribune of January 3, 1883, p. 2, col. 4 (bottom of article and column) wherein three previous events of 1832, 1868 and 1873 were mentioned:

...Lastly, there was a smart shock felt - by those who happened to be awake - about one or two o'clock at night, some time during the year 1873. Owing to the lateness of the hour, but few people were aware of its occurrence.

This reference, though thin, would appear to confirm a Yarmouth, Nova Scotia earthquake in 1873 and we suspect the reference is referring to Smith's (1962) July 8, 1873 event. If so this is a confirmation of Smith's entry and gives a time of 0100-0200 AST, but in turn suggests along with Smith (1962) and Rockwood (1874) that the event was felt in Yarmouth and Halifax; possibly there were two events in 1873?

MARCH 5, 1874 EVENT

EPICENTRE LOCATION:

In the Yarmouth area. The CEEF lists 43.8° N, 66.1° W for the March 12, 1874 event which is actually on March 5, 1874. In fact, we have such limited data that the exact location of the epicentre probably is not known at present.

MAGNITUDE: Not really known at present. Smith lists its intensity as II on the Modified Mercalli Intensity Scale of 1931; the CEEF has a magnitude of 2.4.

DATE: Thursday, March 5, 1874 (not March 12, 1874 as Smith (1962) has)

TIME: "about 2 o'clock on Thursday afternoon" 1400 AST (1800 GMT)

SUMMARY OF REPORTS:

There is really only one report in the Yarmouth Herald of March 12, 1874 "A shock of earthquake...accompanied by a rumbling noise and caused a rattling of dishes, but did no damage."

REFERENCES AND TRANSCRIPTS:

Smith (1962) lists this earthquake as being on March 12, 1874 in his compendium per the entry below:

112. 1874 MARCH 12. II. Slight shock felt at Yarmouth, N.S. R4.6.

Smith's reference R4.6 is Rockwood's (1875) Notices of Recent Earthquakes, No. 5 which notes only on p. 332, "A slight shock at Yarmouth, Nova Scotia." on March 12, 1874. It appears that Rockwood and/or Smith mistook the date of the published report in Yarmouth as the actual date of the event.

The Yarmouth Herald probably provides the only original report in the issue of Thursday, March 12, 1874 on p. 3, col. 4. This article states:

A shock of earthquake was experienced here about 2 o'clock on Thursday afternoon last. It was accompanied by a rumbling noise, and caused a rattling of dishes, but did no damage.

This original article clearly indicates that the earthquake was a Thursday, March 5, 1874 event not a March 12, 1874 event.

Lawson in 1902 made no such mistake in writing his Yarmouth County history and he correctly cites this earthquake on p. 598 as being on an earlier date:

A shock of earthquake was experienced in Yarmouth on Thursday afternoon, March 7th, 1874, accompanied by a rumbling noise, and rattling of dishes, but no damage.

MARCH 5, 1874 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED)

but Lawson (1902) got his calendar muddled and put March 7 not March 5, 1874; March 7, 1874 was a Saturday not a Thursday. Lawson (1902) has clearly used the Yarmouth Herald article as his source; probably his only source.

Later articles in the Nova Scotia Farmer and Annapolis County Times on Wednesday, March 18, 1874 on p. 2, col. 3 and Halifax's The British Colonist of Tuesday, March 17, 1874, on p. 3, col. 3 simply use the March 12th Yarmouth Herald article but do not make the date clear. We transcribe the March 18, 1874 article from the Nova Scotia Farmer and Annapolis County Times below:

The Yarmouth Herald says a shock of Earthquake was experienced there at two o'clock on Thursday afternoon last. It was accompanied by a rumbling noise, and caused a rattling of dishes, but did no damage.

Newspapers Searched:

Yarmouth Herald, searched from Thursday, March 12 to Thursday, March 26, 1874; one article was found (see above).

Yarmouth Tribune, searched from Wednesday, March 11 to Wednesday, March 25, 1874; no articles were found.

Halifax Acadian Recorder, searched from Friday, March 13 but it was impossible to read the microfilms; this paper was not available at the Province House Legislative Library either. Thus this publication could not be checked.

Halifax The British Colonist, searched from Saturday, March 14 to Tuesday, March 17, 1874; one article was found (see above).

Annapolis The Nova Scotia Farmer and Annapolis County Times, searched from Wednesday, March 18 to Wednesday, March 25, 1874; one article was found (see above).

Halifax Evening Reporter, searched from Friday, March 6 to Monday, March 16, 1874 (Daily and tri-weekly); no articles were found.

Halifax Morning Chronicle, searched from Friday, March 6 to Monday, March 16, 1874; no articles were found.

Pictou Eastern Chronicle, searched from Thursday, March 12, 1874 to Thursday, March 26, 1874; no articles were found.

Pictou The Colonial Standard, searched from Tuesday, March 10, 1874 to Tuesday, March 24, 1874; no articles were found.

MARCH 5, 1874 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS:

Smith (1962) or more likely his source Rockwood (1875) took the date of the Yarmouth Herald's March 12, 1874 account to be the date of the event itself. Smith (1962), hence the CEEF incorporate an incorrect date.

The March 12, 1874 event should be removed from the CEEF as a 'ghost' event. The newly-documented March 5, 1874 event should be added to the CEEF as the correct date. (Note: As well that Lawsons's (1902) date of Thursday, March 7, 1874 is also incorrect and was likely a typographic error in typesetting of his county history of Yarmouth which escaped Lawson's eye in proofing; certainly my hand-written 7s and 5s can, on occassion, become confused.)

There may still be a few other newspapers that should be checked in a last attempt to expand and detail the felt area of this quite small earthquake. Our search period was predicated on Smith's (1962) date of March 12, 1874 and the one reference we found was found only because our event-specific search of the Yarmouth Herald began on Thursday, March 12, 1874. None of our searches covered the period March 5 to 11, 1874 and for completeness this should be done; we are not sure any other references will be found but would feel better if the intervening 6 or 7 days were examined in a number of sources.

DECEMBER 31, 1882 EVENTS

EPICENTRE LOCATION:

Smith (1962) cites this event as being in Passamaquoddy Bay off New Brunswick at 45.0° N, 67.0° W. There may well have been more than one event and in different locations; certainly one of these events appears to have been centred in Nova Scotia, closer to Halifax, as opposed to in New Brunswick and will require more research. The widespread felt area implies a large offshore event on the Scotian Shelf not an event in Passamaquoddy Bay.

MAGNITUDE:

Smith lists the Intensity as V on the Modified Mercalli Intensity Scale of 1931; this converts to a magnitude of 4.3 on the CEEF. We believe that with further research this event (or one of the possible three or even four events) will be revised upwards in magnitude.

DATE:

Sunday, December 31, 1882, local time (Monday, January 1, 1883, GMT)

TIME:

Smith (1962) notes 2156 - 2205 local time. Captain Samuel Trott of the cable steamer MINIA, wrote a letter on January 2, 1883 from his home at No. 1 South Street, Halifax to the editor of the Halifax Morning Chronicle and he cites the time at the end of the perceptible motion from the first, and severest shock, as exactly 1007:25 or a GMT of 1415:19. He cites the second shock, which was shorter and 'very slight' as occurring at 1043:20 local time, "by [the] same watch" which he would presumably give as 1451:14 GMT if he incorporated the same 4 hours, 7 minutes and 54 seconds between local time and GMT in both cases. Captain Trott estimated the first shock to have lasted, "something over a minute."

We would tend to trust the chronometer of Captain Trott especially when observed in his own study. If we assume the first event was one minute (plus a bit) long then the two shocks arrived at 2206 and 2243 local time, Sunday, December 31, 1882 (or using Captain Trott's difference at 0214 and at 0251 GMT on Monday, January 1, 1883).

Several of the American newspaper reports, quoted in the Halifax papers, refer to a shock at 2145 local time at Dover, New Hampshire with a later shock at 2200 at Rockland, Maine. If the times are correct (and Halifax and New England are on the same time zone) and if the 2200 shock is the same as that felt in Halifax at 2206 then there was an earlier (foreshock?) at 2145. Kain (1898) gives a "9.56 p.m." time for New Brunswick; this is presumably the stronger first shock felt by Captain Trott in Halifax at 2206 local time. If Halifax and New England or New Brunswick are not on the same time zone then a different set of equivalent shocks will prevail.

DECEMBER 31, 1882 EVENTS (CONTINUED)

TIME (CONTINUED):

Similarly, the January 2, 1883 Acadian Recorder mentions an event at 0130 local time on Monday, January 1, 1883, which may be an aftershock; there is only one mention of an 0130 time however. Smith and Bridges (1983) cite a Machias Union report of January 9, 1883 of an event felt at Machias at 0500, January 1, 1883. Smith (1962) lists 2 events on January 1, 1883 felt at Addison, Maine at 0258 and 0828 that may also be related.

SUMMARY OF EVENTS:

Felt in Machias, Eastport, Rockland, Bangor, Maine; in Dover, New Hampshire; in St. Stephen, Saint John, Sussex, Rothesay, Fredericton, Indiantown, New Brunswick and in Halifax (with flashes), Dartmouth, Windsor, Rockhead (Halifax), 3 miles off Seal Island enroute from Boston to Halifax by steamer EUREKA (with flashes), [Cape] Sable Island Light off Yarmouth, Chester, [St.] Margarets Bay Road (with flashes), Truro, Meteghan, Annapolis, Prospect, Port Mouton, "In the Western portion it seems to have been more severe than in Halifax, the people residing in the fishing settlements on the Western shore of this county [Halifax County] feeling it very heavily.", Yarmouth (with flashes), Waterville, Carleton, Brier Island, Shelburne, Kempt, Westport, Bridgewater (with flashes) and Antigonish, Nova Scotia.

Just the number of reports and correspondents' communications to Nova Scotia newspapers as opposed to reports from New Brunswick indicate to the authors of this compilation that this event was felt more heavily in Nova Scotia than in New Brunswick. The transcripts below cite damage in southern Nova Scotia whereas we see no such reports for New Brunswick or Maine.

REFERENCES AND TRANSCRIPTS:

Smith (1962) lists this event in his compilation per the transcript below:

147. 1882 DECEMBER 31. 9:56 - 10:05 p.m. VI. 45.0°N, 67.0°W. Off the coast of New Brunswick in Passamaquoddy Bay. Felt to Halifax, N.S., Fredericton, N.B., and Eastport, Me., over 80,000 square miles. B5, D7, H1, K1, R4.13.

"It was also felt at Sussex, (in addition to St. John), Fredericton, and very markedly at Rothesay." (all in N.B.). K1.

Samuel Kain (1898) also listed this event in his list but only lists one shock per the transcription below from p. 19:

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

1882. December 31; 9.56 p. m.

St. John, Rothesay, Sussex and Fredericton. Light. Two shocks felt. The following is from the St. John Daily Sun (January 2nd, 1883): "At four minutes to 10 on Sunday night a slight shock of earthquake was felt. In one residence on Charlotte street a vase was thrown from its stand to the floor and broken; in another house, in an opposite part of the city, all the ornaments on a Christmas tree were set swinging vigorously. The shock was also distinctly felt in Indiantown and on the other side of the harbour. It was also felt at Sussex, Fredericton, and very markedly at Rothesay."

Mather Byles DesBrisay (1895, reprinted 1980) cited a December 31, 1882 event at 2145 local time in his History of Lunenburg County on p. 565 as seen below in transcript:

1882

December 31st. - Sharp shock of earthquake felt throughout the county. Commenced with heavy, rumbling noise, like distant thunder. Time at Lunenburg, fifteen minutes to ten p.m. Houses rocked there, in some cases so as to shake articles from mantel-pieces. Felt sensibly at Halifax, Truro, Annapolis and other places.

There was a significant wealth of newspaper material to be found. We only drew on seven Nova Scotian newspapers in our search; while one had no articles there were in the order of 21 reports and articles plus some repeats in the other six. The reports were surprisingly detailed given the lack of detail so often found in the articles elsewhere in this compilation. This fact alone leads us to the conclusion that at least one of these events may have been centred much closer to Halifax and the southwestern shore of Nova Scotia than the presently listed Passamaquoddy Bay epicentre would indicate.

The Halifax Morning Chronicle of Monday morning, January 1, 1883 had the first report of the previous night's earthquake on p. 3, col. 2. What is interesting is that the time cited of 2330 to 2400 is almost certainly incorrect and indeed two days later when the Yarmouth Tribune reprinted the story almost verbatim in the Wednesday, January 3, 1883 issue on p. 2, col. 3 the error was repeated. However, five days later on Saturday, January 6, 1883, when the Halifax NovaScotian reprinted the story again almost verbatim on p. 3, col. 2 they corrected the times to, "Between half-past ten and eleven o'clock Sunday night,". The transcript of the original article with the error appears below:

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

A SHOCK OF EARTHQUAKE

 The South End of the City Shaken, but
 Trifling Damage Caused

Between half-past eleven and twelve o'clock last night, while the usual watch night services were proceeding in a number of the city churches, a slight shock of earthquake, accompanied by a rumbling noise like that of distant artillery, was felt at the south end. Houses were shaken and the contents moved, small light ornaments on tables or mantels were thrown over and many broken, pictures with frail hangings fell to the floor and were smashed, and other little damage of a like character occurred, but the disturbance fortunately was not sufficiently severe to cause any serious injury to property. The shock continued for between a third and a half minute. It was observed by several in a large congregation assembled in St. Luke's Cathedral, but luckily it did not disturb many, and thus have created a stampede. In other places of worship unusually large numbers had gathered to spend the last hour of the departing year in religious exercises, the Methodist churches containing great crowds. But the shock fortunately, was not felt North of Spring Garden Road. Had there been any indication of an earthquake in the Northern part of the city these immense congregations of people, alarmed in the midst of their devotions, would have made a disastrous rush for the places of exit from the edifices and the result would undoubtedly have been most deplorable. In the crush following many would have been trampled under foot or otherwise placed in danger, receiving fatal or very severe injuries. One gentleman who felt the shock states that when it shook his house it made him feel as though he was in a boat on the water. Articles about the room were knocked over and rolled about and for the time it lasted his family were greatly frightened. It is many years since the last earthquake was felt in this vicinity, but so far we have had the good fortune to escape serious results.

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The Halifax Acadian Recorder of Monday, January 1, 1883 also had the first reports on p. 2, col. 2 and as one can see in the transcript below the reports all cover the Halifax area:

A VERITABLE EARTHQUAKE

Halifax Disturbed by a Heavy Shock

About 10.25 o'clock last night - accounts differ as to the time - a severe earthquake shock was felt in various portions of Halifax and Dartmouth. From various sources the following synopsis of the symptoms are gleaned.

Mr. A. G. MacDonald, of the W. U. Telegraph Office, lives on Hollis Street, south of the Halifax Hotel. He says the noise resembled that of a very heavy flame rushing up a chimney, or a waggon being driven along a frozen road, and suddenly stopping. It was in his mind that there was something wrong with the furnace below, and he went to see; but found everything all right.

In the north-end of the city Mr. Thomas Rhind, City Clerk, was sitting with his family round a table, when the leaves came suddenly together, in such a way that the enquiry was made: "What was that?" There was no solution of the question; but it was supposed that perhaps the arrival of a steamer at the Deep Water Terminus on Water Street below, and firing of guns, might have produced the movement, or that some portion of a new addition to the house had settled.

Mr. George J. Troop, who lives in Dartmouth, said his house was rocked by the shock, which seemed to last for a minute, but this is probably considerably longer than its real duration. These are about the leading incidents observed, others corroborating the impressions. It is stated that the shock was felt most severely at the South end, in some houses articles being thrown to the ground and broken.

The shock was felt in Windsor, and shook dishes on the dressers, etc.

Governor Murray, of Rockhead, says the shock was felt there with considerable severity, disturbing the whole of the building. It was accompanied by a sound as of many heavily-laden waggons rolling along.

Mr. A. Stephen, sr., who resides on Queen street, observed that it reminded him of the tramping of feet through the house.

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Mr. Edward Kelly, who resides on Cornwallis street, was engaged in writing, and was disturbed by the shock, which was of a peculiar nature. He heard a jingling in a closet and went there, and found the dishes in motion. At first thought it was some persons walking or pounding up-stairs, but found nothing of the kind going on.

Mr. Robert H. Cogswell (Cogswell street) says a very heavy door was thrown violently back against the wall. The nicknacks on the mantelpiece were observed in motion, and a general disarrangement of other small articles.

Mr. George Fawson, who resides on Fawson street, says the shock was very sensibly experienced. It was also felt forcibly on the Longard road, where a rushing sound was perceptible in residences.

There was a rumor that the burned Poor House walls had fallen down; but this was not correct.

The first impressions were that the shock had been confined to the North-end, but from the above it would be seen that it was felt throughout the city.

Over the next two days many more reports began to come in. The Acadian Recorder of Tuesday, January 2, 1883, p. 3, col. 5 printed a brief telegraphic report from Saint John, New Brunswick:

Latest by Telegraph:

The Earthquake in New Brunswick

The Carvill Failure. - Death of a
Doctor.

(SPECIAL DESPATCH TO DAILY RECORDER.)

St. John, N.B., Jan. 2.

Earthquake felt here, at Sussex, Fredericton, and other points in the Province, but not very severe.

Dr. Thomson, of St. Stephen, brother of the late S. R. Thompson, died yesterday.

Failure of Carvill, McKean & Co. excites much regret.

New Year's very quiet.

The Halifax Morning Chronicle of Wednesday, January 3, 1883, had a similar laconic report on p. 3, col. 3:

THE EARTHQUAKE

A slight shock of earthquake was felt here Sunday night.

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Only the Halifax Acadian Recorder covered the story on Tuesday, January 2, 1883 with Nova Scotian reports from farther afield on p. 4, col. 3 per the transcript below [Note: The Seal Island mentioned in the article is just west of Cape Sable Island and is a landmark for sailors rounding the cape; it is mentioned in Campbell (1876). We show the area 3 n mi off Seal Island to the south west as a felt locality on Enclosure 1]:

The Earthquake

Some more Facts Regarding It.

It is averred to account for the apparent discrepancy in time of the earthquake incident of Sunday night, that there were three shocks - one at 10.10, another at 11.20, and a third at 1.30 in the morning.

Bright. "Eureka" arrived this morning from Boston, consigned to Lawson, Harrington and Co. Capt. Ross reports that when about 3 miles off Seal Island, on Sunday night, he felt the shock of the earthquake very severely. Capt. R. was on deck at that time. He says the shock was very heavy, and was accompanied with loud rumbling and a bright flash of light. As soon as he arrived in port he enquired if the shock had been felt here. The shock was also very severe at Sable Island Light, off Yarmouth.

The reports which came in from various sources are all strongly corroborative that the shock was felt much more severely in some houses than in others; and we are inclined to believe that the situation and stability of the foundation of dwellings has a great deal to do in such cases. Mr. F. W. Horley, who resides at the head of Bedford avenue, Lockman street, states that he was in bed at the time and was aroused by its rocking. He sat up, while the bed continued to rock; and he is of the opinion that the duration was fully a minute.

A letter from Chester states that the shock was very severe at that place, the people being very much frightened.

It will be seen by our special despatches that the earthquake was felt, but not very severely, in New Brunswick.

Earthquake was felt on [St.] Margaret's Bay road; and several persons have averred that about the same time they saw a remarkable flash of light.

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The Morning Chronicle published a series of 5 articles on p. 3, col. 2 of the Wednesday, January 3, 1883 issue. These appear in order in transcript below and were based on telegrams the newspaper received; Captain Trott of the cable ship MINIA wrote the last item as a letter from his study in his home onshore and presents one of the more precise accounts especially of the times of the events and of damage that occurred to the plaster of his ceilings. All five of the items below were reproduced verbatim in the NovaScotian of Saturday, January 6, 1883 on p. 3, col. 2, in the same order as below:

LOCAL AND OTHER MATTERS

SEE FIRST PAGE

SUNDAY NIGHT EARTHQUAKE.

The shocks Felt in Many Parts of the Province -
Letter from Capt. Trott.

The earthquake, which startled so many in the city on Sunday night, was also experienced in many parts of the province, as telegrams received testify. In the Western portion it seems to have been more severe than in Halifax, the people residing in the fishing settlements on the Western shore of this county feeling it very heavily. A correspondent, writing from Prospect, states that in that village the inhabitants were greatly frightened, their dwellings receiving a rude shaking and starting in fear the occupants into the road. A Port Matoun[sic] correspondent says the shock was very distinctly felt there and continued with a loud rumbling noise for thirty or forty seconds. Capt. S. Trott, of the cable steamer Minia, sends us a letter which is printed below, stating that two shocks were felt by him in the city, the second being very slight and of shorter duration than the first, and he gives the time at which they occurred. Capt. Ross, of the brigantine Eureka, which arrived here yesterday from Boston, reports that when about three miles off Seal Island he felt the disturbance, which he states to have been severe and accompanied by a bright flash of light. Below we give telegrams received from Provincial towns regarding the earthquake.

In Truro.

Truro, Jan. 1.

The earthquake felt in Halifax last night was quite perceptible in Truro, though the shock was hardly so heavy as that reported in the former place. Many

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

residents of the town state having noticed the shaking of their dwellings and rattling of the contents, but the shock passing away so quickly they paid little attention to it. The waterworks building outside the town received a severe shaking, the men working in it getting quite frightened, but fortunately the disturbance was not severe enough to cause any but trifling damage.

At Meteghan.

Meteghan, Jan. 1.

An earthquake passed over this place about 11.30 p. m. Sunday evening, making the windows and dishes in the houses rattle.

At Annapolis.

Annapolis, Jan. 1.

We were visited with a sharp shock of an earthquake about ten o'clock last night.

Letter from Capt. Trott.

No. 1 South Street

Halifax, Jan. 2, 1883.

To the Editor of the Morning Chronicle:

Sir, -

As the time of the shock of earthquake of Sunday evening, as reported by different persons, varies considerably, I herewith give you particulars as observed by myself. I was sitting quietly at my table reading when I heard a sound as of a rapidly approaching railway train, causing the house to vibrate considerably. I soon realized the fact that it was an earthquake shock, and as it was passing I held my watch in my hand and carefully noted the time. When the last vibrations ceased my watch showed 10h. 7m. 25s., giving Greenwich mean time 14h. 15m. 19s. The whole shock must have lasted something over a minute. A second shock occurred at 10h. 43m. 20s. by same watch, but it was very slight and of short duration when compared with the first. The shock was travelling from North to South, apparently along the magnetic meridian. The plaster of the ceiling in almost every room is cracked, and ran in same direction as the noise was progressing.

I am, Sir,

Yours truly,

SAM'L TROTT

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

On the same afternoon of Wednesday, January 3, 1883 the Acadian Recorder printed on p. 3, col. 6 a precis of the Morning Chronicle's five articles of that very morning crediting only "a contemporary" when citing the source of Captain Trott's letter which they reprinted in part. The transcript of the afternoon article is below:

Earthquakiania.

Reports from everywhere - Captain Trott Observes.

The earthquake of Sunday Night seems to have been generally felt. A letter from Chester, says it was felt in that vicinity very much; rumbling noise, slight rocking motion, and one or two allege that a flash of light was seen.

At Truro, the quake was felt more severely at the Waterworks buildings than elsewhere, the men working there getting frightened. At Meteghan, the windows and dishes rattled. An Annapolis despatch says there was a sharp shock there. A letter from Capt. Trott to a contemporary, contained the observation of the earthquake as he was seated in his residence, No. 1 South Street, reading. He took out his watch just as the house commenced to vibrate. The Capt. says: -

"When the last vibrations ceased my watch showed 10h. 7m. 25s. giving Greenwich mean time 14h. 15m. 19s. The whole shock must have lasted something over a minute. A second shock occurred at 10h. 43m. 20s. by same watch, but it was very slight and of short duration compared with the first. The shock was travelling from North to South, apparently along the magnetic meridian. The plaster of the ceiling in almost every room is cracked, and ran in the same direction as the noise was progressing."

A correspondent at Prospect states that the inhabitants were greatly alarmed, their dwellings receiving a rude shaking.

Word from Port Matoun[sic] says the shock was distinctly felt there and continued with a rumbling noise for 30 or 40 seconds.

The Yarmouth Tribune first reported the earthquake on Wednesday, January 3, 1883 on p. 2, col. 3 by reprinting the earlier Morning Chronicle story of Monday, January 1, 1883 on p. 3, col. 2; we do not reproduce this as a transcript here. Rather we do present in a transcript below of the Yarmouth Tribune's report of new material found on Wednesday, January 3, 1883 on p. 2, col. 4:

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

EARTHQUAKE. - There was a smart shock of earthquake experienced in Yarmouth on Sunday evening, at sharp 10. Simultaneously with the shock, or perhaps a little in advance, bright flashes were seen by those who happened to be out of doors - flashes which they were unable to recognize as resembling ordinary lightning, and which, besides were unaccompanied by peals of thunder. These flashes were seen by observers in different parts of the township and in the majority of instances appeared to arise from the ground before them. The duration of the shock was probably about 45 seconds, though there are not wanting those who affirm that it lasted to 1 1/2 to 2 minutes. Its manifestations are variously described by those who happened to be awake at the time, according to locality and other circumstances. Some speak of a violent jarring of floors, doors, and windows; others tell of preliminary rumblings, as of an incoming train, heard in the distance, and rapidly swelling in volume. We have as yet heard of no resulting damage, beyond the toppling over of one or two weak-backed chimneys.

In Halifax, also they appear to have enjoyed the distinguished honor of an earthquake scare, which seems to have been got up for their exclusive benefit, inasmuch as it occurred an hour and a half after the time when the shock in Yarmouth was experienced. We incline to the opinion that separate and independant shocks were felt in the two places, and from the published accounts in the Halifax papers, we infer that though no serious damage was done, household belongings of various kinds were in several instances tumbled about with perfect looseness.

Five or six shocks of earthquake are said to have been experienced in Yarmouth within the past 50 years. the first of which we have any recollection occurred on a calm Sunday morning about 7 o'clock, in May or April, 1832. It was preceded by a hoarse, distant rumbling, followed by a violent jarring of doors, windows and things generally, and ending in one or more heavy concussions. The next occurrence of the kind was in October, 1868, and it, also, "came off" about 7 in the morning. Its manifestations were not dissimilar to those of the earthquake of 1832. Lastly, there was a smart shock felt - by those who happened to be awake - about one or two o'clock at night, some time during the year 1873. Owing to the lateness of the hour, but few people were aware of

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

its occurrence.

Earthquakes were formerly supposed to be caused by subterranean forces of a volcanic character operating within the bowels of the earth, but the latest opinion held by scientists is, that they are due to accumulation and subsequent outburst of vast masses of electricity in a positive or negative condition, and these outbursts can only take place under peculiar geological conditions. Be that as it may, the flashes of lightning seen on Sunday evening would seem to go far to corroborate the theory of electric agency.

In the above article the 0700 Sunday morning event in, "May or April, 1832" is probably actually referring to the 0640, Sunday, August 12, 1832 event which was felt in Yarmouth. The "October, 1868" event at "about 7 in the morning" is probably actually referring to the 0545, Friday, October 22, 1869 event. The last mentioned event at, "about one or two o'clock at night, sometime during the year 1873", may be referring to the July 8, 1873 event recorded in Smith (1962).

On Thursday, January 4, 1883 the Morning Chronicle of Halifax published a January 2 letter from, 'J.' of Waterville, Kings County, Nova Scotia on p. 3, col. 2, wherein he or she provides another felt report from the Annapolis Valley per the transcript following:

CORRESPONDENCE.

The Earthquake

To the Editor of the Morning Chronicle:

Sir,-

As it may perhaps interest some of your readers to know how far the earthquake, felt at Halifax about 10.20 p. m., on the night of the 31st ult., extended in this Province, I beg to state that it was felt distinctly in this locality, about midway between the North and South Mountains. The house in which I reside was shaken sufficiently to attract the attention of two friends who were with me that evening. The dining room stove jarred as if a heavy weight had been rolled over the floor, and the chairs were shaken with some force.

This earthquake, like all others that have been known to visit this Province heretofore, appears to have been simply a vibratory movement, its origin, doubtless, being at a considerable distance from our

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

position.

As phenomena of this kind are generally accompanied by visible movements of the ocean known as "earthquake waves" throughout their extent, and as Nova Scotia is almost entirely surrounded by water, it would be interesting to learn if any navigators on the coast perceived anything like an earthquake wave that night. More especially would it be interesting to know if anyone afloat on the Bay of Fundy, a locality remarkable for the highest tidal waves in the world, observed any unusually large wave that night, for as the tide was on the flow from 9 p. m., up the Bay, such an occurrence would certainly have been rendered very apparent, as the night was remarkably calm.

These "earthquake waves" are well known on the Pacific coast of South America, where their force and proportion have been exhibited at the vast distance of 4,000 miles from the origin of disturbance.

Waterville, Kings Co., Jan. 2.

The latter two paragraphs of this letter are referring to tsunami. The Yarmouth Herald of Thursday, January 4, 1883 put forward more felt reports from western Nova Scotia in its article on p. 2, col. 1:

An Earthquake.

On Sunday evening last, at about ten o'clock, a sudden and rather severe shock of earthquake was experienced in Yarmouth and vicinity. The various accounts given by people in this town agree that the shock which caused considerable shaking of the loose articles in houses lasted for half to three quarters of a minute, and was accompanied by one or more flashes of light and by a low rumbling sound resembling the rapid passage of a heavy carriage over a hard and uneven road.

Correspondents in Carleton, Brier Island and Shelburne furnish similar reports. Our Shelburne correspondent says, "The vibration was very perceptible and was attended by a peculiar sound resembling the rumbling of a carriage over frozen earth or the rushing of a rising wind." The other accounts from Carleton, Kempt and Westport give similar descriptions of the phenomenon.

At Halifax we are informed the shock was not felt until somewhat later, but it was very similar in its effects there.

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

It has been many years since a shock of earthquake has been experienced in this vicinity. There was, we learn, a severe shock of earthquake felt in Nova Scotia about the year 1845 and one or two slighter ones since.

The first American report from an unidentified Boston paper was found in the Acadian Recorder of Friday, January 5, 1883 on p. 2, col. 1. Virtually the same article from probably the same Boston paper had appeared in the Morning Chronicle of the same day, Friday, January 5, 1883 on p. 1, col. 6. A similar article appeared in the North Sydney Herald on Wednesday, January 10, 1883, on p. 2, col. 1 as the latter part of a longer article and the Yarmouth Herald of Thursday, January 18, 1883 reproduced the Acadian Recorder article verbatim on p. 1, col. 8. We reproduce only the Acadian Recorder article of Friday, January 5, 1883 on p. 2, col. 1 below in transcript:

THE EARTHQUAKE AND METEOR. - A
Boston paper says:

At 9 45 o'clock Sunday night an earthquake was felt at Dover, N.H. Fifteen minutes later the shock was felt at Rockland, Me., and vicinity, followed by a tempest of thunder and lightning. At 10.20 o'clock the same night a meteor of remarkable size and brilliancy was observed from East Concord, N.H. It is described by those who saw it as having the appearance of a ball of fire in the southeast, seemingly four inches in diameter, which shot through less than a degree towards the southwest and exploded like a rocket, but without noise. People who had retired were startled by their rooms being suddenly illuminated as if by lightning.

A brilliant meteor was observed in the northwest at Taunton, Mass., at 9.40 o'clock Sunday night.

It will be noted by the above that those who aver that they saw a very bright light about the time the earthquake shock was felt in this vicinity, are corroborated.

The Halifax Morning Chronicle of Saturday, January 6, 1883 on p. 2, col. 1 quoted a Bridgewater correspondent to the Lunenburg Progress and thus provided a felt report for Bridgewater including a damage report of some broken [oil] lamp chimneys in Curll's Store. This identical correspondent's report was also reproduced verbatim by the NovaScotian of Saturday, January 13, 1883 on p. 3, col. 3. We present a transcript below:

Inhabitants of this town and vicinity were startled on last Sunday night at ten o'clock by the unusual occurrence of an earthquake shock. The motion lasted only about half a minute, but sufficiently long enough

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

to scare three-fourths of the population pretty badly. In some houses bottles and crockeryware were thrown down, and some lamp chimneys were broken in Curll's store. The shock was accompanied by several flashes of lightning of a peculiar red color.
- Bridgewater correspondent, Lunenburg Progress.

As we noted above, the Saturday, January 6, 1883 NovaScotian on p. 3, col. 2 in a long article, reproduced verbatim the Halifax Morning Chronicle article of January 1, 1883 (but with the times in the first line corrected downwards by one hour to read, "Between half-past ten and eleven o'clock Sunday night") and reproduced verbatim the five reports which the Morning Chronicle had had in its January 3, 1883 issue including the January 2, 1883 letter of Samuel Trott. We do not produce these here in transcript to avoid needless duplication.

John MacLeod's search of the Cape Breton newspapers (Appendix 4) turned up a review article in the North Sydney Herald of Wednesday, January 10, 1883 on p. 2, col. 1. This article draws on many of the above-cited reports in other papers but does add a felt report of Antigonish though gives no details; the article is transcribed below:

Earthquake and Meteor on New
Year's Day

Heavy shocks of earthquake were experienced in several parts of Nova Scotia, New Brunswick and the United States on New Year's eve. In Nova Scotia the shock was experienced as far east as Antigonish. The crews of vessels on the Nova Scotia coast also experienced a shock and at the same time observed a remarkable meteor. One report says that this meteor when within ten degrees of the horizon exploded with much noise and flame, the fragments streaming down into the ocean like great sparks and sprays of fire. The most wonderful part of the phenomenon then followed, for at the point in the heavens where the meteor burst there appeared a figure shaped like an immense distaff, all aglow with a bluish light of intense brilliancy. It kept that form for perhaps two minutes when it began to lengthen upward, and growing wavy and zigzag in outline, diminished in breadth until it became a fine, faint spiral line at its upper end dissolving into gathering clouds. It remained for about ten minutes, when it began to fade and finally disappeared at eleven minutes past 5 o'clock.

A Boston paper says: - "A severe shock of earthquake was experienced on Sunday night. It was followed at Rockland, Me., by a tempest of thunder

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

and lightning. At 10 20 o'clock the same night a meteor of remarkable size and brilliancy was observed from East Concord, N.H. It is described by those who saw it as having the appearance of a ball of fire in the southeast, seemingly four inches in diameter which shot through less than a degree towards the southwest and exploded like a rocket but without noise. People who had retired were startled by their rooms being suddenly illuminated as if lightning.["]

Professor Kenneth B. S. Burke of the Department of Geology, University of New Brunswick, Fredericton, New Brunswick kindly sent along one article from the Shediac, New Brunswick Moniteur Acadien of Thursday, January 11, 1883, p. 3, col. 1 thinking it indicated a possible Halifax, Nova Scotia event for Sunday, January 7, 1883. After discussion he agrees with us that this article, "is probably the 1882 [event] with a wrong date attached" (personal communication, Professor Kenneth B. S. Burke, letter of December 10, 1985). We reproduce the Moniteur Acadien article below:

Nouvelles et Faits Divers

Dimanche, on a ressenti à Halifax et dans diverses autres localites de la Nouvelle Ecosse, une violente secousse se de tremblement de terre.

The last two articles found that referred to the Sunday, December 31, 1882 earthquake were in the NovaScotian of January 13, 1883 on p. 3, col. 3 which was transcribed above as it appeared in the Halifax Morning Chronicle of January 6, 1883 and in the Yarmouth Herald of Thursday, January 18, 1883 on p. 1, col. 8 repeating the American report earlier transcribed as reported in the Halifax Acadian Recorder of Friday, January 5, 1883. We do not repeat either of these articles here to avoid duplication.

Lawson (1902) cites the December 31, 1882 event as "a rather severe shock"; however, he is almost certainly deriving his material from the Yarmouth Herald when he reports on p. 598:

At 10 o'clock on Sunday evening, December 31st, 1882, a rather severe shock of earthquake was experienced in Yarmouth. It lasted from from half to three-quarters of a minute, and was accompanied by one or more flashes of light, and by a low rumbling sound resembling the rapid passage of a heavy carriage over a hard road. It was felt in Carleton, Brier Island, Shelburne and Halifax.

The earlier-quoted North Sydney Herald article of Wednesday, January 10, 1883 on p. 2, col. 1, which John MacLeod (1984) found, reported that the December 31, 1882 event was felt, "as far east as Antigonish" and thus implied that it was not felt on Cape Breton Island. However B. D. Tennyson

DECEMBER 31, 1882 EVENTS (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

(1978) cites the Sydney Daily Post of November 22, 1929 (which we have not seen) as the source for his/her sentence on the 1882 event in his/her, Earthquakes in Cape Breton, as found in Appendix 7 of this report and as transcribed from p. 147, para. 2 below:

The 1882 earthquake took place on New Year's Eve and was concentrated in the Baddeck-Middle River area. Little is known about it and it appears to have been very minor in scale and did no real damage.

Time did not permit an examination of all Cape Breton Island sources. These should be examined to confirm the Baddeck and Middle River, or other Cape Breton Island, felt localities; these would greatly expand the felt area.

Newspapers Searched:

Halifax Morning Chronicle, searched from Monday, January 1 to Saturday, January 6, 1883; ten articles were found in five issues (see above).

Halifax Acadian Recorder, searched from Monday, January 1 to Friday, January 5, 1883; five articles were found in four issues (see above).

Halifax NovaScotian (weekly), searched from Saturday, January 6 to Saturday, January 13, 1883; seven articles all taken from daily newspapers were found in the two issues (see above).

Yarmouth Herald, searched from Thursday, January 4 to Thursday, January 18, 1883 (Thursday, January 11, 1883 missing); two articles found (see above).

Yarmouth Tribune, searched from Wednesday, January 3 to Wednesday January 10, 1883; two articles were found (see above).

North Sydney Herald, searched by John MacLeod (1984) of the Public Archives of Nova Scotia (Appendix 4) from Wednesday, January 10 to Wednesday, January 24, 1883 (Wednesday, January 3, 1883 missing); one article was found (see above).

Liverpool Advance, searched from Wednesday, January 10 to Wednesday January 17, 1883 (Wednesday, January 3 missing); no articles were found.

DISCUSSION AND CONCLUSIONS:

These events deserve the all inclusive type of study such as Leblanc and Burke (in press, 1985) have done for the 1817, 1855, 1869 and 1904 New Brunswick events. It is not at all clear how many events there were and it is not at all clear from the reports we have found how Smith (1962) centred the event(s) in Passamaquoddy Bay; we have not seen all of his references. Brooks (1960) and Rand (1977) seem derivative in nature and even Smith and Bridges (1983) do not give enough detail to sort the events out.

DECEMBER 31, 1882 EVENTS (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

Captain Trott's account from Halifax clearly documents two evening events on Sunday, December 31, 1882 commencing at circa 2206 and 2243 local time. The January 2, 1883 Acadian Recorder notes there was a third shock at 0130 local time on Monday, January 1, 1883. The Acadian Recorder of Tuesday, January 2, 1883 on p. 4, col. 3 stated, "It is averred to account for the apparent discrepancy in time of the earthquake incident of Sunday night, that there were three shocks - one at 10.10, another at 11.20, and a third at 1.30 in the morning." [on January 1, 1883] ie at 2210, 2320 local time on December 31, 1882 and at 0130 local time on January 1, 1883.

The few American reports seen note events at 2145 and 2200 local time on December 31, 1882 which may be the same single event but variously recorded in different communities in New Hampshire and Maine or they may be two different events and may be the same two events as the two noted by Captain Trott in Halifax but again, variously timed. Certainly the 2155 event or "about 10 p.m." event recorded at Eastport, Maine as noted by Bridges and Smith's (1983) appendix is the same as the 1000 p.m. (or 2200) Rockhead, Maine event and the same as Kain's 2156 event (assuming there is no foul up from the use of different time zones).

However, Bridges and Smith's (1983) appendix notes an event at 0500 local time on Monday, January 1, 1883 felt at Machias, Maine and reported in the Machias Union of January 9, 1883, as "about the same as previous evening's quake". This may well be a different, fourth event. Similarly in Smith's (1962) American section he lists two January 1, 1883 events at 0258 and 0828 local time in Addison, Maine. These events if only felt in Addison may be quite unrelated to the above major event but one is left with a suspicion that at least the 0130 event noted in the January 2, 1883 Acadian Recorder, the 0500 Machias, Maine event noted in the Machias Union of January 9, 1883 and the two Addison, Maine events of 0258 and 0828 in Smith (1962) may be related.

The apparent strength of the event in Nova Scotia, especially along the southern and western shore seems to suggest either a stronger event, or even an event with a different locality than that which Smith (1962) located in Passamaquoddy Bay. A detailed analysis of the event and a mapping of the apparent intensities of each event as Leblanc and Burke (in press, 1985) have done for four other earthquakes would go a long way to resolving this uncertainty both in the number of events and in their location and magnitude.

There is even a suggestion that one of the events may be a non-tectonic event related to a meteor impact or meteor termination similar to the December 21, 1863 event recorded at Amherst and Parrsboro, Nova Scotia. A detailed analysis of all sources for the December 31, 1882 - January 1, 1883 events would possibly resolve this. The widespread felt area suggests that this event was quite a bit larger than its present classification in Smith (1962) would indicate and suggests that it was an offshore event somewhere on the Scotian Shelf or Georges Bank or at the Shelf edge. More work is needed.

DECEMBER 31, 1882 EVENTS (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

Regardless of a future detailed analysis the CEEF can be altered to show two events, separated by 37 minutes, felt in Halifax with the first stronger than the second. Further changes to the CEEF will result once the detailed analysis is complete and the number of events (foreshocks and aftershocks?) may rise to four or even five events.

OCTOBER 6, 1886 EVENT

EPICENTRE LOCATION

In the area of Annapolis and Queens Counties, Nova Scotia; possibly in the Bay of Fundy. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known at present

DATE: Wednesday, October 6, 1886

TIME: "On the night of the 6th inst." The exact time is not known at present.

SUMMARY OF REPORTS:

There is only one report cited in two papers quoting the Annapolis Spectator. The two citations are brief and only say, "Shocks of an earthquake were distinctly felt...." "Many persons have reported having felt them plainly in places many miles apart."

REFERENCES AND TRANSCRIPTS:

There were only two references found to this apparently, previously-unreported, event on the evening of Wednesday, October 6, 1886. The first was in the Yarmouth Herald of Wednesday, October 20, 1886 on p. 2, col. 3 per the transcript below:

-The Annapolis Spectator says the shocks of earthquake were distinctly felt in sections of Annapolis and Queens Counties on the night of the 6th inst.

This report states quite clearly that the event occurred on Wednesday, October 6, 1886. Virtually the same report appears in the Halifax NovaScotian of Saturday, October 23, 1886 on p. 8, col. 1 but in this reproduction of the Annapolis Spectator's report the implication is that the event occurred, "on Wednesday week," which would be during the previous week ie. on Wednesday, October 13, 1886. The transcript is below:

HOME AND FOREIGN NEWS

SHOCKS of earthquake were distinctly felt in sections of this and Queens counties on Wednesday week, says the Annapolis Spectator. Many persons have reported having felt them very plainly in places many miles apart.

Clearly one of the dates is incorrect. The Annapolis Spectator is not available at the Public Archives of Nova Scotia to resolve this problem; inquiries were made at the MacDonald Museum in Middleton, Nova Scotia but the Spectator of that date is not available.

OCTOBER 6, 1886 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Smith (1962) does not record an event on October 6, 1886 in either his Canadian or American sections but does record an October 13, 1886 event exactly 1 week later; Lawson's (1902) history of Yarmouth County does not note any 1886 events. Calnek's (1897) History of the County of Annapolis does not note an 1886 event as far as we have found. Time did not permit a complete search around this previously-unrecorded event to resolve its date etc.

Newspapers Searched:

Halifax Morning Chronicle, searched from Wednesday, October 6 to Tuesday, October 19, 1886; no articles were found on this local October 6, 1886 event; on Thursday, October 7, 1886 p. 2, col. 1 there was an article on a lecture by a Professor Proctor on seismology and prediction of earthquakes and on Wednesday, October 6, 1886, p. 2, col. 3 there was an article on a remote earthquake on the Island of Nigsu.

Halifax The Morning Herald, searched from Wednesday, October 6 to Tuesday, October 19, 1886; no articles were found on this event. See also the newspapers searched for the October 13, 1886 event.

DISCUSSION AND CONCLUSIONS:

Before the CEEF is altered to add an October 6, 1886 event, more research must be done on this event. We suspect that the Yarmouth Herald's reference to the "6th inst." ie. to Wednesday, October 6, 1886, is correct. However, we are suspicious since:

- a) the reports do not appear until the October 20 and 23 issues of the Yarmouth Herald and Halifax NovaScotian respectively
- and b) the October 6, 1886 event occurs on a Wednesday at night which would appear to be exactly the same day of the week on which the Cape Breton October 13, 1886 event occurred exactly one week later which also occurred at night.

One must search out copies of the Annapolis Spectator for October 7-19, 1886 if possible and reexamine earlier papers of the area for the period October 7-20, 1886. Our event-specific search was only initiated in looking for an October 14, 1886 event as noted in Smith (1962) hence the Yarmouth Herald, Yarmouth Times and Western Counties Journal, Yarmouth Telegram, Bridgetown Weekly Monitor, Halifax NovaScotian, Lunenburg Progress and Liverpool Advance were not examined for the earlier October 7-13, 1886 period to resolve this possible Wednesday, October 6, 1886 event; two Halifax papers were later examined specifically for this event but no reference was found and no southern New Brunswick sources have been checked for a possible Bay of Fundy epicentre.

This possible October 6, 1886 event should not be added to the CEEF until more work is done on the primary newspaper sources. If this October 6, 1886 event is a ghost of the October 13, 1886 event then it implies a much larger felt area for the October 13, 1886 event and may well imply an offshore source.

OCTOBER 13, 1886 EVENT

EPICENTRE LOCATION:

Near Sydney, Cape Breton Island, Nova Scotia; possibly offshore in the Laurentian Slope Earthquake Zone. Smith (1962) lists no epicentre. The exact location of the epicentre of this event is not known at present.

MAGNITUDE: Not really known at present. Smith (1962) lists an intensity of III on the Modified Mercalli Intensity Scale of 1931 which converts to a magnitude of 3.0 on the CEEF.

DATE: Wednesday, October 13, 1886 local time (Thursday, October 14, 1886 GMT). Smith (1962) lists Thursday, October 14, 1886 citing Dawson (1896) however the three references the event-specific search turned up suggest both "last night" in two October 14th datelined accounts and "last night" in an article with a dateline of October 15; we accept the two earlier dates.

TIME: "at half-past ten o'clock last night" 2230 AST (0230 GMT)

SUMMARY OF REPORTS:

There seems to only be one so far datelined, "Sydney, October 14." "A distinct shock...lasting ten seconds...was principally felt in the south end of town and while it created quite a sensation, did no damage.

REFERENCES AND TRANSCRIPTS:

There were only three newspaper reports found; two were in Friday, October 15, 1886 newspapers and one of these had a "Sydney, October 14" dateline and one had a dateline reading "Sydney, C.B., Oct. 15" but both referred to an earthquake "last night." The third article which appeared on Wednesday, October 20, 1886 had a "Sydney, Oct. 14" dateline and it too referred to an earthquake "last night." Thus two newspaper references refer to events on October 13, 1886 and one to an event on October 14, 1886; we accept the October 13, 1886 date.

Smith's (1962) entry in his compendium uses October 14, 1886 per the entry below:

183. 1886 October 14. 10:30 p.m. III Felt at Sydney,
N.S. D7.

Smith's reference is to Dawson (January, 1894; not 1896 as cited in Smith). Dawson (1894) gives a list entitled, Statement of Earthquake Shocks Felt in Canada on pp. 15-16 which he credits to Professor C. H. McLeod of McGill College Observatory. That list contains as the nineteenth entry on p. 15 the following event:

1886 Oct. 14. Sydney, N.S. 10.30 p.m., lasting ten
seconds.

OCTOBER 13, 1886 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Dawson (1894), in updating his earlier work, notes as he lists the Montreal events earlier in his paper, "They are given as reported in the newspapers of the time and the dates are of course very imperfect." We presume Professor C. H. McLeod of McGill suffered the same restriction in constructing his list used in Dawson's (1894) paper and has used a date "imperfect" by one day.

The Halifax Morning Herald article of Friday, October 15, 1886, on p. 3, col. 4 (top) appears below in transcript under the column header, "News by Telegraph" implying it was reported from Sydney by telegraph on the morning (?) of Thursday, October 14, 1886:

NEWS BY TELEGRAPH.

EARTHQUAKE AT SYDNEY.

(Special despatch to the Halifax Herald.)

SYDNEY, October 14 - A distinct shock of earthquake was felt in Sydney at half-past ten o'clock last night, lasting ten seconds. The shock was principally felt in the south end of town and while it created quite a sensation, did no damage.

Similarly, the Yarmouth Telegram of the same day, Friday, October 15, 1886, on p. 3, col. 1 reports the event under the column header, "By Telegraph" but uses the dateline, "Sydney, C.B., Oct. 15."

BY TELEGRAPH.

SPECIAL DESPATCHES TO

YARMOUTH TELEGRAM.

Sydney, C.B., Oct. 15.

There was a shock of earthquake last night, lasting 10 seconds. No damage.

The Bridgetown Weekly Monitor of Wednesday, October 20, 1886, on p. 3, col. 1 under the column heading "General News" reported exactly the same words as the October 15, 1886 Halifax Morning Herald article with the same, "Sydney, Oct. 14." dateline. We do not reproduce this duplicate report here.

Newspapers Searched:

Halifax The Morning Chronicle, searched from Wednesday, October 6 to Tuesday, October 19, 1886; no articles on this event were found.

OCTOBER 13, 1886 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Halifax The Morning Herald, searched from Wednesday, October 6 to Tuesday October 19, 1886; one article was found (see above).

Halifax Acadian Recorder, searched from Wednesday, October 13 to Saturday, October 16, 1886; no articles were found.

Halifax NovaScotian, searched from Saturday, October 16 to Saturday October 23, 1886; one article was found re an apparently earlier event in Annapolis and Queens Counties on October 6, 1886 but no articles were found for the October 13, 1886 Sydney event.

Yarmouth Telegram, searched from Friday, October 15 to Friday, October 29, 1886; one article was found (see above).

Yarmouth Herald, searched from Wednesday, October 20 to Wednesday, October 27, 1886; one article was found on an apparently earlier event in Annapolis and Queens Counties on October 6, 1886 but no articles were found on the October 13, 1886 Sydney event.

Yarmouth Times, searched from Saturday, October 16 to Saturday, October 23, 1886, no articles were found.

Bridgetown Weekly Monitor, searched from Wednesday, October 20 to Wednesday, October 27, 1886; one article was found (see above).

Lunenburg Progress, searched from Wednesday, October 20 to Wednesday, October 27, 1886; no articles were found.

Liverpool Advance, searched from Wednesday, October 20 to Wednesday, October 27, 1886; no articles were found.

Antigonish Casket, searched on Thursday, October 14, 1886; in poor shape, no article was found. All other issues to Thursday, November 25, 1886 are missing at the Provincial Archives of Nova Scotia.

 DISCUSSION AND CONCLUSIONS:

While it is not certain, there appears to be reasonable evidence from the October 15, 1886 issue of the Halifax Morning Herald that this event occurred on the night of Wednesday, October 13 at 2230 local time. The CEEF should be altered to correct the date. However, a serious effort should be made to examine all other possible sources to check for new data and to hopefully confirm the date as October 13, 1886. Copies of the Antigonish Casket should be located for October 7-28, 1886 if possible. This event is a possible offshore event and an effort should be made to detail it especially since it may represent a felt event from the Laurentian Slope Seismic Zone. If the October 6, 1886 event is a ghost of this event then this event's felt area and hence its magnitude will increase quite significantly.

MARCH 21, 1904 EVENT

EPICENTRE LOCATION:

Smith (1962) lists 45.0° N, 67.2° W near the Oak Bay - Passamaquoddy Bay area.

MAGNITUDE:

Smith (1962) lists an intensity of VII on the Modified Mercalli Intensity Scale of 1931 which converts to a magnitude of 5.0 on the CEEF. Leblanc and Burke (in press, 1985) have reevaluated this event and suggest a magnitude ^{mlg} of 5.9.

DATE:

Monday, March 21, 1904

TIME:

0104 local time in Smith (1962); Leblanc and Burke (in press, 1985) use 0204 AST and Woodman (1905) reports a variety of times around 0200 AST but also selects a 0204 AST (0604 GMT)

SUMMARY OF REPORTS:

Leblanc and Burke (in press, 1985) have done a complete study on this event and as a result our study did not initiate an event-specific search. Leblanc and Burke have indicated in their Table 2 that the event was felt in Amherst, Annapolis, Antigonish, Apple River, Bear River, Belledale, Berwick, Bridgetown, Bridgewater, Cornwallis, Digby, Glace Bay, Halifax, Joggins Mines, Kentville, Liverpool, Lunenburg, Mahone Bay, Middle Musquodoboit, Middleton, New Glasgow, Nictaux Falls, North Kingston, North Williamstown, Paradise West, Pictou, Shelburne, Springhill, Stellarton, Sydney, Sydney Mines, Truro, Westville, Windsor, Wolfville and Yarmouth in Nova Scotia from their analysis of some 114 sources listed in their Table 1. [Note: we believe Belledale (above) may be a typo in Leblanc and Burke (in press, 1985) or may be a typo in their source; we suspect Belledale is Belleisle, Nova Scotia.]

REFERENCES AND TRANSCRIPTS:

No event-specific search was carried out for this earthquake. Leblanc and Burke (in press, 1985) had gathered 114 references and documented the earthquake's felt experience in some 237 communities over the Maritimes, Quebec and the northeast New England states. Thirty seven of these were in Nova Scotia. They used 14 Nova Scotia newspaper sources. We have not searched for or found any particular deficiencies except to note that they used Woodman's (1905) accounts from newspapers in one case rather than going back to the original newspaper source, ie. Lunenburg Progress-Enterprise of March 23, 1904. We have not sought this issue out and it may well be that Leblanc and Burke's researcher did, but that it was missing, in which case Woodman's (1905) review of the articles would have to do. Woodman (1905) gives the best account of the March 21, 1904 earthquake in Nova Scotia.

MARCH 21, 1904 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS:

The CEEF should be modified to reflect the findings of Leblanc and Burke (in press, 1985) with respect to the increased magnitude. The time should be corrected in the CEEF. There are a few more newspapers in Nova Scotia that were not examined by Leblanc and Burke for this event and it may be possible to amplify reports in the southern, western, eastern and even parts of northern Nova Scotia, ie. Amherst.

AUGUST 21, 1904 EVENT

EPICENTRE LOCATION:

Offshore from the islands of Saint-Pierre et Miquelon. Possibly in the Laurentian Slope Earthquake Zone. The exact location of the epicentre is not known at present.

MAGNITUDE: Not known, the felt intensity on the islands was apparently quite low.

DATE: Sunday, August 21, 1904

TIME: "à 20 heures (heure local); 2000 local time (2300 GMT) Note: at present, l'heure local" on Saint-Pierre et Miquelon is one half hour ahead of Atlantic Standard Time hence only three hours behind GMT; it is not presently known if this was also the case in 1904.

SUMMARY OF REPORTS:

The shocks were felt at 2000 local time to come from the southwest and diverge towards the southeast; they only lasted a few seconds.

REFERENCES AND TRANSCRIPTS:

This previously-unreported earthquake is not recorded in Smith (1962) or on the CEEF. The only reference to this event at present comes from E. Aubert de la Rue (1937) on his p. 25-26:

Bien que les secousses séismiques soient très rares à Saint-Pierre et Miquelon, du moins celles suffisamment violentes pour être ressenties par les habitants, car la colonie ne possède pas de séismographe, il était intéressant de recueillir quelques données sur celles dont on conserve le souvenir. J'ai pu seulement obtenir, jusqu'à présent, des renseignements relatifs à deux tremblements de terre.

Le plus ancien se produisit le 21 août 1904. Des secousses furent ressenties ce jour là à Saint-Pierre à 20 heures (heure locale). Venant du Sud-Ouest et se dirigeant vers le Sud-Est, elles durèrent pendant quelques secondes.

We were alerted to this reference by Staveley et al. (1984) and were able to obtain it from a French source.

This event was not discovered in Staveley et al's. (1984) work on Newfoundland newspapers which may only mean that it was not reported or was not even felt on the main island of Newfoundland. No Saint-Pierre sources have been examined.

AUGUST 21, 1904 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS:

This previously-unreported event should be added to the CEEF. If available, southern Newfoundland sources should be examined and Saint-Pierre et Miquelon sources should be examined. The Saint-Pierre sources are not generally on microfilm and the few that are are in France; Ottawa holds no Saint-Pierre et Miquelon material, at least no newspapers or journals etc. The Cape Breton newspapers should be examined for this event.

We do not believe there is any chance of this being a ghost of the March 21, 1904 event. We do not believe Aubert de la Rue mistook 03/21/04 for 08/21/04 since the time of 2000 local time during daylight hours is quite different than the 0204 AST (near midnight) time of the Eastport-Oak Bay event on March 21, 1904.

No further work was done on this event at this time since it was beyond the areal scope of this study. It deserves further attention since it may reflect a felt report of an offshore event in the Laurentian Slope Earthquake Zone.

MAY 13, 1908 EVENT

EPICENTRE LOCATION:

Smith (1962) lists an epicentre of 44.0° N, 65.8° W in the interior of western Nova Scotia. The exact location of the epicentre probably is not really known at present; it may even be in the Bay of Fundy or in the Gulf of Maine southwest of Nova Scotia.

MAGNITUDE: Smith lists an intensity of V on the Modified Mercalli Intensity Scale of 1931 which converts to a magnitude of 4.0 on the CEEF. The magnitude may be subject to revision with more detailed research.

DATE: Wednesday, May 13, 1908 local time (Thursday, May 14, 1908 GMT)

TIME: Between, "11:30 - 12:00 midnight" according to Smith (1962); this will be local time. The average is 2345 AST (or 0345 GMT on the next day). However, the CEEF lists 0445 GMT; this is in error by one hour.

SUMMARY OF REPORTS:

No event-specific search was done because of time constraints; Smith (1962) notes only that it was, "felt in Digby, Annapolis and Shelburne counties, Nova Scotia, but most severely at Yarmouth. No damage was reported."

REFERENCES AND TRANSCRIPTS:

Time did not permit an event-specific search as part of this study. At this point we have only Smith's (1962) listing:

239. 1908 May 13. 11:30-12:00 Midnight. V. 44.0° N, 65.8° W. Felt in Digby, Annapolis and Shelburne counties, Nova Scotia, but most severely at Yarmouth. No damage was reported. S2.

There are numerous newspapers of the day available for the Valley and western Nova Scotia at the Public Archives of Nova Scotia; they have not been searched.

DISCUSSION AND CONCLUSIONS:

A complete documentation of western Nova Scotia and southern New Brunswick sources (including Grand Manan Island if available) should be initiated in an effort to resolve the epicentre location, magnitude and exact time. It does appear that, even now, the time in the CEEF can be corrected (see above) from 0445 to 0345 GMT (2345 AST).

CIRCA 1908(?) TSUNAMI(?) EVENT

EPICENTRE LOCATION:

Not known, it could have been a distant earthquake or possibly a local northern Cape Breton event.

MAGNITUDE: Not known

DATE: Not known, circa 1908(?)

TIME: Not known exactly, "it came in the day" this was between about 0700 and 2100 local time.

SUMMARY OF REPORTS:

Only an oblique reference in a discussion of the May 1914 tsunami, "this same vicinity was visited by something of the same nature...."

REFERENCES AND TRANSCRIPTS:

Professor D. S. McIntosh (1919) in his April 12, 1915 paper notes an account by Mr. A. H. McIntosh of Pleasant Bay, Cape Breton Island who gives an account of the May, 1914 tsunami. Mr. A. H. McIntosh, on p. 42, is quoted in his account as saying:

...Some six years before, this same vicinity was visited by something of the same nature, but as it came in the day, it occasioned no loss.

At the end of his paper, Professor D. S. McIntosh refers to this earlier event citing it as being at Bay St. Lawrence, Nova Scotia:

From the occurrence of a similar wave disturbance at Bay St. Lawrence some years before, as reported, it would be inferred that the surface of the sea bottom is unstable off the coast of Northern Cape Breton, and that such disturbances may recur until the area has arrived at a state of stability.

No event-specific search was initiated for this event because of time constraints and no overall search of a long run of newspapers for the area has been carried out as yet.

Smith (1962) lists no likely Atlantic Provinces events in 1908 to cause a tsunami in this area of northern Cape Breton Island.

DISCUSSION AND CONCLUSIONS:

This reference seems to suggest a tsunami-like event "some six years before" the May 1914 tsunami - ie. in 1908 some time. We note that the known Monday, December 20, 1909 earthquake in the area of the North Peninsula, Cape Breton was only 5.4 years before the May 1914 tsunami; and possibly

CIRCA 1908(?) TSUNAMI(?) EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

this poorly documented tsunami was in fact caused by the December 20, 1909 earthquake? This event requires more research, and possibly a thorough search of Cape Breton newspapers for 1908-1909 might provide more details. If tide gauge records are still available, they might allow the exact date to be determined. The worldwide earthquake epicentre file (NEIS) should be examined for 1908-09 to see if there were any Atlantic events large enough to have possibly caused a tsunami in northern Cape Breton Island. At this point the possible tsunami event should not be entered into the tsunami section of the CEEF until the event is confirmed*.

* Note added in proof: Professor Ken B. S. Burke, Department of Geology, University of New Brunswick, Fredericton, New Brunswick, has provided us documentation of a tsunami which occurred in daylight hours on September 11, 1908 in the Baie des Chaleurs area of the Gulf of St. Lawrence. This may be the tsunami to which Professor D. S. McIntosh (1919) obtained an oblique reference in his interview of Mr. A. H. McIntosh of Pleasant Bay, Nova Scotia. Bay St. Lawrence however is not directly on the Gulf of St. Lawrence and is just east of the narrowest part of the Cabot Strait (Enclosure 1). It may be that one could not reasonably expect the same tsunami to be able to affect both the Baie des Chaleurs, south of the Gaspé Peninsula, and Bay St. Lawrence, in northern Cape Breton Island, east of Cape North, because of geographical restrictions?

DECEMBER 20, 1909 EVENT

EPICENTRE LOCATION:

Smith (1962) and the CEEF list the epicentre at 46.5° N, 60.5° W on the east side of the North Peninsula of Cape Breton Island. This epicentre will almost certainly be revised when the results of the event-specific search are plotted and evaluated; it may be closer to Lake Ainslie.

MAGNITUDE:

Smith (1962) lists an intensity of VI on the Modified Mercalli Intensity Scale of 1931 which converts to a magnitude of 4.0 on the CEEF. The magnitude too may be subject to revision once the event-specific search is evaluated.

DATE:

Monday, December 20, 1909. Smith lists December 19 or 20, 1909; we believe this can now be resolved.

TIME:

1500 AST (1900 GMT)

SUMMARY OF REPORTS:

Felt in northern Cape Breton Island at Mabou, St. Anns, Baddeck, Orangedale, (not at Grand Narrows), West Bay, Margaree, Inverness County, Inverness, Port Hood, Nyanza, Munro's Point on the northern side of St. Ann's Bay, Whycocomagh, mouth of Middle River 15 miles northeast of Orangedale, ("was not felt along the southern part of the Strait of Canso"), Judique, (not at Ingonish), Keppoch district of Antigonish County and Lake Ainslie where McIntosh (1913) reports, "it is said that a fracture was made in the cement walls of a cellar by the shock" (in a paper presented February 14, 1910).

REFERENCES AND TRANSCRIPTS:

Smith lists this event on December 19 or 20, 1909 as felt, "throughout" Cape Breton Island per the transcript below (the 'cables' he refers to are not offshore telegraph cables but rather onshore overland telephone wires):

249. 1909 December 19 or 20. 3:00 p.m. VI. 46.5° N, 60.5° W. Felt throughout Cape Breton, N. S. News of the shocks was said to have been delayed by the breaking of cables. B5, S1.2, S2.

In the various newspaper accounts cited below there were three specific notes that the event was not felt in certain communities of Cape Breton; Ingonish, Port Hawksbury and Grand Narrows were mentioned in this regard. Only one off-island area was mentioned in the Antigonish Casket; that was the Keppoch district of Antigonish County which is near Antigonish at $45^{\circ} 30' N$, $62^{\circ} 09' W$ on modern day maps; it is now a ski area.

DECEMBER 20, 1909 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The real challenge for the researcher on this earthquake is to nail down the date. Smith and his references ran into the same problem we did. We have several Tuesday, December 21, 1909 newspaper articles with Sydney or Halifax, Monday, December 20, 1909 datelines that refer to the event as, "an earthquake yesterday afternoon." ie. Sunday, December 19, 1909. We have one reference that seems derivative in nature that actually uses "Sunday".

However, no articles on this event appear until Tuesday, December 21, 1909; none appear on Monday, December 20, 1909. As well all the newspapers using the Sydney or Halifax, December 20, 1909 datelines to begin their articles with state, "Northern Cape Breton was shaken by an earthquake yesterday afternoon," and all appeared on Tuesday, December 21, 1909. Most of these articles imply they are "special to the Morning Chronicle" or as, "By Telegraph, Special to Yarmouth Herald" and we are not convinced that a "special report would be delayed a full day. We believe the dateline December 20 refers to the day of the event (though perhaps by error).

Brooks (1960) also notes this earthquake as his item 341 and cites no ambivalence re the date. His entry reads:

341 1909 12-20 2000 GMT ca. Felt in part of Inverness County, Nova Scotia

The rather independent reports of The Sydney Record of Tuesday, December 21, 1909 on p. 1, col. 5 (top) refers to "a slight earthquake shock was felt yesterday..." which is Monday, December 20, 1909. Most convincing is an article in The Casket of Antigonish on Thursday, December 23, 1909, on p. 8, col. 1 which presents some quite independent news such as the felt location in the Keppoch District of Antigonish County; this report twice refers to the event, "on Monday" ie. on Monday, December 20, 1909. B. A. McIntosh (1913) in his brief note on the event also uses, December 20, 1909 ie. the Monday. We accept the date Monday, December 20, 1909.

The same article appeared in at least four papers virtually word for word outside of differing headlines and datelines. The same article appeared in the Tuesday, December 21, 1909 Sydney Daily Post on p. 1, col. 1; in The Morning Chronicle of Halifax on Tuesday, December 21, 1909 on p. 1, cols. 2 and 3; in the Amherst Daily News of Tuesday, December 21, 1909 on p. 1, cols. 3 and 4; and in the Halifax Herald of Wednesday, December 22, 1909 on p. 9, cols. 4 and 5. A transcript of the Sydney Daily Post article of Tuesday, December 21, 1909, p. 1, col. 1 is found below:

NEW EXPERIENCE IN CAPE BRETON

Heavy Shock Of An Earthquake Felt From St. Ann's On The East To Inverness On The West

Northern Cape Breton was shaken by an earthquake yesterday afternoon, the effects of which were felt

DECEMBER 20, 1909 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

from Mabou on the western coast of the Island to St. Anns on the east. Communication with Inverness was wholly off last night. The shock was felt there more severely than in any other section of the Island, and after three o'clock yesterday afternoon it was impossible to get in communication with that section of the Island. While it was not thought there has been any severe damage there, some anxiety was felt last night over the interruption of communication.

News By Telephone.

The first news of the disturbance came from Baddeck. The telephone central there reports that between three and half past three the town was rocked by a seismic disturbance of considerable force. St. Anns, on the eastern coast, also reported a severe shock.

At Orangedale.

Reports came in next from Orangedale of a disturbance there. The telephone control at that point stated that shortly after three o'clock the village was startled by a heavy rumbling sound. At first it was thought to be an express train running at high speed, but in a moment the ground began to sway and tremble. Dishes and light articles danced around on the shelves and a store was badly shaken.

No Special Damage Reported.

No damage was reported on the line of the Inter-colonial. The operator at Grand Narrows station stated that the earthquake had not been felt there, but Orangedale station, before it closed for the night stated that in addition to the shock there, West Bay, Mabou and Margaree had also been visited by the trembler.

Inverness Cut Off.

But no news could be secured from Inverness or Port Hood last night. All the evening the long distance operators in the Sydney central endeavored to establish connections with these points, but every attempt proved futile. The wires all failed to respond and about eleven o'clock the Sydney office concluded that the earthquake was responsible for the

DECEMBER 20, 1909 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

derangement of communication. Judging from the force of the disturbance in other sections of the country, it is not thought that the quake could have been severe enough in Inverness to have caused any damage, but the fact that no word could be got from there during the night caused some anxiety.

A severely abridged version of the above article also appeared almost as a filler in The Yarmouth Times of Tuesday evening, December 21, 1909 on p. 3, col. 4; in The Yarmouth Herald of the same day on p. 3, col. 2; and in the Liverpool Advance of Wednesday, December 22, 1909 on p. 2, col. 4. None of these articles are reproduced here in transcript since they do not add any new information.

The Sydney Record of Tuesday evening, December 21, 1909 on p. 1, col. 5 (top) does add new information and clearly indicates that the event occurred on Monday, December 20, 1909 ie, "yesterday". The article also tends to discredit the assumptions made in the earlier report that the telephone lines to Inverness were down or account of the earthquake; this article suggests that the snow storm was the sole factor per the transcript below:

EARTH TREMORS REPORTED FROM INVERNESS COUNTY

 Slight Shock Felt Distinctly at Nyanza--Storm
 Interrupts Telephone

Reports received in the city, last evening from Inverness county, that ed[sic] that what seemed like a slight earthquake shock was felt yesterday in different parts of the county.

An official of the Eastern Telephone Company, who was in communication with their manager at Inverness, was informed that the tremor was not as great as at first reported. The tremor felt at that town was but very slight, while at Port Hood there was about enough to cause uneasiness among the residents.

Shortly after the shock was felt Inverness called Baddeck on the phone to enquire if they had felt a shock, but were told that they had not experienced anything of the[sic]

The disturbance was most severely felt at Nynanza [sic], where it is said one house was quite badly shaken up and dishes thrown from the selves[sic] in the kitchen, while the disturbance was remarked throughout the village. At Orangedale also slight trembling of the earth was felt, but there was no damage done.

DECEMBER 20, 1909 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

The lines of the telephone company were down between the city and Inverness last night, but this was caused by the show[sic] storm, and not by any disturbance due to the reported earthquake.

The second widely circulated article was printed in The Sydney Daily Post on Wednesday, December 22, 1909 on p. 10, cols. 3, 4 and 5. This same article with a "Sydney, December 21." dateline and a headline, "Northern Cape Breton Was Visited By An Earthquake: Rumbblings Like Thunder" appeared in the Wednesday, December 22, 1909 issue of the Halifax Herald on p. 9, cols. 4 and 5. Similarly the Pictou Eastern Chronicle of Friday, December 24, 1909, on p. 8, col. 2 reproduced the same article with a, "Sydney, N.S. Dec. 21" dateline. We reproduce the Sydney Daily Post article of Wednesday, December 22, 1909 on p. 10, cols. 3, 4, and 5 in transcript below:

THE EARTHQUAKE SHOCK EXTENDED OVER LARGE AREA
FROM ST. ANN'S TO JUDIQUÉ

(From Yesterday Afternoon's Post)

The earthquake which shook Northern Cape Breton yesterday extended over quite a large area.

At Munro's Point, on the northern side of St. Ann's Bay, Mr. Fraser reports that the shock was quite heavy and accompanied by a deep rumbling sound which he mistook for heavy and distant thunder.

From Munro's Point to Inverness is about sixty miles, as the crow flies. At the latter place and extending easterly through Mabou the shock was quite heavy and accompanied by a heavy rumbling sound. One man describes the sound as like that made by a heavy snow slide from a roof.

At Orangedale, which is approximately as far distant from Inverness as Munro's Point is from Inverness, the shock was very distinct and the rumbling quite loud. Taking the map of Cape Breton and joining these three by straight lines we have a large triangle covering an approximate area of eighteen hundred square miles.

Whycocomagh is approximately located on a line drawn from Orangedale to Inverness or Mabou and there the shaking and the heavy rumbling noise were distinctly felt and heard.

DECEMBER 20, 1909 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

It was reported last night that a barn on the north side of Whycocomagh Bay was shaken from its foundations, but this is not confirmed.

At the mouth of Middle River, about fifteen miles in a straight line northeast from Orangedale, Widow McKenzie reports that he[sic] house was distinctly shaken and all the inmates of the house were startled by the loud rumbling that followed.

The Port Hawkesbury correspondent reports that the shock was not felt along the southern part of the Strait of Canso.

Later reports say that the shocks of the earthquake extended through Port Hood and as far as Judique. This extends the area of the disturbance considerably and shows that it extended from the shores of St. Anns Bay to Judique and from Orangedale to Inverness.

A special to the Post from Ingonish states that the shock did not extend as far north as those points, or at least is not reported in that part of the island.

Another brief article appeared in The Sydney Record on Thursday, December 23, 1909 on p. 1, col. 3 (bottom). The possible report of Mr. Angus McKenzie has not been seen:

TO INVESTIGATE THE EARTHQUAKE

Glace Bay. Dec. 23. - It is rumored that Mr. Angus McKenzie, janitor of the Brookside school, and who takes a deep interest in astronomy and all matters relating to the solar systems, intends next week visiting the region affected by the recent earthquake, with a view of making a thorough investigation. Mr. McKenzie's report will no doubt prove interesting.

The Antigonish Casket of Thursday, December 23, 1909, on p. 8, col. 1 also had an article that gave a felt report for "the Keppoch district of this County...." While Keppoch is not on modern maps a Nova Scotia gazetteer indicates that "the Keppoch", Keppoch Hills, Keppoch River and Keppoch Gulch are located about four miles southwest from Antigonish at 45° 30' N, 62° 09' W; the name has been revived in the modern Keppoch ski area. The Casket article appears in transcript below:

DECEMBER 20, 1909 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

AN EARTHQUAKE shock was felt in parts of Cape Breton on Monday Districts from Mabou on the west coast of the Island to St. Ann's on the east report having been visited by the quake. No damage resulted from the disturbance. The people of the Keppoch district of this County state that there were indications of an earthquake there on Monday, distinct and loud rumbling sounds being heard.

On February 14, 1910 B. A. McIntosh, a lecturer on geology at Dalhousie University of Halifax read a short note to the Nova Scotia Institute of Science which did not appear in the Proceedings and Transactions for 1906-1910 (Volume XII) until 1913. McIntosh (1913) gives the following account in the first of his two paragraphs on p. 311:

On the afternoon of December 20th, 1909, about three o'clock, a distinct earthquake shock was felt in a part of Inverness county, Cape Breton. The disturbed area embraced Port Hood, Mabou, Inverness, Lake Ainslie, Whycocomagh, and Orangedale. From beyond these localities it is not reported. In the towns of Port Hood and Inverness, it was thought that an explosion had taken place in the mines. At Lake Ainslie it is said that a fracture was made in the cement walls of a cellar by the shock. Mr. A. Stirling McLean thus describes it at Orangedale: "While not destructive or terrifying in any way, it was quite pronounced in this locality. One could feel the whole building trembled in a sort of [sic] rapid vibratory motion. Tinware and crockery on the shelves danced at a great rate. The shock lasted for about five seconds - long enough for one to realize what was taking place. A loud rumbling noise was distinctly heard before the shock which was thought by some persons to be that of an approaching train, by others that of a flue on fire."

B. D. Tennyson's (1978) article on the event (Appendix 7) is not quoted here since it is entirely derivative in nature and adds no new data.

Newspapers Searched:

Halifax Herald, searched from Monday, December 20 to Saturday, December 25, 1909; one article was found on Wednesday, December 22, 1909 on p. 9, cols. 4 and 5 (see above).

DECEMBER 20, 1909 (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Halifax Morning Chronicle, searched from Monday, December 20 to Wednesday, December 29, 1909; one article was found on Tuesday, December 21, 1909 on p. 1, cols. 2 and 3 (see above) and a second brief article, re an apparently different event, was found on Saturday, December 25, 1909 on p. 10, col. 3 re an event at Isaac's Harbour at 1530 local time, on Thursday, December 23, 1909.

Halifax Acadian Recorder, searched from Monday, December 20, 1909 to Saturday, January 1, 1910 (not published on December 25, 1909; no articles were found.

Sydney Daily Post, searched from Monday, December 20 to Friday, December 24, 1909; 2 articles were found (see above); the microfilm for these issues at the Public Archives of Nova Scotia is very dark and somewhat better microfilm is available at the Beaton Institute, University College of Cape Breton.

Sydney Record, searched from Monday, December 20 to Monday, December 27, 1909; one article was found (see above).

Antigonish The Casket, searched from Thursday, December 23 to Thursday, December 30, 1909; one article was found (see above).

Amherst Daily News, searched on Monday, December 20 and on Tuesday, December 21, 1909; one article was found (see above).

Bridgetown Weekly Monitor, searched from Wednesday, December 22 to Wednesday, December 29, 1909; no articles were found.

Truro Daily News, all issues for December 1909 are missing at the Provincial Archives of Nova Scotia.

Pictou Eastern Chronicle, searched from Tuesday, December 21 to Friday, December 24, 1909, one article was found (see above).

Yarmouth Times, searched from Tuesday, December 21 to Friday, December 24, 1909, one article was found (see above).

Yarmouth Herald, searched from Tuesday, December 21 to Thursday, December 28, 1909; one article was found (see above).

Liverpool Advance, searched from Wednesday, December 22 to Wednesday, December 29, 1909; one article was found (see above).

Lunenburg Progress-Enterprise, too faint to read and we did not persist.

DECEMBER 20, 1909 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS:

The date on this event can be resolved and put in the CEEF as December 20, 1909. A time of 2000 GMT appears in the copy of the CEEF supplied by the EPB; this should be altered to 1900 GMT (1500 AST). The epicentre should also be adjusted to reflect the area of the felt locations as seen in the above reports. The epicentre should be moved southwest into the Lake Ainslie area we believe. Once the felt area can be plotted up a new estimate of the magnitude using the approach of Nuttli and Zollweg (1974) or Street and LaCroix (1979) should be attempted. Before this is done an attempt should be made to get the few remaining newspaper references that are available. One might also check whether the event was felt in easternmost Prince Edward Island.

DECEMBER 23, 1909 EVENT

EPICENTRE LOCATION:

Near the mouth of Isaac's Harbour, Nova Scotia. The exact location of the epicentre is not known at present; it may be offshore.

MAGNITUDE: Not known at present; the intensity at the mouth of Isaac's Harbour was quite low.

DATE: Thursday, December 23, 1909

TIME: 1530 AST (1930 GMT)

SUMMARY OF REPORTS:

"distinct earthquake shock...there was no noise but simply a quivering of the ground which made some of the houses tremble."

REFERENCES AND TRANSCRIPTS:

This event is not recorded in Smith (1962) or in the CEEF. It was found in just one source while investigating the Monday, December 20, 1909 event. The article in the Halifax Morning Chronicle of Saturday, December 25, 1909 (was actually published on Christmas Day!) on p. 10, col. 3 (bottom) clearly indicates an event on, "Thursday" December 23, 1909 per the transcript below:

Earthquake Shock at Isaac's Harbor

Word was received here yesterday that at half past three o'clock Thursday a distinct earthquake shock was felt in the vicinity of Isaac Harbor Mouth. The party who reported the shock stated there was no noise but simply a quivering of the ground which made some of the houses tremble.

While a number of other newspapers were searched past Thursday, December 23, 1909 this event occurred at almost the worst time to get recorded; a number of the newspapers did not publish on Saturday, December 25, 1909 (Christmas) and the issues leading up to Christmas were full of revenue-producing advertising. No event-specific search was initiated for this event since it was caught in passing thus not all possible sources for this earthquake have been searched even with the Christmas holiday problem; often we broke off on Friday, December 24, 1909 because the search had been initiated for the Monday, December 20, 1909 event on Cape Breton Island.

Newspapers Searched:

Halifax Morning Chronicle, searched from Monday, December 20 to Wednesday, December 29, 1909; one article was found on Saturday, December 25, 1909 on p. 10, col. 3 (see above).

DECEMBER 23, 1909 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched (Continued):

Halifax Herald, searched from Monday, December 20 to Saturday, December 25, 1909; no articles were found re this event.

Halifax Acadian Recorder, searched from Monday, December 20, 1909 to Saturday, January 1, 1910 (not published on Saturday, December 25, 1909); no articles found.

Sydney Daily Post, searched from Monday, December 20 to Friday, December 24, 1909; no articles were found; microfilm at the Public Archives of Nova Scotia very dark and somewhat better microfilm is available at the Beaton Institute, University College of Cape Breton.

Sydney Record, searched from Monday, December 20 to Monday, December 27, 1909; no article was found.

Antigonish The Casket, searched from Thursday, December 23 to Thursday, December 30, 1909; no article was found.

Bridgetown Weekly Monitor, searched from Wednesday, December 22 to Wednesday, December 29, 1909; no articles were found.

Truro Daily News, all issues for December 1909 are missing at the Public Archives of Nova Scotia.

Pictou Eastern Chronicle, searched from Tuesday, December 21 to Friday, December 24, 1909; no article was found.

Yarmouth Times, searched from Tuesday, December 21 to Friday, December 24, 1909; no article was found.

Yarmouth Herald, searched from Tuesday, December 21 to Thursday, December 28, 1909; no article was found.

Liverpool Advance, searched from Wednesday, December 22 to Wednesday, December 29, 1909; no article was found.

Lunenburg Progress-Enterprise; too faint to read and we did not persist.

DISCUSSION AND CONCLUSIONS:

Any other newspaper sources for this event should be carefully run to ground in the hope of getting more reports and at least confirming the event. The time of 1530 AST is close to the generally reported 1500 AST time of the Monday, December 20, 1909 event and for this reason there is a suspicion that the Isaac's Harbor Mouth event of Thursday, December 23, 1909, may be a 'ghost event' of the Monday, December 20, 1909 event.

DECEMBER 23, 1909 EVENT (CONTINUED)

DISCUSSION AND CONCLUSIONS (CONTINUED):

We have only one report from, "Isaac's Harbor Mouth". this location should be well outside the felt area for the Monday, December 20, 1909, Cape Breton Island event as detailed in the previous event-specific search and for this reason and the fact that a specific day of the week is reported we are inclined to accept this as a new previously-unreported earthquake. This event should be added to the CEEF. It could be a felt report for an offshore event in the Laurentian Slope Seismic Zone.

MAY, 1914 TSUNAMI EVENT

EPICENTRE LOCATION:

Not known; it could be a distant earthquake or possibly an event in the Laurentian Slope Earthquake Zone or more locally in the Gulf of St. Lawrence or Cabot Strait.

MAGNITUDE: Not known

DATE: May 1914; the day of the month is not known at present.

TIME: "About eleven o'clock", (McIntosh, 1919) for the 2 pulses of the tsunami; 2300 AST (0300 GMT the next day). The time of the causative earthquake is not known at present.

SUMMARY OF REPORTS:

The fishermen at Meat Cove on the northern tip of Cape Breton Island drew their boats up to a normally safe place on the beach and found they all had been swept out to sea the next morning. "The marks on the beach showed plainly that the tide had come up very much higher than usual,..., it was also noted as an unusually high tide at Pleasant Bay on the west [side of the North Peninsula of Cape Breton Island], and [at] Bay St. Lawrence and Aspy Bay to the eastward. One man near Bay St. Lawrence, at about eleven o'clock, saw it come in the form of two large seas succeeding each other, and rushing onshore. A fishing schooner lying some two miles off shore also reports several heavy seas striking the vessel about the hour mentioned; otherwise the night was calm."

REFERENCES AND TRANSCRIPTS:

This event is not recorded in Smith (1962) or in the CEEF. Smith (1962) lists a January 13, 1914 event near Calais, Maine; a February 10, 1914 event near Lanark, Ontario; a February 14, 1914 event centred north of Ste-Emelie, Quebec and an April 12, 1914 event at 1520 EST at Godbout, Quebec about 250 miles downstream from Quebec City on the northshore of the St. Lawrence River. Smith (1962) has no May 1914 events in either his Canadian or American sections.

The only report is found in Professor D. S. McIntosh's (1919) report delivered before the Nova Scotian Institute of Science on April 12, 1915. He presents the following description and facts on his pages 41 and 42 before spending the rest of the paper hypothesizing on the cause of the tsunami:

NOTES ON AN ABNORMAL WAVE OCCURRENCE ON THE NORTHERN
CAPE BRETON COAST. - BY D.S. MCINTOSH, B.A., M. Sc.,
Professor of Geology, Dalhousie University, Halifax, N.S.

(Read 12 April 1915)

The occurrence which formed the basis of this paper, while relatively of little importance, is

MAY 1914 TSUNAMI EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

thought by the writer to be of sufficient interest to be recorded in the Transactions of the Institute.

In a small indentation on the northern coast line of Cape Breton Island between Cape St. Lawrence and Bay St. Lawrence, is situated the little settlement of Meat Cove. It has no harbor, and the boats of the fishermen, after each trip, are hauled up on the beach beyond the reach of the waves.

From correspondence with Mr. Joseph O'Brien, of Dingwall, Aspy Bay, supplemented by personal observation, Mr. A. H. McIntosh, of Pleasant Bay, furnished the writer with the following description of the wave phenomenon:

The monthly bulletin issued by the Department of Marine and Fisheries, Ottawa, gives the total catch of fish for Canada, also the kinds of fish, quantities and values. It also aims at giving such information as weather conditions during the month, loss of life, boats and gear among the fishermen.

In the copy for June 1914, we find this entry: "Nine boats were lost at Meat Cove, Victoria County." Had the facts connected with this loss been given they would have interested the readers of the publication. The following statement is given as what occurred. "On the evening of the night on which the boats were lost, the fishermen had hauled them up on the beach to a place where they were considered to be in safety. A light wind began to draw from the land, and all the usual signs in which fishermen believe promised a fine night. Judge of the surprise of those men when on coming to the beach in the very early morning not only were their boats gone, but they were not even in sight on the sea. Eventually, one or two were found along the shore, but others were found only after some days had elapsed, picked up at great distances from the starting place. The marks on the beach showed plainly that the tide had come up very much higher than usual, and while at this place, it seemed to have been the highest, it was also noted as an unusually high tide at Pleasant Bay on the west, and Bay St. Lawrence and Aspy Bay to the eastward. One man near Bay St. Lawrence, at about eleven o'clock, saw it come in the form of two large seas succeeding each other, and rushing on shore. A fishing schooner lying some two miles off shore also reports several heavy seas striking the

MAY 1914 TSUNAMI EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

vessel about the hour mentioned; otherwise the night was calm. Some six years before, this same vicinity was visited by something of the same nature, but as it came in the day, it occasioned no loss."

The above account shows plainly that the disturbance was abnormal. That it falls outside the category of tide phenomena is evident. It occurred on a calm night and consisted of a succession of high waves which continued for a brief period of time. Tidal waves of the nature of a bore or as the result of conflicting currents are in the highest degree of improbable as an explanation. In searching about for a probable cause, one recalls some well-known and strikingly disasterous effects of great abnormal sea-waves.

Professor D. S McIntosh credited his account to Mr. A. H. McIntosh of Pleasant Bay who in turn corresponded with Mr. Joseph O'Brien of Dingwall, Aspy Bay; Mr. A. H. McIntosh also used his personal observations in providing his account to D. S. McIntosh. The account above refers to, "The monthly bulletin issued by the Department of Marine and Fisheries, Ottawa", then proceeds to misquote and to miscite it at the bottom of page 41.

We have, with considerable difficulty, found the original in the Department of Fisheries and Oceans library archives in Ottawa. Firstly it is not, "the copy for June 1914", one wishes but rather the copy for May's statistics which is dated on p. 4 "Ottawa, June 1914" and credited to J. J. Cowie. Cowie's (1914) short one and a half page, "Notes", on pp. 3 and 4 begins with the following general comment for the previous month of May, 1914 on p. 3:

NOTES.

Eastward of Halifax and in the Gulf generally the weather was unfavourable. Eleven small fishing boats were wrecked at Meat Cove and vicinity, Victoria County, N.S., while two Inverness county fishermen, and one Guysboro fisherman, were drowned in the course of the month.

Professor D. S. McIntosh clearly did not review the original Monthly Bulletin of Sea Fishery Statistics (Cowie, 1914) or he would have realized the tsunami occurred in May of 1914 and that eleven, not nine, boats were reported as lost.

Three local newspapers were searched and no confirmation of the tsunami event was found and no mention of an earthquake was found.

MAY 1914 TSUNAMI EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

Newspapers Searched:

Sydney Record, searched from Friday, May 1 to Monday, June 29, 1914; no articles were found.

Sydney Daily Post, searched from Friday, May 1 to Wednesday, July 1, 1914; no articles were found.

Pictou Eastern Chronicle, searched from Friday, May 1 to Tuesday, July 7, 1914; no articles were found.

DISCUSSIONS AND CONCLUSIONS:

While Professor D. S. McIntosh may have neglected to check the original Canada Department of Marine and Fisheries Monthly Bulletin of Sea Fishery Statistics there is no doubt that this account drawn from Mr. A. H. McIntosh* (and Mr. Joseph O'Brien) is an authentic account of a tsunami in May of 1914. While the exact date can not as yet be determined this event should be added to the tsunami section of the CEEF.

Any additional sources in Nova Scotia for May 1914 should be examined for a report of the day of the loss of the fishing boats from off the beach at Meat Cove and for a local causative earthquake event. The historical sources in southern Newfoundland and Saint-Pierre should be examined to see if an earthquake in the Laurentian Slope Earthquake Zone might be the cause. Similarly, the worldwide earthquake file (NEIS) should be examined for May 1914 to see if any Atlantic events could have caused this event. The tidal records at Halifax or elsewhere in the immediate area of northern Cape Breton Island for the night periods of May, 1914 should be examined for evidence of this tsunami event.

* We suspect that Mr. A. H. McIntosh was related to Prof. D. S. McIntosh; he may have been his father(?).

JANUARY 22, 1915 EVENT

EPICENTRE LOCATION:

Smith (1962) lists an epicentre of 41.0° N, 60.0° W on the continental rise well south of Sable Island, Nova Scotia.

Smith (1962) lists an intensity of VI on the Modified Mercalli Intensity Scale of 1931; this converts to a magnitude of 5.0 on the CEEF.

MAGNITUDE: Friday, January 22, 1915.

DATE: not known, Smith (1962) does not list a time

SUMMARY OF REPORTS:

We have been able to locate the two references that Smith (1962) refers to but they add little to his report as item 349 in his American section. The British ship M/V ALEPPO reported a "tremendous shock" in the Atlantic.

REFERENCES AND TRANSCRIPTS:

Time did not permit an event-specific search to be initiated for this event thus we are left only with the entry of Smith (1962) made in error in the American section of his compendium on p. 297 rather than in the Canadian section: Smith (1962) records:

349. 1915 January 22. VI. 41.0° N, 60.0° W. The British ship Aleppo reported a "tremendous shock" in the Atlantic about 300 miles southeast (not southwest) of Halifax, N.S. The correction was made by Woodworth (W4.5). R1.5, W4.5.

Reid (reference R1.5) first published this report in 1916 in the American Year Book for 1915. He lead off his article with the item as follows (p. 596):

EARTHQUAKES. - the British ship Aleppo reported a "tremendous shock" in the Atlantic about 300 miles southwest of Halifax on Jan. 22.

In 1917 J. B. Woodworth published the Seventh Annual Report of the Harvard Seismographic Station for the year 1915. He also noted the event but corrected the direction from Halifax from southwest to southeast based, presumeably on the, 'personal information' he cites. His entry indicates that he may have seen this event on the Harvard Seismograph record but he does not list it on p. 112 or 127. His note re this event is as below (pp. 147-148).

According to Professor H. F. Reid (American year book for 1915, New York, 1916, p. 596, and personal information) the British ship "Aleppo" encountered a heavy shock at sea 300 miles southeast (not

JANUARY 22, 1915 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

southwest) from Halifax on January 22, 1915. On that day and for several days prior thereto the instruments at the Harvard Station recorded violent jars which were not considered at the time to be of seismic origin. The vibrations were registered most clearly on the north-south component. Shocks of the same character were ususally recorded, at various Intervals between 8 a.m. and 4 p.m., from January on Sundays when the street traffic movements about the building were at a minimum, as well as on week-days. None of the registered shocks were reported as felt by individuals.

Smith (1962) was the first to put an epicentre location on this event. He somewhat arbitrarily used 41.0° N, 60.0° W as a point about 276 nautical miles or 318 statute miles southeast of Halifax perhaps uncertain as to Reid's (1916) units. The M/V ALEPPO almost certainly would have reported in nautical miles. A point 300 nautical miles southeast (rather than southwest) of Halifax is at about 40.6° N, 59.7° W.

DISCUSSION AND CONCLUSIONS:

Time did not permit an event-specific search of this event. The superintendent's records on Sable Island should be checked for this day. If there was not a major storm one would expect such a large event to possibly be felt on Sable Island and possibly in the very southwest of Nvoa Scotia. If the M/V ALEPPO felt a strong shock so might other Nova Scotian vessels and there may have been comment in the local press as the the vessels returned to port. Various local sources including Sable Island records and newspapers should be checked for this period. The CEEF could be adjusted to give the epicentre as 300 nautical miles southeast of Halifax as 40.6° N, 59.7° W; to make such an adjustment is to assume that the M/V ALEPPO knew her position exactly and that she was exactly at the epicentre and of course neither assumption is likely quite correct.

JULY 27, 1915 EVENT

EPICENTRE LOCATION:

Smith (1962) lists this epicentre at 44.0° N, 65.0° W in southwestern Nova Scotia

MAGNITUDE:

Smith (1962) lists an intensity of V on the Modified Mercalli Intensity Scale of 1931, this converts to a magnitude of 4.0 on the CEEF.

DATE:

Tuesday, July 27, 1915

TIME:

Smith (1962) cites this as between 1100 and 1200 AST (1500 - 1600 GMT). The exact time is not known at present.

SUMMARY OF REPORTS:

Pictures on the walls were disarranged near Sable River, Nova Scotia. Felt from Mahone Bay to Shelburne.

REFERENCES AND TRANSCRIPTS:

Time did not permit an event-specific search to be instituted for this earthquake thus we are left only with the entry of Smith (1962) made from the Dr. O. J. Klotz 1905-1917 "scrapbook" maintained at the Seismological Service of Canada in the Dominion Observatory, Ottawa per the transcript below:

262. 1915 July 27. 11:00-12:00 noon. V. 44.0°N, 65.0°W. Centred near Sable River, N.S., where pictures on walls were disarranged. Felt from Mahone Bay to Shelburne, N. S. S2.

No newspapers or other sources were examined for this event.

DISCUSSION AND CONCLUSIONS:

The newspapers of western Nova Scotia should be checked for this day, almost certainly a better time will be found and possibly the epicentre location and magnitude can be adjusted. It would be valuable to obtain the "scrapbook" items from Dr. O. J. Klotz's collection. It may be worth reexamining the Dalhousie University record, if it is available, once the exact time is known.

1928 TSUNAMI(?) EVENT

EPICENTRE LOCATION:

Not known. Possible tidal wave was felt at Curling at the head of the Bay of Islands on the west coast of the Island of Newfoundland.

MAGNITUDE: Not known.

DATE: "in 1928.", exact date not known

TIME: Not known

SUMMARY OF REPORTS:

"...a tidal wave was felt"

REFERENCES AND TRANSCRIPTS:

This event is not reported in Smith (1966) or in the CEEF. The only report seen is in Keith (1930) in a discussion on tidal waves (p. 5):

"...At Curling on the northwest shore of Newfoundland a tidal wave was felt in 1928"

Smith (1966) had the Keith (1930) reference but does not list a 1928 tsunami. It is not known if he was able to dismiss it on other data; Keith (1930) gives no references and appears to mislabel the June 27, 1864 tsunami as 1863 which does not increase our confidence in his work.

If the 1928 event was a tsunami then its effect would have been greatest at Curling near the head of Humber Arm of the Bay of Islands but it should have been seen to a certain degree along the full length of the Arm.

We are inclined to be skeptical about this 1928 event until more research is done in Cornerbrook newspapers of 1928; this event may be similar to the late December, 1876 high (lunar or atmospheric) tide that was truly a "tidal wave" not a tsunami. The report of this event was found in the Halifax Citizen on Wednesday, January 24, 1877 on p. 2, col. 7 per the transcript below:

FROM BAY OF ISLANDS, NFLD. - A private letter received from Bay of Islands, Nfld., states that about the end of December an immense tidal wave swept up the way, carrying everything before it, and it was feared had caused some wrecks, though none had been heard of up to the date the letter was written. The lower flats of nearly all the houses at the head of the bay were submerged, and in one case a fisherman had to row into his house with a boat and rescue his wife and family from the top of a table. Herring had at last struck in in considerable quantities. The Bay was frozen, but not strong enough to walk on.

1928 TSUNAMI(?) EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED):

This event in late 1876 was not a tsunami and Keith's (1930) event in 1928 may not be either.

Staveley et al. cited a possible 1925 tsunami in Bonne Bay as told by a Dr. L. M. Green. This too may be an exaggerated lunar or atmospheric tide but as described in Adams and Staveley (1985) on p. 44 sounds more like a true tsunami.

DISCUSSION AND CONCLUSIONS:

The possible 1928 event from Keith (1930) should be investigated in the Cornerbrook newspaper(s) of 1928. At this point we are inclined to dismiss it as an exaggerated atmospheric or lunar tide that flooded the lower parts of the town of Curling.

JULY 24, 1985 EVENT

EPICENTRE LOCATION:

Felt on the north tip of Ubekendt Island, West Greenland. Epicentre within 10 km +/-5(?) km of 71°19'N, 52°15'W. The exact epicentre is not known at present.

MAGNITUDE: not known, fairly low, about 3.0(?)

DATE: Wednesday, July 24, 1985

TIME: between 0800 - 0900 ADT
(1100 - 1200 GMT)

SUMMARY OF REPORTS:

A light tremor felt by one person of two-person geological team, very shortly followed by at least four pulses of a small tsunami observed by three persons.

REFERENCES AND TRANSCRIPTS:

Milner, Michael W. (personal communication, October 22 and November 5, 1985). Personal report to Alan Ruffman at Ocean Mining Institute meetings on Tuesday, October 22, 1985, followed by a detailed letter dated November 5, 1985.

From: Michael W. Milner
Geologist - Geomorphologist
182 Gough Avenue
Toronto, Ontario M4K 3P1
(416) 465-0612

A transcript of the letter is below:

5 November, '85

Dear Alan

Further on the tidal wave - earth tremor. The location was westcoast Greenland 71°19'N, 52°15'W. About 25 km east on[sic = of?] the N tip of Ubekendt Island. The time was about 9 am - 10 am, 24 July, time zone two hours east of Toronto 4 hours west of Kopenhagen[sic].

My Danish-Greenlander assistant who was seated on a rock adjacent the stream in which I was processing a sample, felt the vibration "in the seat of his pants", but was not enough impressed by the motion to comment at the time - I felt nothing which is reasonable - standing in soft sand ankle deep in water. As we went down to the beach, having signaled the outboard to pick us up and return us to the M/V MASIK, we witnessed the tide go out. I considered warning the boatman, but he was almost at the beach and had turned off the motor. The first wave carried him up onto the beach leaving him high and dry; the next wave brought him further. As we disliked the idea of trying to move the boat into the water after the oscillation ceased, we took advantage of the

JULY 24, 1985 EVENT (CONTINUED)

REFERENCES AND TRANSCRIPTS (CONTINUED)

next two waves to free the boat, got in and went to the mother ship. We did not observe the waves after that as we quickly moved out to a distance where the waves seemed unimpressive. The time lapsed between the vibration and the tidal events, as recalled by my assistant upon our discussion regarding an earthquake versus an iceberg cause of the waves, was three minutes (probably a minimum time). I feel quite strongly that it was a tidal wave rather than a calving iceberg because I had experienced the latter at the previous stop in the fjord north and east from this site. The frequency of the waves from the calving berg was greater perhaps one every 3 or 5 seconds while that from the tidal wave was 10 to 15 seconds. The power boat had a draft of 3 dm. Probably the wave carried it two or three times that distance vertically onto the sandy delta. The person that might help with Greenland firsthand data would be Finn UlffMoller and some of his colleagues at GGU, Gronlonds Geologisk Undersogelse, Oster Voldgade 10, DK-1350, Kobenhaven K, Denmark. Alternately ask Barry[sic] Clarke; he spent quite a bit of time just west of this location on Svasterbook; you probably run into him at Dal.

Hope this is useful.

Mike
(signed)

DISCUSSION AND CONCLUSIONS:

This event is not seen on the Earth Physics Branch's Frobisher Bay station's record for this time; there is no event reported in the NEIS worldwide reports (Dr. John Adams, Earth Physics Branch, Canada Department of Energy, Mines and Resources, 1 Observatory Lane, Ottawa, Ontario, personal communication, circa November 21, 1985). The Geological Survey of Greenland had no field crews in the area and has no other reports (L. Thorning, Geological Survey of Greenland, Copenhagen, personal communication, telex of November 22, 1985).

The epicentre should be within about 3 minutes (minimum) travel time from the $71^{\circ}19'N$, $52^{\circ}15'W$ position given by Mr. Milner if the assistant's estimate of elapsed time is correct. We estimate this to be about 10 km. This event should be entered in the CEEF as both an earthquake and as a minor tsunami. No further work was done on this apparently previously-unreported event since it was beyond the area scope of this study.

COMMENTS ON THE CONCLUSION TO THE
EVENT-SPECIFIC SEARCH SECTION OF APPENDIX 5

Halifax, Nova Scotia got its first seismograph in 1915. While the Mainka instruments located in the old Physics building at Dalhousie were low-gain, intermediate-period seismographs of magnification less than 300 and paper speeds of 8 mm/min or 15 mm/min (Stevens, 1980) we have chosen to end the event-specific section of the report at this point. All Nova Scotian events prior to 1868 were subjected to reasonable event-specific searches; only selected Nova Scotian events from 1868 to 1915 have been subjected to event-specific searches because of severe time constraints.

As it is, this project has run very significantly over in time and could not cover all known Nova Scotian, or suspected Nova Scotian, felt events in the 1868-1915 period let alone do a search of a long run of a newspaper of record for the 1868-1915 period in Nova Scotia. There is a great deal left to do on many of the Nova Scotian or Bay of Fundy events located in the period 1868 to 1915 and the Earth Physics Branch must consider how to fill in the needed work in this period. This study has also defined many apparently new or previously-unrecorded events outside of Nova Scotia that deserve more attention by the Earth Physics Branch. The July 24, 1985 event in Greenland was caught by accident through a personal contact and is included here for the record.

APPENDIX 6

COPY OF NEWFOUNDLAND RESEARCH ON
NEWFOUNDLAND STANDARD TIME



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF CULTURE, RECREATION AND YOUTH

HISTORIC RESOURCES DIVISION
Newfoundland Museum
285 Duckworth St.
St. John's, NF
A1C 1G9

Our file 400-5

15 January 1986

Mr. Alan Ruffan
Geomarine Associates Ltd.
P.O. Box 41, Stn. "M"
Halifax, NS
B3J 2L4

Dear Mr. Ruffan:

Your letter of January 7, 1986 to the Provincial Archives regarding Newfoundland Standard Time has been referred to me for reply.

A number of years ago I perused a number of local sources to try to determine why Newfoundland's half-hour time zone exists and when it was established. Unfortunately I was unable to answer these questions using the sources available. (See attached summary of my research.)

Taking into account the vagueness of information on this topic it is difficult to respond to your inquiry regarding the time used in Bonavista in 1848. One might assume that as St. John's time is quoted in 1875 as being 3½ hours behind Greenwich Time the time in Bonavista was the same but this is just an assumption and impossible at present to document.

Sorry I could not be of more assistance in this matter.

Sincerely,

MARILYN DAWE
Historic Sites Officer

MD/kaw

Attachment

RESEARCH - NEWFOUNDLAND HALF HOUR TIME ZONE

Having perused a large number of local primary and secondary sources it appears that there was no Newfoundland legislation regarding time prior to that concerning Daylight Savings Time which was passed in the early 20th Century.

There was however accepted practices regarding time and its measurement in place in Newfoundland ie. St. John's much earlier. As early as 1842 a newspaper reported that a gun was fired from Fort Frederick, St. John's at noon every day. The Newfoundland Almanac of 1875 compared St. John's time with other locations in the world showing it to be 3 hr 30 min behind that of Greenwich. A later Almanac (1890) showed St. John's time to be 3 hr 31 min behind Greenwich Time. A listing of time signals prepared from official sources to June 1888 by the Admiralty London states that St. John's had a gun fired at Signal Hill at noon St. John's mean time, 3 hr 30 min 43 sec Greenwich Mean Time.

Greenwich mean time had been in common usage in Great Britain in the 1850s. It was not until 1880 that it was legally adopted by that country. In 1884 international standard time with Greenwich as the initial meridian was approved by the International Meridian Conference in Washington. In local records 1880-1888 however no reference could be found of a despatch being sent from Colonial Office in Great Britain to the Governor in Newfoundland regarding either Great Britains adoption of Standard Time or the International Meridian Conference in Washington.

In the Journals of the House of Assembly of Newfoundland 1880-1910 there is no reference to time and its definition until 1908-9 when Mr. John Anderson proposed the Daylight Savings Bill. The first Acts which dealt with time, "the Daylight Savings Act" 1917 and the "Daylight Savings Act 1918" do not refer to Newfoundland Standard Time as being 3 hrs 30 min behind Greenwich (see appendix #5). It is not until 1935 with the passage of the "Standard Time (Newfoundland) Act 1935" that Greenwich is first referred to in an Act of the House of Assembly (see appendix #6). Subsequent Acts of the House of Assembly

dealing with time - 1953, 1960, 1970 - all refer to Newfoundland Time as being 3 hrs 30 min later than Greenwich Time (see appendix #7).

Having now completed a search of the more obvious sources it now appears that (1) St. John's local time being approximately 3 hr 30 min later than Greenwich time, was the accepted standard for Newfoundland during the latter part of the 19th Century and (2) it was not until the passing of the "Daylight Savings Act" in 1917 that there was any Newfoundland legislation concerning time.

APPENDIX 7

COMPENDIUM OF DIRECT COPIES OF ALL REPORTS OF EARTHQUAKES AND RELATED PHENOMENON, FOUND IN SECONDARY SOURCES DURING THE STUDY, ARRANGED IN ALPHABETICAL ORDER OF THEIR FIRST AUTHOR, ANNOTATED AS TO THEIR SOURCE AND DATE, AS WELL AS TO THE PAGE NUMBER IN THE SOURCE. REFERENCE SHOULD BE MADE TO THE SECTION OF REFERENCES USED IN THE STUDY FOR FULL DETAILS AS TO THE SOURCE. NOTE: IN A NUMBER OF CASES WHERE WE HAVE LOCATED AND USED SMITH'S (1962) REFERENCES, WE HAVE NOT REPRODUCED THEM IN THIS APPENDIX.

Tremblemens de terre.

*Supplément à la liste donnée, pour 1818, dans le
tome IX, page 435.*

- 30 mai 1818, dans la matinée. *Mexico*. Les bâtimens publics, à la ville et à la campagne, souffrirent beaucoup.
- 2 octobre, 1 h. $\frac{1}{2}$ après midi. *Brunten-Sorg* (Batavia). Très-forte secousse.
- » octobre. *Islande*. Grande secousse; bruits souterrains, suivis d'une éruption du mont Hécla.
- 11 octobre. *Nord de Québec*. Secousses assez fortes.
- 31 octobre. *Dalton* en Lancashire.
- 10 novembre, à minuit 20'. *Inverness*. Secousses pendant 3 secondes; bruit semblable à celui du tonnerre.

4. Earthquakes.

Early in the morning of the last day of May, a severe earthquake was felt at Mexico, which did much injury to the city. Many of the public buildings suffered materially. A number of the arches of the aqueduct of Santa Fé were rent and discharged quantities of water, and the aqueduct of Belen and nine bridges were greatly injured. The hospitals, military quarters, cathedrals, churches, and other large buildings did not escape the effects of the shock.

A dreadful shock of an earthquake was felt in Iceland in October, accompanied with subterranean noises and horrid crashes, at the close of which an eruption from Mount Hecla commenced.

An earthquake, sufficiently powerful to shake the windows and furniture of houses, was felt on the 11th of October, along the base of the mountain north of Quebec.

A shock of an earthquake was felt on the 31st of October, at Dalton, in Low Furness (Lancashire). A shock was felt near the same place about a year ago; and it is said that such convulsions are not rare in the line of country which extends along the western coast from Lancashire to Ayrshire in Scotland.

A smart shock of an earthquake was felt at Inverness, and to some distance round the town, at about 20 minutes past 12 a'clock, on the night of Tuesday November 10. It was felt with great violence along the banks of Loch Ness. The motion continued nearly three seconds, and was accompanied by a noise like thunder. Lighter shocks were also felt on the evening of Tuesday, and at four in the morning of Wednesday.

A slight shock of an earthquake was felt at Bangor, on Monday Dec. 7, about nine o'clock in the morning. It was much more sensible in the neighbourhood of Penter, where it was described as if the earth sank nearly a yard from under the feet.

Diary: Anonymous (1860 - 1870)

Community: "Preliminary research indicates that the anonymous diarist may have been a 63 year old (1860) Nova Scotia spinster living near Annapolis Royal, possibly at or near Mochelle, about 3 miles east of Annapolis Royal on the south side of the Annapolis River."

Name: Anonymous, probably a 63 year old (in 1860), spinster

PANS Call No.: n/a Diary is held by L. W. Collins, 6443 London Street, Halifax, N. S. It was found in a second-hand book store (Schooner Books).

Dates Covered: Sunday, September 30, 1860 to Tuesday, December 28, 1870

Other Data or Comments: "The daily records appear to indicate that the writer was a woman of considerable intelligence, some education, a shrewd observer of the world around her. Her record of nearly a decade of life in the Annapolis Valley between Bear River and Bridgetown, but especially in the immediate vicinity of Annapolis Royal, provides the reader with a unique window on the past." (Personal communication, Lou W. Collins, 6443 London St., Halifax, Nova Scotia, letter of February 4, 1987.)

Dates Examined, Transcripts, Findings: October 22, 1869
"mild This morning we were visited with the heaviest shock of an Earthquake I ever felt being the seventh I have felt (warm and pleasant)"

October 21*, 1870
"dul[sic] but warm a heavier shock of an Earthquake than I ever heard of in this place, but only in some places"

* 'This report may be incorrectly dated. Diarist recorded nothing between October 18 and 20th. For October 20th, 1870 she noted: "dul[sic] rainy but warm" (Personal communication, Lou W. Collins, 6443 London Street, Halifax, Nova Scotia, Letter of February 4, 1987.

Le petit archipel de Saint-Pierre et Miquelon, possession française de l'Atlantique nord, constitue au point de vue géographique et géologique, une simple dépendance de Terre-Neuve, territoire situé dans l'une des régions les plus stables du globe.

Les recherches que j'ai entreprises dans ces îles, en 1932 et 1935, m'ont montré qu'elles étaient entièrement formées par des roches éruptives et métamorphiques très anciennes et par des terrains sédimentaire d'âge principalement précambrien et cambrien, peut-être aussi silurien. A partir de cette époque, les

samment violentes pour être ressenties par les habitants, car la colonie ne possède pas de séismographe, il était intéressant de recueillir quelques données sur celles dont on conserve le souvenir. J'ai pu seulement obtenir, jusqu'à présent, des renseignements relatifs à deux tremblements de terre.

Le plus ancien se produisit le 21 août 1904. Des secousses furent ressenties ce jour-là à Saint-Pierre à 20 heures (heure locale). Venant du Sud-Ouest et se dirigeant vers le Sud-Est, elles durèrent pendant quelques secondes.

Le tremblement de terre du 18 novembre 1929, le dernier en date, fut beaucoup plus violent. A 16 h. 30 (heure locale), plusieurs fortes secousses furent perçues à Saint-Pierre, se prolongeant pendant une minute environ. Elles étaient accompagnées de grondements souterrains très nets. Peu accoutumée à un tel phénomène, la population en émoi se précipita dans les rues. Il n'y eut pas d'accident ni de dégâts, mais dans plusieurs maisons les pendules s'arrêtèrent. Un peu plus tard, vers 19 h. 20, un raz de marée, certainement consécutif au séisme, envahit les quais, aux abords de la douane, sans causer cependant, lui non plus, de dommages graves.

Les secousses, également accompagnées de roulements souterrains, se firent aussi sentir à Miquelon où elles ébranlèrent simplement les maisons. On estima là, la durée du tremblement de terre à deux minutes environ. A Miquelon toujours, d'autres secousses, moins violentes mais également accompa-

gnées de grondements se produisirent à nouveau pendant quelques instants dans la soirée, entre 19 heures et 20 heures.

À l'île aux Marins, le tremblement de terre fut suivi, quelques heures plus tard, d'un raz de marée, comme à Saint-Pierre, mais beaucoup plus fort. Une vague énorme vint déferler avec une force inouïe, le long de la côte orientale, franchissant le puissant cordon de galets qui la protège sur toute son étendue, submergeant une partie de l'île et déplaçant d'énormes rochers. Deux maisons eurent leur façade défoncée, des caves furent noyées, des jardins inondés et leurs clôtures arrachées. Le long de la côte ouest de l'île aux Marins, par contre, face à la rade, le raz de marée fut beaucoup moins désastreux. Le niveau de la mer monta d'abord puis baissa ensuite d'une façon tout à fait anormale (1).

Ce tremblement de terre du 18 novembre 1929 et surtout le raz de marée qui lui succéda eut des conséquences beaucoup plus graves à Terre-Neuve, surtout sur la côte sud de la baie de Plaisance, entre Burin et Lamaline, où il causa la mort de 27 personnes. Ce séisme provoqua, d'autre part, entre les côtes américaines et Saint-Pierre, relais important pour les communications télégraphiques transocéaniques, la rupture de plusieurs câbles sous-marins.

E. AUBERT DE LA RUE.

(1) Au sujet de ce raz de marée, voir les *Annales de la Commission pour l'étude des raz de marée*, 1931, n° 1, p. 61 et p. 76.

The year 1817 was remarkable for three earthquake shocks, about sunrise of May 22nd, of a severity unusual in this part of the globe. They were felt all over the county, particularly at Digby, where houses were shaken, and the people much alarmed.

Indians supplied the new comers with eels and the flesh of the moose, to the extent of saving their lives.*

More than a hundred years ago, there was at Milton on the site of Mr. William Burrill's house, a permanent Indian encampment, or rather settlement. Their wigwams were covered with skins. At that time the spot must have suited them admirably; being at once in the woods and in the immediate vicinity of water, fresh and salt. To this Indian rendezvous, were the settlers' children in the habit of going, nor is there any tradition even, of their being violent. I have here appended a careful list of the principal.

INDIAN NAMES OF PLACES IN THE COUNTY.

ANGLICIZED NAMES.	INDIAN NAME.	SIGNIFICATION.
Yarmouth (Cape),	Keespougiac,	"A Point of Land."
" (Harbour),	Molegucoko,	"Crooked Channel."
Kelley's Cove,	Walnaic,	Any Cove.
Bunker's Island,	Menegook,	Any Island.
Chegoggin (Cove).	Isagögin,	"Place for Wares."
Chebogue (River),	'Itebögue or	"Spring Water."
" "	Te-ceboke,	"Cold Water."
Tusket Wedge,	{ Osegon and	[Uncertain.]
Eel Brook,	{ Nizigouziack,	"Place for Eels."
Salmon River,	Ooptomagögin,	"Place for frost fish."
Abuptic (Argyle).	Ponamagotty,	[Uncertain.]
Pubnico,	Pobbobteck,	[Uncertain.]
Tusket Village,	Bogbunkook,	Place where the English
	Angluseawagatty,	live. This is late Indian.
Forks,	Mawtookyac,	"Place where two
		Rivers meet."
Bad Falls,	Assookeunkaknuc,	"Crossing Place."
Argyle Lake,	Mespag,	"Sheet of Water."
Seal Island,	Camän,	"Far off Island."
Mud Island,	Camanjitel,	"Little far off Island."
Strawberry Point,	Qesawseutee,	"Projecting Marsh."
Cranberry Head.	Sooneeaty,	"Place for Cranberries."

* That the Indians were in the habit of supplying the settlers in very early times with Moose meat, and that at rates that raise a sigh for "the good old times"

Eastward of Halifax and in the Gulf generally the weather was unfavourable. Eleven small fishing boats were wrecked at Meat Cove and vicinity, Victoria county, N.S., while two Inverness county fishermen, and one Guysboro fisherman, were drowned in the course of the month.

The Lunenburg banking fleet did not land any fish during May.

With favourable weather, lobster fishing in the western part of Nova Scotia was exceptionally good.

At the Magdalen Islands herring were in abundance as usual, and many vessels got their full requirements of bait.

The total pack of canned lobsters on the Atlantic coast from the 15th of November to the end of May, was 81,702 cases; while the total shipment in shell was 68,552 cwts. During the corresponding period in the preceding year the pack was 97,039 cases, and the shipment in shell 78,813 cwts.

In northern British Columbia the weather was favourable and halibut were found to be very plentiful especially on the west coast of Queen Charlotte Islands and further to the northward and westward.

The catches in the following counties, being confined to a few kinds, have not been given in the usual tabular form:—

NOVA SCOTIA.

Antigonish County—Lobsters, 4,201 cwts. landed, value \$25,206; canned, 2,100 cases. Herring, 2,720 cwts. landed, value \$1,360; used fresh, 30 cwts.; used as bait, 1,345 brls. Value of all fish landed, \$26,566.

Hants County—Salmon, 5 cwts. landed, value \$75. Cod, 40 cwts. landed, value \$160. Herring, 10 cwts. landed, value \$15. Alewives, 430 cwts. landed, value \$580. All used fresh. Value of all fish landed, \$830.

PRINCE EDWARD ISLAND.

Kings County—Lobsters, 19,330 cwts. landed, value \$115,980; canned 9,665 cases. Herring, 8,900 cwts. landed, value \$4,450; used fresh, 7,000 cwts.; dry-salted, 950 cwts. Value of all fish landed, \$120,430.

Queens County—Lobsters, 7,788 cwts. landed, value \$46,728; canned, 3,894 cases. Herring, 1,476 cwts. landed, value \$1,476; used fresh, 20 cwts.; pickled, 728 brls. Value of all fish landed, \$48,204.

Prince County—Lobsters, 11,860 cwts. landed, value \$6,336; canned, 5,930 cases. Herring, 7,433 cwts. landed, value \$6,708; pickled, 1,131 brls.; used as bait, 2,021 brls. Quahaugs, 170 brls. landed, value \$170; used fresh. Value of all fish landed, \$5,170.

Totals for Prince Edward Island—Lobsters, 38,978 cwts. landed, value \$169,044; canned, 19,489 cases. Herring, 17,811 cwts. landed, value \$7,802; used fresh, 7,020 cwts.; smoked, 950 cwts.; used as bait, 2,749 brls.; pickled, 1,131 brls. Quahaugs, 170 brls. landed, value \$170; used fresh. Value of all fish landed, \$177,016.

NEW BRUNSWICK.

Albert County—Lobsters, 12 cwts. landed, value \$252. Cod, 14 cwts. landed, value \$70. All used fresh. Value of all fish landed, \$322.

3

63298—1½

QUEBEC.

Saguenay County—Herring, 5 cwts. landed, value \$5; used fresh.

On page 18 will be found the total results of the sea fisheries for the whole of Canada for May, together with the results for May, 1913.

N.B.—The values herein shown are based on the prices of the various kinds when first brought to land by the fishermen. The figures contained in the monthly bulletins are subject to revision before publication in the Annual Report.

Ottawa, June, 1914.

J. J. COWIE.

1817.

May 22nd.—The shock of an earthquake was felt at Lunenburg. At the same time houses were shaken, and furniture moved at Digby. Shocks were also felt at Granville, Annapolis, and Wilmot.

Continued

1869.

October 5th.—The storm and high tide predicted by Captain Saxby occurred at this date. Much damage was done along the Bay of Fundy shore, but on this Atlantic coast, there was comparatively slight loss of property.

The late Adolphus Gaetz, Esq., from whose journal some of these items are taken, kept an account of earthquake shocks which were sensibly felt in Lunenburg, and which occurred almost at the same time in two successive years.

Friday, October 22nd, 1869.—“About ten minutes before six this morning, an earthquake shock was very sensibly felt by most of the persons of this town. Scarcely a house but rolled like a ship on the ocean—the whole of my house cracked and creaked as though it was tumbling to pieces. The pictures swung on the walls. The church bell tolled once or twice from the shaking of the tower. A bedstead on castors in one house rolled two feet away from the wall, against which it had been placed.”

Thursday, October 20th, 1870.—“At noon an earthquake was experienced, which was considerably felt through the greater part of this town. In my house the family rocked on their chairs. The girl in the kitchen, hearing a rumbling noise, looked out of the door, but seeing nothing she became quite alarmed. In the Academy near my dwelling, the walls were cracked in several places.”

Continued

1871.

"At sunset, on Sunday, June 4th, a violent squall of wind was felt at Lunenburg, followed by thunder and lightning. Next morning rain fell, leaving a thick scum, which some surmised was sulphur. Intelligence came from St. John, N.B., that on Sunday evening there had been a shower of sulphur, and another on the Tuesday following, and it was reported that many persons were alarmed. Passengers by steamer from Boston to St. John, saw the water in many places covered with a thick coat of sulphur."

Thursday, October 12th.—"Forenoon at Lunenburg cloudy and calm. About three o'clock p.m., the wind commenced blowing from the eastward, steadily increasing until 6 p.m., when it drew more to the southward, and blew a perfect hurricane, with storm of rain, and more destructive than any experienced for many years. An unusually high tide covered most of the wharves, and much damage was done to wharf property and shipping. All the wharves but one were literally torn to pieces, the logs and planks drifted in all directions, and most of them were lost. Vessels in the harbor were driven up on dry land, boats were broken up, fish stores demolished, and the greater part of the fish carried away."

1882

December 31st.—Sharp shock of earthquake felt throughout the county. Commenced with heavy, rumbling noise, like distant thunder. Time at Lunenburg, fifteen minutes to ten p.m. Houses rocked there, in some cases so as to shake articles from mantel-pieces. Felt sensibly at Halifax, Truro, Annapolis and other places.

1884

February 28th.—There was an unusually high tide at Lunenburg. None such known for years. Two stores for fish-curing floated from foundations—one one hundred feet away. Much damage at Blue and Black Rocks.

Continued

October 1869

Friday, 22nd,—Earthquake. About 10 Minutes before 6 o'clock this morning, the end of an Earthquake was very sensibly felt by most of persons of this town; scarcely a house but what rolled like a ship on the ocean; the whole of my house cracked and cracked as though it was tumbling to pieces; the pictures swung on the walls and for the short time it lasted was truly frightful. Nearly all the families in town, who were sleeping at the time, were aroused from their slumbers. The Church Bell toll'd once or twice from the shaking of the tower. One person whose Bedstead stood on Castors, and was placed against the Wall roll'd two feet away; every house felt it more or less.

Continued

The Diary of Adolphus Gaetz
(Charles Bruce Ferguson, 1965)
p. 100, centre
(diary covers May 1, 1855, to March 18, 1873
for the town of Lunenburg)

October 1870

Thursd. 20th,—Earthquake. At noon an Earthquake was experienced which was considerably felt through the greater part of this town, in my house the family rocked on their chairs; the servant girl in the kitchen hearing a rumbling noise as if waggons were passing the house, looked out of the door but seeing nothing she became quite alarmed. In the Academy, near my dwelling, the walls were cracked in several places.

The Diary of Adolphus Gaetz
(Charles Bruce Ferguson, 1965)
p. 101, lower half
(diary covers May 1, 1855 to March 18, 1873
for the town of Lunenburg)

Predicting earthquakes in Atlantic Canada remains "guessing game"

For most of us the Atlantic provinces are a region of tranquillity: Solid, rockbound coastlines surrounding granite outcrops which display scars of earlier unsuccessful glacial assaults. Yet two earthquakes shook the southern Atlantic area and northern Maine in the past six months. The quakes were small: Less than four on a scale known to reach 8.9. But they're raising questions among scientists and environmentalists. Some wonder if the tremors are a new phenomenon caused by man's tinkering with the environment. There are fears that, whatever their cause, the quakes could affect projects like the Point Lepreau nuclear reactor or the Fundy tidal power project.

In fact, earthquakes have occurred in this region for more than 400 years. But no one understands why. Most have been minor, but there have been big, damaging ones, too. In the 1880s Moncton got a jolt estimated at about 6.5. The National Building Code ranks the Bay of Fundy area at two on a scale of zero to three, suggesting the possibility of moderate earthquake damage. In Canada, only the St. Lawrence River Valley and coastal British Columbia have higher indices. The Atlantic region rates high partly because offshore earthquakes can be sizable. In 1929 a quake

registering 7.2 hit the south coast of Newfoundland. It generated a tidal wave that struck the Burin Peninsula, killing more than 30 people and causing more than \$1-million damage.

Seismologists have given the Bay of Fundy special attention since the Point Lepreau power plant got under way. Moreover, construction may soon begin on a preliminary small-scale tidal barrier in the Bay, and a new wrinkle has appeared. Will the raising of the tides by a full-scale barrier cause earthquakes?

Scientists have known since 1936 that, in earthquake-prone areas, tremors increase sharply with the filling of reservoirs behind newly constructed dams. It happened first when Lake Mead rose behind the then-new Hoover dam. They believe high water pressure spreads to the rocks below and increases the stress. A study at Lake Mendocino, a reservoir about 150 km north of San Francisco, showed the area suffered seven earthquakes since 1959, four of them within six months of the largest water-level changes in the lake's 20-year history.

Dr. Christopher Beaumont of Dalhousie University has tried to assess the danger that could result from increased tidal loading in the Bay of Fundy. But he could neither confirm nor deny that a threat exists. So little

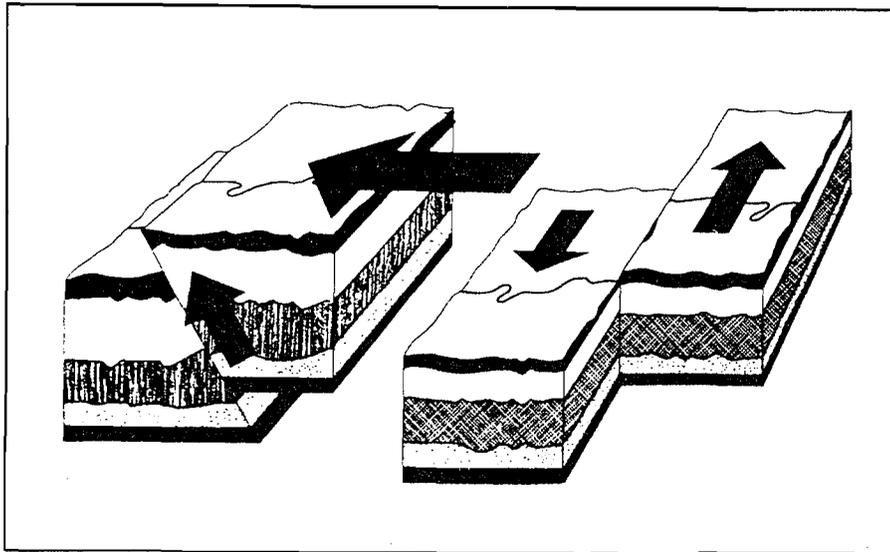
research has been done that we don't even know whether the crust beneath the Bay is under stress. But since two minor earthquakes occurred under the Bay as recently as 1975, it's clear that stresses must build up. Beaumont thinks the worst that could happen might be advancing the occurrence of a quake by a few days or years. But we need more research to know for sure.

Earthquakes happen when stresses within the earth's crust are suddenly released. Picture a fault or fracture in which both sides are trying to slide by in opposite directions. Instead they become stuck and the forces build. Rocks bulge or crack until they break. Then, both sides of the fault suddenly slip and slide, with considerable jumping and shaking, to produce an earthquake. The earthquake-rich areas of the world usually lie along plate boundaries. "Plates" are the 20-or-so interlocking pieces of the earth's crust and, since they constantly grind against each other, their edges are the sites of incredible geological activity.

Scientists have got better at predicting earthquakes in the past 10 years. But the state of the art is still like that of powered flight immediately after the Wright brothers. They've tried making complex measurements of the ability of rocks to pass electrical currents and of changes in the earth's magnetic or gravitational field. They've also tried observing the level of water in wells and the behavior of animals—methods especially popular in Russia and China. In November 1978 Russian scientists predicted a quake within 24 hours of its occurrence by observing 10 artesian wells. As soon as the rocks began to fracture, their capacity to retain water declined. The earthquake alarm went out when the wells went dry. The Chinese have shown that old superstitions about the ability of animals to sense impending tremors could be valid. Dogs often begin to bark, cattle bellow mournfully and catfish leap out of ponds. No one knows why, but research suggests the animals could be sensitive to changes in barometric pressure, electrostatic charge in the air or even high frequency sound.

Whether these advances will be useful to studies in Atlantic Canada isn't clear. We are several thousand kilometres from the nearest plate edge and conditions could be quite different from those where research activity is most intense. Until we've done more of our own homework, predicting where, how and why a quake may strike here remains a guessing game.

—Robert Fournier



In two faults, plates rear up (left) or grind against each other (right)

The river fishery, which was one of the principal attractions to the early settlers, and sometimes supplied them with 1,000 barrels of Salmon in a season, though much injured by the erection of Mills, is still productive, and at the mouth of the harbour great quantities of mackarel and herrings are taken every year in seines. a short distance up the river, there is another wooden bridge about 300 feet in length, situated near the "falls," a beautiful cascade, around which are settled 50 families. In the year 1813 Liverpool was visited by a very extraordinary influx of the sea. On the 19th of January, there was a severe gale of wind from the southward, which terminated at 5 o'clock on the morning of the 20th in a thunder storm. From that time the weather had become moderate, the wind had ceased and the water was calm. At 11 o'clock in the day it began to blow violently from the South East, and immediately afterwards from the Northward, when the sea appeared to have suddenly risen 6 feet above its ordinary level, and to be rushing with prodigious violence into the harbour. The vessels at the wharves were swept away in an instant, some of them having broken their fastenings, and others torn away the piles to which they were attached. Five of them were forced up the river, with as much velocity as if they had been under a press of sail, and on the reflux a large brig and a ship were driven over the bar and carried out to sea. At the falls the Ice was immediately floated, and on its rise destroyed the bridge. In less than an hour the agitation of the water subsided, and was succeeded by a breeze from the North East, attended with sleet and hail. A rumbling noise, not unlike that of thunder, having been heard a short time previous, and no similar influx having been perceived in any harbour on the coast, this phenomenon has been generally attributed to the shock of an Earthquake.

History of Nova Scotia,
 An Historical and Statistical Account of Nova Scotia
 (Thomas C. Haliburton, 1829; reprinted 1973)
 p. 147 bottom
 p. 148 top

Note: Only the footnote is of interest
The included paragraph is taken out of
context and is of no consequence except
to show footnote.

He drew up a statement of his claim, under the transfer of Sir William Alexander to his Father; and in conjunction with Thomas Temple and William Crowne, petitioned the Protector for a grant of Nova Scotia. This memorial met with a favorable reception in England, and Oliver Cromwell, by letters patent under the great seal, Dated 9th August, 1656,* granted to him, by the style of Sir Charles La Tour, and his two associates, all that extensive Country contained within the following bounds, commencing at Merliguesch, (now Lunenburg) and extending from thence to Port La Have, thence following the

* In the year 1663, (January 26) a terrible Earthquake was felt in the northern parts of America, but Canada was the chief seat of its concussions—"the doors opened and shut of themselves, with a fearful clattering—the bells rang without being touched—the walls split asunder—the floors separated and fell down—the fields put on the appearances of precipices—and the mountains seemed to be moving out of their places; many small rivers and fountains were dried up; in others the water became sulphureous, and in some the channel in which they ran before was so altered, that it could not be distinguished; many trees were torn up and thrown to a considerable distance, and some mountains appeared to be much broken, and moved half way between Tadousac and Quebec—two mountains were shaken down, and formed a point of land, which extended half a quarter of a league into the River St. Lawrence.—The island Aux Coudres became larger than it was before, and the channel of the River became much altered.—Memoirs Am. Acad. Arts and Science. 1st. 263—and 1st. Holmes 389.

* The only English Colonies on the American Continent, after an emigration of half a century, were Virginia, New England, and Maryland, which are supposed to have contained, in 1660, no more than eighty thousand inhabitants.

History of Nova Scotia,
An Historical and Statistical Account of Nova Scotia
(Thomas C. Haliburton, 1829)
p. 63-64, footnote and continuation on next page

Shake, Rattle and Roll

It's been 50 years since Halifax last experienced an earthquake. They used to occur regularly

Earthquakes in Halifax? Yes! And throughout the Maritimes as well. They were once so frequent on Canada's East coast the Micmacs and Maliceets created the legend of Kuhkw, a subterranean god who walked with loud thundering feet and who shook the earth so violently even the Blomidon cliffs, the lodge of the great Glooscap, trembled at his step.

There have always been skeptics. Halifax merchants, in 1764, pooh-poohed the *Royal Gazette's* September 30th news item that a "severe earthquake" shook the trading settlement at the mouth of the River St. John. It began at 12:00 noon, the newspaper reported, with a low subterranean rumble that preceded the quake. Nothing spectacular, just shaking and rumbling. No fissures, cracked walls, nor broken dishes. Neither Halifax nor Boston reported similar earth tremors. Bah!, the Halifax merchants and government officials scoffed. They attributed the earthquake along the St. John River to a bad batch of Josh Mauger's Halifax rum.

But it wasn't rum devils in 1817. This time, foundation stones quaked from Halifax to Fredericton. Even Bostonians, 500 miles southwest, trembled in their feather beds at what their Puritan minds saw as a sign of God's wrath.

Digby settlers claimed a hollow roar welled from the earth before the shaking. A wind gathered out in Fundy Bay and blew so hard from Digby Gut to the Halifax wharves that it bent even the tallest of His Majesty's mast pine. The actual quake lasted 15 seconds; enough time, however, to chase the most hardened Halifax toughs from their bar stools to their knees. For a long minute after, the air filled with a dull moaning sound like that of a cow after calving. Then it was over, as quick as that, all back to normal. The churches emptied and the grog shops filled.

For many years after, grandfathers and fathers sat near the fire, a clay pipe in one hand and rum bowl in the other, and told the children, "The one in '17, now there was an earthquake..." Before the wide-eyed nippers had matured and married, however, they experienced one for themselves.

On February 8, 1855, at 7:00 a.m., after the coldest snap of weather in nigh 30 years, a "violent shock of an earthquake was felt in Halifax". Furniture moved across the floors as though poltergeist haunted every house in town. Breakfast dishes danced off drop-leaf tables, fireplace spits rattled and morning molasses tea spilled from copper pots. One old Haligonian said that as he lay in bed that morning, wide-eyed and lonely, the sensation he felt "was quite delightful".

Near Pictou, shipwrights listened to the crackling of the timber on their newly built schooner and expected the three-masted vessel to break stocks and launch herself. No injuries, thank God, none reported at least, and only minor damage.

Once again, various towns throughout the Maritimes, from Halifax to Saint John, reported either a "severe shock" or "minor tremor". And later that day, the telegraph from Boston signaled that that city, too, had felt a small earthquake.

And still another generation matured, this time in 1883. A sound like rolling thunder punctuated a fire and brimstone sermon during "night watch" service at St. Paul's Church, Halifax. Many parishioners wondered at rolling thunder in January, particularly since the air outside crackled from the cold. An unusual cold. No winter like it in 30 years. Not since the last... The minister stopped preaching, surprised that his sermon, written in haste the night before, had evoked such an immediate result. The plaster walls of the church cracked like thin ice

under foot, and a crucifix swayed in time to the ringing steeple bell.

The same throughout the town; knick-knacks and lamps fell off mantels; gilt-frame mirrors, the rage of Victorian Halifax, jumped from their nails and smashed on the floor. A reporter for the *Novascotian* said he felt as though he were asea in a single jib "fore and after". Had he been, he would have surely drowned. Captain Ross was on board the steamer Eureka off the coast of Seal Island that night of January 3rd. He saw a bright flash of light far in the distance, then the sea swelled and crested in one huge 20 foot wave.

Despite Palmieri's invention 30 years before, not one seismograph was near enough to record the movement of the 1883 quake. It wasn't until 1929 that an accurate measurement of a Maritime quake was made — as late as that, November 18, 1929.

Many old folks today will wink at you and joke that the great stock market crash precipitated the '29 quake. There's memory and fireside talk for you, making jokes about what was frightening. And frightening it was.

In Halifax, the scars from the big explosion 12 years before were still vivid — vacant lots and gravestones. So at 4:34 p.m. when buildings started shaking like top-sails in a storm every downtown office and department store cleared faster than a school at recess. Old nightmares of that 1917 disaster painfully flashed through many minds. Secretaries fainted at the sight of plaster cracking and crumbling from the walls and their male co-workers, nearly frozen from fright themselves, swallowed their fear and carried the faint females to the street.

Chimneys crashed through roofs into attics and second floor flats. Parked autos bounced about like bumper cars at a fair. Roadways buckled and split as though the spring frost heaves were five months early. And the Telephone Company's main

switchboard blazed like a theatre marquee; more than 25,000 calls in less than an hour.

Cape Breton women crammed into churches to pray for their husbands, sons, and lovers who were hundreds of feet down in the collieries. The miners themselves huddled together in the dark bowels of that convulsing beast. When the shaking stopped and they counted themselves all safe and sound, they thanked God that only weeks before they had reinforced the shaft supports.

On the coastline, the sea raged. In Newfoundland, one gigantic wave washed away fishing shacks, weirs, and dories. Tidal wave, the old folks called it, the highest wall of water they had ever seen.

Seismographs at New York City, Boston, Halifax, and Ottawa recorded that the earth's crust moved 1/10 of an inch (The 1917 explosion moved it only 1/1000 of an inch). Scientists first pointed to the Saguenay Fault in Quebec as the centre of the quake, but their opinions changed over the next few hours as more data accumulated. At 7:10 p.m. that evening, the seismograph needles jumped again when a second shock occurred. Now they were sure. The centre of the quake was the Glooscap Fault, an overlapping of the earth's crust stretching from the Bay of Fundy to the coast of Cape Ann. One massive earth plate scraping against another during normal geological shifting had transmitted a shock wave in all directions over the earth's crust. Though the wave's force dissipated as it spread, those land masses nearest the Glooscap Fault, the Maritime Provinces, suffered the greater shock.

So there we have it, a record of more than 300 years of earthquakes in Halifax, occurring with the regularity of a salmon run. Thirty to 40 years separated the earthquakes of the past. Now another generation has matured. It has been 50 years since the '29 quake — 10 more than in preceding intervals. Perhaps he sleeps. Perhaps our scientific age with its geological mumbo-jumbo about scraping plates has discouraged him from waking. Or perhaps Kuhkw patiently waits for memories to fade before again walking the nether world with loud, thundering feet.

Robert E. Kroll

EARTHQUAKES.

Two slight shocks of earthquake were felt in Yarmouth, and, in fact, throughout Nova Scotia, on the 1st February, 1848, one of them just before daybreak, the other about 8 o'clock in the morning, both accompanied by a rumbling noise.

The shock of an earthquake was felt in Yarmouth, extending eastward as far as Windsor, at 4 p. m. on June 3d, 1853.

Two slight shocks were felt throughout the Province on the 8th February, 1855.

A severe shock was experienced in Yarmouth on the 13th March, 1855, at 11 p. m., lasting 10 seconds. It caused houses to shake violently and dishes to rattle. It was accompanied by a loud rumbling noise.

A slight shock of earthquake was felt in Yarmouth on the morning of the 15th January, 1856, at 7.30 o'clock.

A smart shock was again felt in Yarmouth at 9 a. m. of May 28th, 1856.

About a quarter before 6 o'clock on Friday morning, October 22d, 1869, a violent shock of earthquake was experienced in Yarmouth. It was preceded by a rumbling noise, and lasted several seconds, making buildings tremble, dishes rattle, etc. The shock was felt throughout the Province and also in New Brunswick.

A shock of earthquake was experienced in Yarmouth on Thursday afternoon, March 7th, 1874, accompanied by a rumbling noise, and rattling of dishes, but no damage.

At 10 o'clock on Sunday evening, December 31st, 1882, a rather severe shock of earthquake was experienced in Yarmouth. It lasted for from half to three-quarters of a minute, and was accompanied by one or more flashes of light, and by a low rumbling sound resembling the rapid passage of a heavy carriage over a hard road. It was felt in Carleton, Brier Island, Shelburne and Halifax.

At low water, a little before dusk, on Tuesday evening, April 18th, 1843, the tide suddenly rushed in, in the space of a few minutes, to the height of from five to seven feet, and immediately receded with equal rapidity, dragging some small vessels from their moorings, and leaving the flats again bare. The whole took place in about 20 minutes. At Bunker Island and the Cove the water rose 10 feet. The schooner Bee, Capt. Bradford McGray, on entering Cook's harbor, was raised and lowered by the wave, striking the bottom, splitting her keel and rudder, starting one of her butts, and wrenching out a great part of her oakum.

Yarmouth, Past and Present
J. Murray Lawson (1902)
p. 617 (middle)

NOTE ON RECENT EARTHQUAKE IN CAPE BRETON.—By D. S. MCINTOSH, B. A., M. SC., Lecturer on Geology, Dalhousie University, Halifax, N. S.

Read 14th February, 1910.

On the afternoon of December 20th, 1909, about three o'clock, a distinct earthquake shock was felt in a part of Inverness county, Cape Breton. The disturbed area embraced Port Hood, Mabou, Inverness, Lake Ainslie, Whycoomagh, and Orangedale. From beyond these localities it is not reported. In the towns of Port Hood and Inverness, it was thought that an explosion had taken place in the mines. At Lake Ainslie it is said that a fracture was made in the cement walls of a cellar by the shock. Mr. A. Stirling McLean thus describes it at Orangedale: "While not destructive or terrifying in any way, it was quite pronounced in this locality. One could feel the whole building trembled in a sort of rapid vibratory motion. Tinware and crockery on shelves danced at a great rate. The shock lasted for about five seconds—long enough for one to realize what was taking place. A loud rumbling noise was distinctly heard before the shock which was thought by some persons to be that of an approaching train, by others that of a flue on fire."

The disturbance would appear to have been merely local. At no place on the Island, other than those referred to does it seem to have been noticed. On account of the small area affected, the seat of the disturbance would not likely be far removed from the surface. Nor would it likely be found in the igneous rocks which outcrop in a few places, and probably underlie the younger rocks of the district. Did a fault take place in these rocks, the effect would likely be more widespread than the recent occurrence. The cause of the shock is

Continued

rather to be sought for in the sedimentary strata that overlie the igneous rocks. Limestones and gypsum are plentiful in these. The falling in of the roof of a subterranean cavern formed by the action of percolating water on the limestones and gypsum would account for the shock. It is highly probable that such a cave-in, or a fault produced by some readjustment of the carboniferous strata, was the cause of the recent earthquake shock.

NOTES ON AN ABNORMAL WAVE OCCURRENCE ON THE NORTHERN CAPE BRETON COAST.—BY D. S. MCINTOSH, B. A., M. SC., Professor of Geology, Dalhousie University, Halifax, N. S.

(Read 12 April 1915)

The occurrence which formed the basis of this paper, while relatively of little importance, is thought by the writer to be of sufficient interest to be recorded in the Transactions of the Institute.

In a small indentation on the northern coast line of Cape Breton Island between Cape St. Lawrence and Bay St. Lawrence, is situated the little settlement of Meat Cove. It has no harbor, and the boats of the fishermen, after each trip, are hauled up on the beach beyond reach of the waves.

From correspondence with Mr. Joseph O'Brien, of Dingwall, Aspy Bay, supplemented by personal observation, Mr. A. H. McIntosh, of Pleasant Bay, furnished the writer with the following description of the wave phenomenon:

The monthly bulletin issued by the Department of Marine and Fisheries, Ottawa, gives the total catch of fish for Canada, also the kinds of fish, quantities and values. It also aims at giving such information as weather conditions during the month, loss of life, boats and gear among the fishermen.

In the copy for June 1914, we find this entry: "Nine boats were lost at Meat Cove, Victoria County." Had the facts connected with this loss been given they would have interested the readers of the publication. The following statement is given as what occurred. "On the evening of the night on which the boats were lost, the fishermen had

(41)

Continued

hauled them up on the beach to a place where they were considered to be in safety. A light wind began to draw from the land, and all the usual signs in which fishermen believe promised a fine night. Judge of the surprise of those men when on coming to the beach in the very early morning not only were their boats gone, but they were not even in sight on the sea. Eventually, one or two were found along the shore, but others were found only after some days had elapsed, picked up at great distances from the starting-place. The marks on the beach showed plainly that the tide had come up very much higher than usual, and while at this place, it seemed to have been the highest, it was also noted as an unusually high tide at Pleasant Bay on the west, and Bay St. Lawrence and Aspy Bay to the eastward. One man near Bay St. Lawrence, at about eleven o'clock, saw it come in the form of two large seas succeeding each other, and rushing on shore. A fishing schooner lying some two miles off shore also reports several heavy seas striking the vessel about the hour mentioned; otherwise the night was calm. Some six years before, this same vicinity was visited by something of the same nature, but as it came in the day, it occasioned no loss."

The above account shows plainly that the disturbance was abnormal. That it falls outside the category of tide phenomena is evident. It occurred on a calm night and consisted of a succession of high waves which continued for a brief period of time. Tidal waves of the nature of a bore or as the result of conflicting currents are in the highest degree improbable as an explanation. In searching about for a probable cause, one recalls some well-known and strikingly disastrous effects of great abnormal sea-waves.

In 1755, Lisbon was laid in ruins by an earthquake which had its origin about 50 miles off the coast. About half an hour after the shock, a succession of high waves, one of which had a height of 60 feet, reached the city and added

Continued

to the destruction wrought by the earthquake. The waves were felt with diminishing effects at great distances, even north as far as Norway, south beyond the Madeira Islands, and west in the West Indies.

Japan was visited by a severe earthquake in 1854. Its focus was also evidently off the coast, for about a half hour after the shock, a series of waves thirty feet high struck the shore and destroyed the town of Simoda. From this spot the waves radiated with diminishing force, travelling the whole breadth of the Pacific to California.

The Coast of Peru was devastated by a great earthquake in 1868. The seat of disturbance was likewise off shore, for in less than half an hour a succession of waves fifty or sixty feet high rushed in and increased the work of destruction of the earth-waves. These waves were felt thousands of miles from the seat of origin, even as far as the coast of Japan, 10,000 miles away.

Many other cases of such waves have been observed and recorded by tidal gauges, such as that of 1877 at Iquique in Northern Chile, and that of 1885 around Krakatoa. The great disturbance of 1896 in the North Pacific will be recalled by many, where 175 miles of the Japan Coast were laid waste. A great amount of shipping was destroyed and 27,000 people lost their lives.

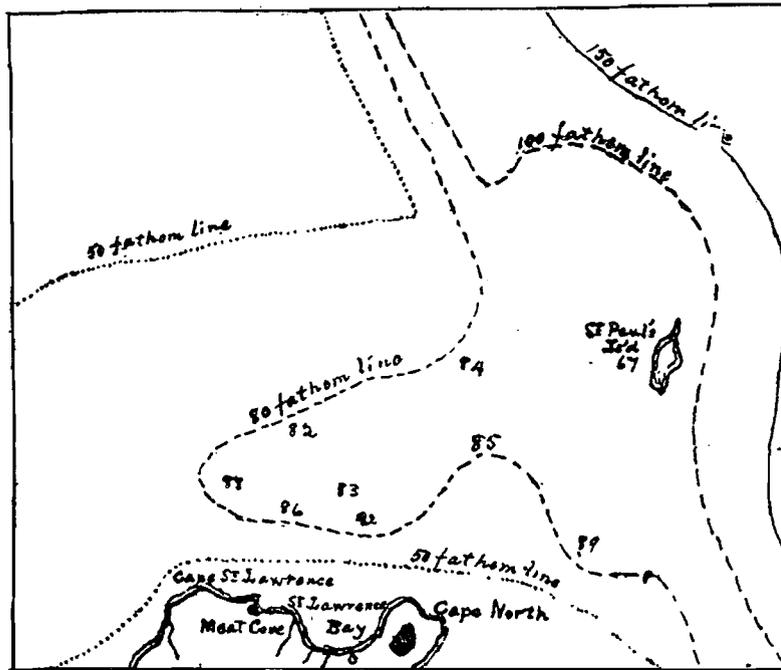
These waves are caused by a dislocation of the earth's crust beneath the sea. The break occurs most often where the water deepens rapidly, as in the case of the western coast of South America where a few miles off shore the water suddenly plunges from the edge of the continental shelf to the ocean abyss. Similarly, off the Japan Islands the descent from the land platform to the Tuscorora Deep is very abrupt. The evidence is abundant and strong that such a condition of land and sea makes a line of weakness in the earth's crust and here may, and does, occur faulting or slipping. As

Continued

44

observed from the shore, the sea, during a disturbance of this kind withdraws from the land, and then returns with great speed and height causing great destruction.

In the opinion of the writer, the cause of the disturbance in Northern Cape Breton was a slipping of the rock, either solid or unconsolidated material, off the coast of Meat Cove. The accompanying map shows the locality where the disturbance was greatest, and the adjoining areas.



It is seen that a short distance east of St. Paul's Island the water deepens very rapidly. Here is the western margin of the submerged channel of the old St. Lawrence river. The 100-fathom line approaches to within about a mile of the island. Here, where there is a declivity of steep grade, a slipping or break in the bottom might be looked for. No

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record of the disturbance, however, is obtained from St. Paul's Island, and, moreover, the description of the phenomenon localizes it rather between the island and the adjoining Cape Breton coast. The *isobathic* lines constructed from the chart show the 50-fathom line about two miles off Meat Cove, with the 80-fathom line about an equal distance beyond that. Here, in all probability, was the seat of the disturbance. A deepening of 80 fathoms in about 4 miles gives a gradient of about 1 foot in 44 feet or a $2\frac{1}{4}\%$ grade. The depths as given on the chart within the area bounded by the 80-fathom line suggest an uneven bottom where may be found steep slopes. Doubtless a large thickness of unconsolidated material has accumulated on the sea bottom. A sliding of this along the slope or a break in the solid rock would give the necessary impetus to the water to produce the waves.

When weather indications point to a calm night, boats are hauled up by the fishermen just beyond the range of high tides. The average difference between high and low water at Meat Cove, we may take as about four feet. To sweep the boats away would require an additional height of water of, say, three or four feet. Waves, therefore, of six or eight feet must have rolled in upon the shore to accomplish the work recorded. If the ordinary proportion between height and length of wave were preserved, the length of these waves must have been sixty or eighty feet. A slip of a belt of rock a hundred or so feet in width on the sea bottom near the 80-fathom line, or within the area bounded by this line would cause a gravitational movement to the water from the landward direction, followed by a return of the water, in the form of a succession of high waves. These waves would diminish in force as they radiated from the place of origin, as was observed to the eastward and westward of Meat Cove. Did the dislocation produce a rise in the sea

Continued

46

flow, the water would be lifted and the accompanying phenomena would be of the same nature as those that would occur in the case of the downward movement.

From the occurrence of a similar wave disturbance at Bay St. Lawrence some years before, as reported, it would be inferred that the surface of the sea bottom is unstable off the coast of Northern Cape Breton, and that such disturbances may recur until the area has arrived at a state of stability.

This Province, and its sister colonies, have, as well as the United States, been repeatedly subject to slight shocks of earthquakes.

The cause of these terrestrial phenomena has not yet been satisfactorily ascertained. Until recently, the subject did not engage much of the attention of scientific men, and those who have devoted any time to it differ much as to the real cause; some supposing that they are produced by the same agency as that which gives rise to volcanic eruptions,—while others affirm that they are caused by the unequal attractions of the moon on the earth's surface at its apogee and perigee; and others again attribute them to some secret and unknown action of electricity. The subject is worth much philosophical enquiry, for the sake of the advancement of science, and not that we anticipate such knowledge as may enable us to stay the mighty agent that thus powerfully operates upon our planet, but rather, if the natural causes and their operations could be discovered, we might be led more fully to adore that first great cause and grand agent who gives existence to this, as well as to all the other phenomena of the universe.

The first notice we have of earthquakes in these Provinces is to be found in Haliburton, vol. 1, p. 63; in which there is an account of one which took place on the 26th of January, 1663, and which was felt over the whole of North America. "But Canada was the chief seat of its concussions: the doors opened and shut of themselves, with a fearful clattering; the bells rang without being touched; the walls split assunder; the floors separated and fell down; the fields put on the appearance of precipices, and the mountains seemed to be moving out of their places; many small rivers and fountains were dried up; in others, the water became sulphurous, and in some the channel in which they ran was so altered, that it could not be distinguished; many trees were torn up, and thrown to a considerable distance; some mountains appeared to be much broken and moved; half-way between Tadousac and Quebec, two mountains were shaken down, and formed a point of land, which extended half a quarter of a league into the river St. Lawrence. The island Aux Coudres became larger than it was before, and the channel of the river became much altered.—Memor. Am. Arts and Science, 1st, 263, and 1st Holmes, 389."

The above extract records the most extraordinary phenomenon of this nature ever known on this part of the continent of America, though there were numerous stories related by the Indians, at the time of its discovery, of similar concussions, which produced the most wonderful results; but we have no reliable data to enable us to give any description of these events.

A little before sunrise, on the morning of the 22nd of May, 1817, three slight shocks were felt in Nova Scotia, New Brunswick, and the State of Maine. They all took place within the short space of fifteen minutes, and were accompanied by a rumbling noise like thunder; buildings were shaken, and their contents moved, so that the people became alarmed. Slight shocks were also felt in different parts of these Provinces in 1827 and 1839, but they produced no serious effects.

About seven o'clock in the morning of the 8th of February, 1855, another of these phenomena visited Nova Scotia, New Brunswick, and a part of the adjacent States. The thermometer, on the day previous, was observed to be lower than had been known, at that period, in the Province for several years. The duration of the motion was very short—not more, in some localities, than twenty seconds; in other parts of the Province it lasted a little longer; and in others there were several concussions felt; in some places slight shocks were perceived some days after. During the time of the heaviest concussions, several stone and other buildings were shaken, and furniture displaced; it produced a rumbling noise, like a chimney on fire, or distant thunder. It was felt most sensibly at the Bend, Sussex Vale, Fredericton, and other low places in New Brunswick, where the rocking motion was said to continue longer; and it is the duration of the shock that produces the greatest effects. No material injury, however, was done in any part of the country.

New Brunswick - With A Brief Outline of Nova Scotia
and Prince Edward Island

(Alexander Munro, 1855; reprinted 1972)

page 278 (bottom) through p. 279 and p. 280 (very top)

CHAPTER V.

Detention of the British fleet at Halifax during the winter of 1812.—
American privateers.—Extraordinary high tide.—Treaty of peace
signed.—Result of it to Liverpool.—Building of the drawbridge across
the river.—By whom owned.—Cost, etc.

In the year 1813 Liverpool was visited by a very extraordinary influx of the sea. Haliburton gives the following description of it. "On the 19th of January there was a severe gale of wind from the southward, which terminated at five o'clock on the morning of the 20th in a thunder storm. From that time the weather had become moderate, the wind had ceased, and the water was calm. At eleven o'clock in the day it began to blow violently from the south east, and immediately afterwards from the northward, when the sea appeared to have suddenly risen six feet above its ordinary level, and to be rushing with prodigious violence into the harbour. The vessels at the wharves were swept away in an instant, some of them having broken their fastenings, and others tore away the piles to which they were attached. Five of them were forced up the river with as much velocity as if they had been under a press of sail, and on the reflux a large brig and a ship were driven over the bar and carried out to sea. At the Falls the ice was immediately floated, and in its rise destroyed the bridge. In less than an hour the agitation of the water subsided, and was succeeded by a breeze from the north east attended with sleet and hail. A rumbling noise, not unlike that of thunder, having been heard a short time previous, and no similar influx having been perceived in any harbour on the coast, this phenomenon has been generally attributed to the shock of an earthquake."

In this year, 1638, earthquakes were felt throughout New England from the 1st to the 21st June. In Canada an earthquake was observed 11th June. At this time Boston was a village of about 20 or 30 houses. . 1 *Ferland's Canada*, p. 293.

On the 26th and 28th January, 1663, corresponding with the 5th and 7th February, new style, earthquakes occurred in New England, New York, Canada, and in Acadie. At Quebec a great earthquake was felt, and over an extent of three hundred leagues from East to West, and one hundred and fifty leagues from North to South. The sea and rivers were perceptibly agitated. The isle aux Coudres was enlarged by its effects. No lives were lost. Earthquakes occurred in North America in 1638, 1658, 1663, 1727 and 1755. [2 *Charlevoix*, 125, 134. *Rel. of Jesuits*, v. 2. 1 *Ferland*, 487.]

History of Nova Scotia
(Murdoch, 1865)
p. 136, lower half

Royal Gazette and Newfoundland Advertiser, 21 March 1848

"Earthquake in Nova Scotia

A slight shock of this wonderful natural phenomenon was felt on Tuesday morning, between the hours of eight and nine o'clock. From the information we have already obtained, we learn that the shock was experienced in some of the houses situated in the Northern part of the city, in the vicinity of Piera' Mill, and also at Porter's Lake and Lawrencetown it was the most sensibly felt at the two latter places. -Chronicle"

Transcript as taken from Staveley, Kavanagh and Meana (1984) on page 6 and from Adams and Staveley (1985) on page 36.

Royal Gazette and Newfoundland Advertiser
March 21, 1848, Tuesday
p. 2, col. 4

Note: This was the second of three items under an upper case dateline reading "HALIFAX, N.S. February 21". February 21, 1848 was a Monday, which suggests that the earthquake occurred the nearest Tuesday, February 15, 1848, "on Tuesday morning between the hours of eight and nine". However, February 1, 1848 is also a Tuesday and Smith (1962) reports an earthquake on this day in Nova and Lawson (1902) reports a quake on the same day (and at the same time).

Earthquakes in Cape Breton

B. D. TENNYSON

When one thinks of earthquakes, Cape Breton does not generally spring to mind. Rather, one thinks of Turkey, Yugoslavia or Nicaragua—places where such disasters have occurred recently—or California. And yet Cape Breton is an area where minor earthquakes (1 to 3 on the Richter scale) might reasonably be anticipated because of the island's position in what geologists call the former Appalachian geosyncline which extended from Newfoundland through Cape Breton and the eastern United States as far south as Alabama. In fact, at least three earthquakes have been recorded on the island, occurring in 1882, 1909 and 1929. Whether or not there is any significance in the fact, each has been more powerful than its predecessor.

The 1882 earthquake took place on New Year's Eve and was concentrated in the Baddeck-Middle River area.¹ Little is known about it and it appears to have been very minor in scale and did no real damage. Another earthquake on 21 March 1904 was felt throughout much of New England, New Brunswick and Nova Scotia. It was concentrated in New England, however, and the most easterly report came from Truro. Sydney's *Daily Post* gave circumstantial accounts of the shock in the district but careful inquiries by a Dalhousie University geologist at Sydney, North Sydney, Sydney Mines and Glace Bay indicated that there was no basis for the story.²

Continued

On the afternoon of 20 December 1909, however, around three o'clock, an earthquake occurred in Inverness County. The area affected embraced Port Hood, Mabou, Inverness, Lake Ainslie, Margaree, Whycocomagh and Orangedale. The tremor was not noticed elsewhere.

The first news came from Baddeck by telephone. At Orangedale, according to the *Sydney Daily Post*, the noise initially was "thought to be an express train running at high speed, but in a moment the ground began to sway and tremble. Dishes and light articles danced around on the shelves and a store was badly shaken."³ One Orangedale resident, Mr. A. Stirling McLean, described the earthquake as "not destructive or terrifying in any way" but

quite pronounced in this locality. One could feel the whole building trembled (sic) in a sort of rapid vibratory motion. Tinware and crockery on shelves danced at a great rate. The shock lasted for about five seconds—long enough for one to realize what was taking place. A loud rumbling noise was distinctly heard before the shock which was thought by some persons to be that of an approaching train, by others that of a flue on fire.⁴

A Mr. Fraser of Munro's Point on St. Ann's Bay described the shock as "quite heavy and accompanied by a deep rumbling sound which he mistook for heavy and distant thunder."⁵ In Port Hood and Inverness people understandably thought an explosion had taken place in the mines.⁶

The earthquake produced very little damage. The *Post*, unable to reach Inverness and Port Hood on the evening of the event, thought the telephone lines were down or at least damaged but this was never confirmed.⁷ It was claimed that a barn at Whycocomagh had been shaken from its foundations and that the walls of at least one cellar in Inverness were fractured. No damage was reported on the line of the Intercolonial Railway.⁸

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According to D. S. McIntosh, a Dalhousie University geologist, the shock did not result from a fault occurring in the igneous rocks which outcrop in a few places in the district. The area affected was too small for this to have been the case and the seat of the disturbance was too close to the surface. Rather, the shock must have been caused by the falling in of the roof of a subterranean cavern formed by the action of percolating water on the limestone and gypsum in the sedimentary strata that overlie the igneous rocks.⁹ Given the very limited size of the area affected and the mildness of the tremor, this may well have been a plausible explanation.

The largest and best-known earthquake occurred on 18 November 1929, at 4:34 p.m. With its epicentre in the Gulf of St. Lawrence, its greatest impact was on the Sydney-Glace Bay area, but it was felt throughout New Brunswick and as far away as Quebec City, as well as throughout New England. E. A. Hodgson, the Dominion Seismologist, described it as "a very severe earthquake".¹⁰ The tremors lasted about two minutes.

People in Sydney at first feared their furnaces were about to explode. In Glace Bay people naturally thought there had been a mine explosion. The *Sydney Daily Post* reported that

Charlotte Street business houses and stores were emptied in almost panic-stricken style, workers fleeing to the streets to escape what appeared to be imminent explosion. When they reached the street, it dawned upon them that similar conditions had been experienced in every other building, and that the city was having its first quake shock.

At the court house, where the trial of Cyril Crier was proceeding at the Supreme Court, the dignity of the court was thrown aside when the shocks began, and the jurors were the first to quit their places and make for the

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exits. Lawyers gathered their gowns about them and fled without regard to the decorum of the court. One witness, Mrs. L. Miller, of Glace Bay, fainted in the confusion, but was revived later. The court was not resumed.¹¹

Aftershocks occurred at 7:10 p.m. and 10:04 p.m. According to Dr. J. H. L. Johnstone, Professor of Physics at Dalhousie University, neither was strong enough to be perceptible except on a seismograph, although residents of Louisbourg reported feeling the earlier one.¹²

About 9 p.m. an eight-foot tidal wave rushed up Sydney harbour, "leaving in its wake considerable destruction." The Westmount Road, which runs along the shore of the harbour, was completely flooded, as was the North Sydney highway. In Sydney the entire area from the corner of Dodd and Pitt Streets to the intersection of Prince and Pitt Streets was flooded. Portions of the Prince Street bridge were swept away and several small boats in the harbour were badly damaged.

In Glace Bay the Number Six bridge was completely submerged by the tidal wave, as was the Dominion sandbar. The temporary footbridge at the foot of Commercial Street was ripped apart and its remains washed up as far as Caledonia. It was reported that large groups of people "gathered along both sides of the Harbour to witness the spectacle."¹⁴ Some were rewarded for their interest when 27 cases of whiskey were strewn over the beach. They were, needless to say, carted away before the police arrived on the scene.¹⁵ In the Canso area, the tidal wave was accompanied by gale-force winds and driving rain, which drove at least one ship, the coastal schooner *Lena M*, ashore.¹⁶

The major damage caused by the earthquake was the breakage of several trans-Atlantic submarine cables. Damage in Sydney and Glace Bay was confined to wrecked boats, fallen chimneys and broken dishes. No damage was reported elsewhere in Cape Breton except at River Denys, where two

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chimneys collapsed. Surprisingly, there was no damage or injury in the mines.¹⁷ It was estimated that the total cost of damage on the island was \$25,000. Newfoundland's Burin Peninsula, however, was much harder hit. There a fifteen-foot tidal wave swept away several houses, boats and fishing stages, killing 27 people and causing damage estimated by one local merchant, George Bartlett, of a million dollars.¹⁸

Cape Bretoners could be thankful that they had escaped with so little damage and no loss of life. The episode naturally became the inspiration for many tales for years afterwards. The earthquake has been regarded as a curiosity rather than a cause for concern or alarm. The general attitude was perhaps reflected by the advertisement placed in the *Post* on the day following the tremor by the enterprising manager of Sydney's Strand theatre. Promoting his latest film, "Woman Trap", he asserted that "just like the earthquake—this stirring picture will make everyone sit up and take notice!"¹⁹ Whether or not the film achieved this effect is not recorded. Certainly the events of that Monday afternoon in November 1929 did so.

1. *Sydney Daily Post*, 22 November 1929.
2. J. Edmund Woodman, "The earthquake of March 21, 1904, in Nova Scotia", *Nova Scotia Institute of Science Proceedings*, 11:2 (1903-4), 233
3. *Sydney Daily Post*, 21 December 1909
4. Quoted in D. S. McIntosh, "Note on recent earthquake in Cape Breton", *Nova Scotia Institute of Science Proceedings*, 12:4 (1910), 311
5. Quoted in *Sydney Daily Post*, 22 December 1909
6. *Ibid.*, 21 December 1909
7. *Ibid.*
8. *Ibid.*, 21 December 1909, 22 December 1909
9. McIntosh, *op. cit.*, 311-12
10. *Sydney Daily Post*, 19 November 1929
11. *Ibid.*
12. *Ibid.*, 19 November 1929, 20 November 1929
13. *Ibid.*, 19 November 1929
14. *Ibid.*
15. "Cape Breton earthquake", *Cape Breton Post*, 22 July 1960
16. *Sydney Daily Post*, 20 November 1929
17. *Ibid.*, 19 November 1929
18. *Ibid.*, 19 November 1929, 23 November 1929
19. *Ibid.*, 19 November 1929

APPENDIX 8

CHRONOLOGICAL COMPENDIUM OF DIRECT COPIES OF ALL THE NEWS-
PAPER ARTICLES FOUND DURING THE STUDY, WHICH DEALT WITH
EARTHQUAKES OR RELATED PHENOMENON, ANNOTATED AS TO THEIR
NEWSPAPER SOURCE, DATE OF PUBLICATION AND THE NEWSPAPER
PAGE AND COLUMN NUMBER, ALONG WITH NOTES REGARDING OTHER
RELEVANT MATTERS; A CHRONOLOGICAL LIST OF ALL ARTICLES
PRECEDES THE COLLECTION OF COPIES

NOTE: This Appendix appears as a separate Volume 2 of this
report