Industry, Energy and Technology

Mines

DETRITAL ZIRCON DATA AND MAXIMUM DEPOSITIONAL AGE ESTIMATES FROM SEDIMENTARY ROCKS OF THE CONNECTING POINT GROUP, BONAVISTA PENINSULA, AVALON ZONE, NEWFOUNDLAND (NTS MAP SHEETS 2C/05 AND 12)

A.J. Mills, C.N. Gomez and C. McFarlene

Open File 002C/0252

St. John's, Newfoundland
October, 2024

NOTE

DISCLAIMER

Departmental website: https://www.gov.nl.ca/iet
Geological Survey website: https://www.gov.nl.ca/iet/mines/geoscience
Email: pub@gov.nl.ca

Recommended citation:

Mills, A.J., Gomez, C.N.* and McFarlane, C.**
2024: Detrital zircon data and maximum depositional age estimates from sedimentary rocks of the Connecting Point Group, Bonavista Peninsula, Avalon Zone, Newfoundland (NTS map sheets 2C/06 and 12). Government of Newfoundland and Labrador, Department of Industry, Energy and Technology, Geological Survey, Open File 002C/0252, 20 pages.

* Department of Earth Sciences, MUN, St. John's, NL, A1B 3X5
** Department of Earth Sciences, University of New Brunswick, Fredericton, NB, E3B 5A3

CONTENTS

FIGURES

TABLES

CONTENTS

Page

PLATES

SUMMARY

This open file data release consists of U–Pb isotopic data of detrital zircons from five sedimentary rock samples collected from the Sweet Bay map area on the Bonavista Peninsula, Avalon Zone, Newfoundland (Figure 1, NTS 2C/05 and 12). Previous bedrock mapping includes maps at 1:125 000 scale by Hayes (1948) and Christie (1950), at 1:250 000 scale by Jenness (1963), and at 1:50 000 scale by O'Brien (1994) and Mills (2014). Samples used in this report were collected by A. Mills, from rocks of the Connecting Point Group.

The Connecting Point Group is an areally extensive succession of Ediacaran, marine siliciclastic sedimentary rocks. It forms a southward-narrowing belt in the western Avalon Zone of Newfoundland that extends from Cottel Island, western Bonavista Bay, in the north, to Long Island, Placentia Bay, in the south (Figure 1). The most comprehensive geological investigation of Connecting Point Group rocks detailed sedimentological and stratigraphic analyses, including measured sections, combined with systematic regional mapping in the Eastport area (Knight and O'Brien, 1988), leading to subsequent petrographic and mineral chemistry investigations in support of provenance studies (Dec *et al.*, 1992). That work (Knight and O'Brien, *op. cit.*) was conducted north of the current study area, and no such rigorous sedimentological and stratigraphic analyses have yet been conducted within the Sweet Bay area. Recognition of the previously identified stratigraphic units, outlined by Knight and O'Brien (*op. cit.*) were hampered in the Sweet Bay area by the lack of unambiguous marker horizons, abundant brittle faults (Figure 2), possible structural repetition owing to thrust imbrication (Mills *et al.*, 2016a), and poor sequence development due to contributions from multiple sources into spatially restricted narrow basins (*see* Knight and O'Brien, *op. cit.*). Sampling for detrital zircon was undertaken in an attempt to yield approximate absolute-age constraints to test whether or not the stratigraphic framework of Knight and O'Brien (1988) can also be applied to the Connecting Point Group within the Sweet Bay area. This data release focuses on the use of the data to determine maximum depositional age (MDA) estimates but does not provide any interpretation of the provenance of the zircons.

REGIONAL GEOLOGY

The Connecting Point Group comprises mainly marine turbiditic sandstone, siltstone, shale, and lesser conglomerate and silicified sedimentary rocks interpreted to have been deposited in basins between volcanic-arc islands (Knight and O'Brien, 1988; Dec *et al.*, 1992). The unit is estimated to be greater than 3500 m in thickness (*ibid.*). It stratigraphically overlies the mainly pyroclastic Broad Island Group (Mills *et al.*, 2021; former Love Cove Group of Knight and O'Brien, 1988) and is unconformably overlain by the Musgravetown Supergroup (Mills and Sandeman, 2021; Mills *et al.*, 2024; former Musgravetown Group of Knight and O'Brien, 1988 and Dec *et al.*, 1992).

The Connecting Point Group is broadly divided into two turbiditic basin-fill successions (Knight and O'Brien, 1988). The lower one comprises fining- and coarsening- upward sequences, with sandy turbidites near the base, overlain by levee-facies (overbank-facies) shale and sandstone. These likely preserve lower to mid-fan deposits, and inner fan deposits, for the lower and upper sequences, respectively. The depositional setting is likely a low-efficiency, prograding

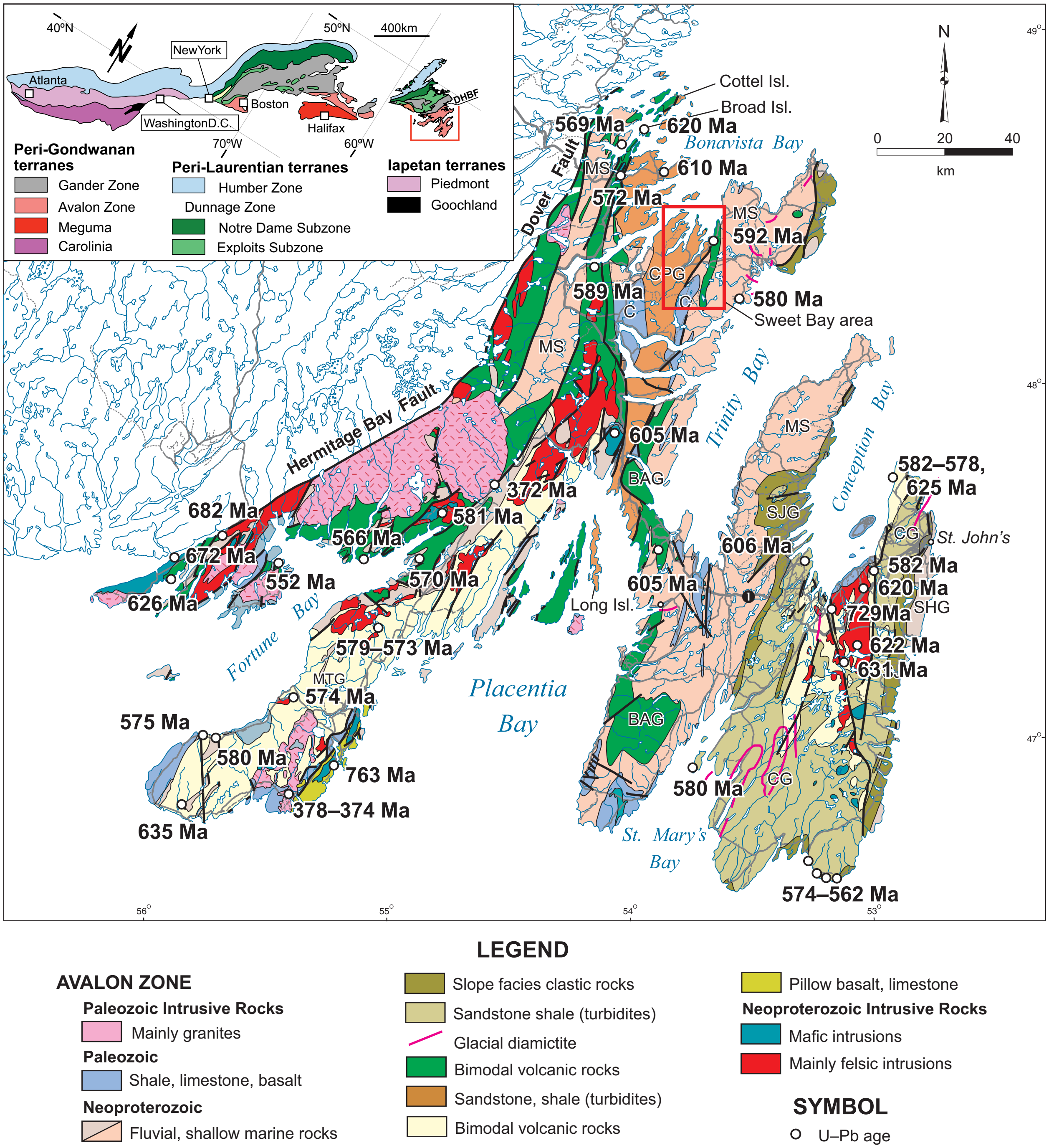

Figure 1. *Simplified geological map of the Avalon Zone in Newfoundland (modified from Colman-Sadd* et al.*, 1990), showing the location of the Sweet Bay map area (red box). BAG–Bull Arm Group; C–Cambrian rocks; CG–Conception Group; CPG–Connecting Point Group; MS–Musgravetown Supergroup; MTG–Marystown Group; SHG–Signal Hill Group; SJG–St. John's Group.*

deep-sea fan typical of volcaniclastic aprons that surround volcanic island-arcs. The upper succession is characterized by upward-coarsening and upward-thickening sequences of thin-bedded distal to medium-bedded, more proximal, turbidite deposits. The two turbiditic successions are separated by a regionally significant mixtite deposit associated with abundant syn-depositional folding and slumping, the intrusion of mafic dykes and small plutons, and a notable increased contribution of volcanic detritus. Collectively, these features suggest nearby uplift of a volcanic source. Petrofacies and mineral chemistry interpretations support an arc-adjacent depositional setting for rocks of the Connecting Point Group (Dec *et al.*, 1992).

Existing age constraints on rocks of the Connecting Point Group include a U–Pb (TIMS; zircon) age of 610 ± 2 Ma for a 3-m-thick crystal ash tuff unit that lies about 10-m above mixtite of the regional olistostrome near Eastport (Dec *et al.*, 1992; Mills *et al.*, 2016b) and 613 ± 3 Ma for a 1-cm-thick ash tuff unit interbedded with black shale ~100 m north of detrital zircon sample 13AM160A, near Summerville (Mills *et al.*, 2016b). A crystal tuff from the underlying Broad Island Group (*see* Figure 1 for location) yielded a U–Pb (TIMS; zircon) age of 620 ± 2 Ma (Mills *et al.*, 2021), and is interpreted to occur near the top of this unit (Dec *et al.*, 1992). Tuffs from below and above the angular unconformity separating Connecting Point Group rocks from Musgravetown Supergroup rocks at Southward Head yielded 605 ± 2.2 and 600 ± 3 Ma, respectively (Mills *et al.*, 2016b).

FIELD AND PETROGRAPHIC DESCRIPTIONS

Brief field and petrographic descriptions are provided for each sample below. Field and slab photographs as well as representative photomicrographs of thin sections are also provided. Petrographic rock classification uses the scheme of Garzanti (2019).

13AM160A

Sample 13AM160A was collected from near the top of the section exposed along the river that flows northwesterly from Muddy Pond (Figure 2). The rock unit is thin- to thick-bedded, medium-grained sandstone, exhibiting asymmetric convolutions, scoured tops and common rip-up clasts near the base of beds (Plate 1A, B). The colour varies from red to grey to green. The sandstone abruptly overlies black shale to the north, and is interpreted to be part of Knight and O'Brien's (1988) upper turbidite sequence. In thin section, the rock is a quartzo-feldspatho-lithic sandstone having a weak foliation defined by trace micas (Plate 1C, D).

13AM227

Sample 13AM227 is from the east shore of Chandler Reach (Figure 2). Thin-bedded, heterolithic sandstone–shale couplets exhibit convolutions and are interstratified with thick-bedded, medium-grained sandstone (Plate 2A-D), likely correlative to the upper part of Knight and O'Brien's (1988) lower turbidite sequence. A thick, coarse-grained bed was sampled for detrital zircon analysis. The rock is a quartzo-feldspatho-lithic sandstone.

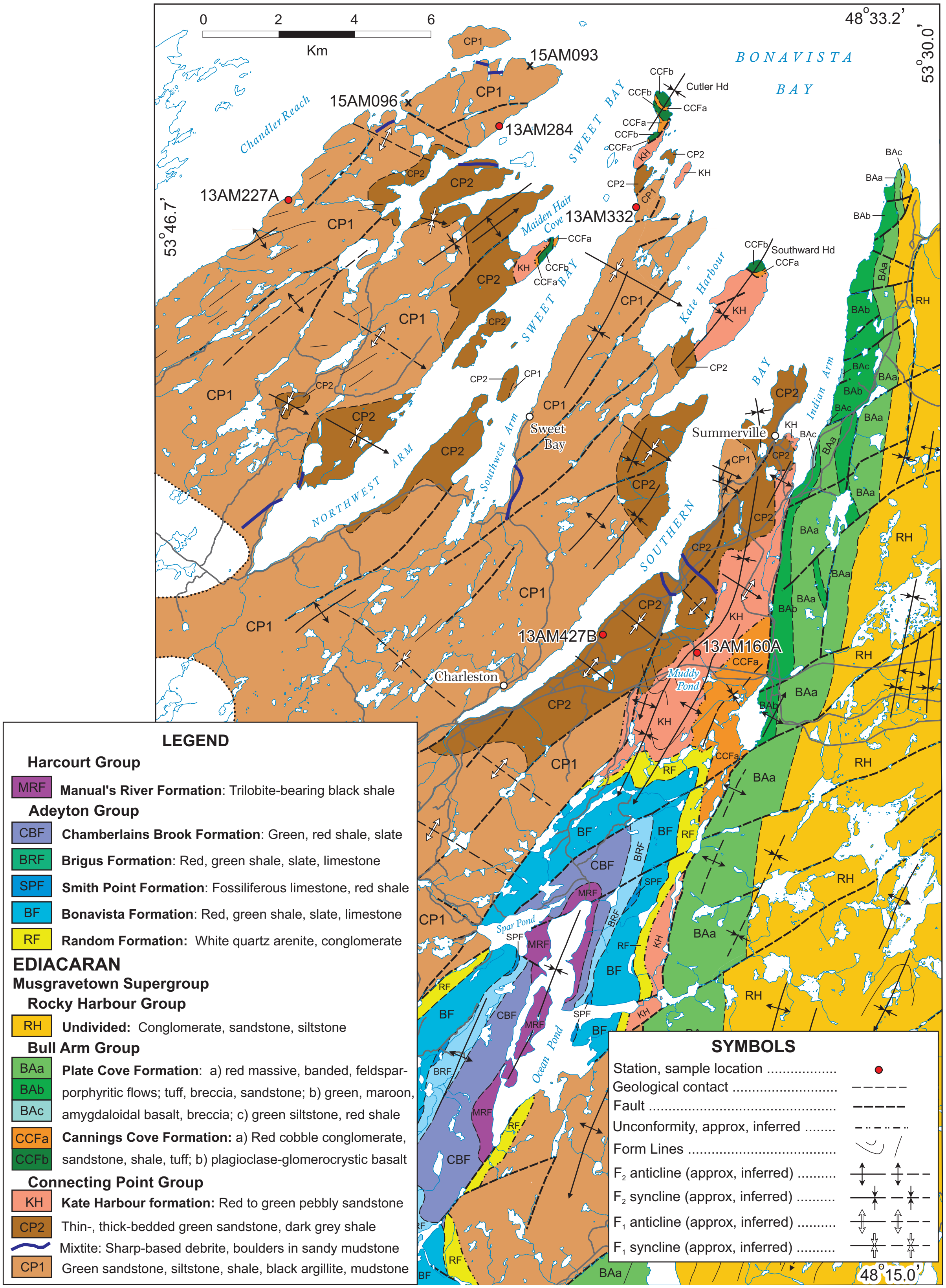

Figure 2. *Simplified geological map of the Sweet Bay area, western Bonavista Peninsula, showing the location of the five samples collected for detrital zircon analysis.*

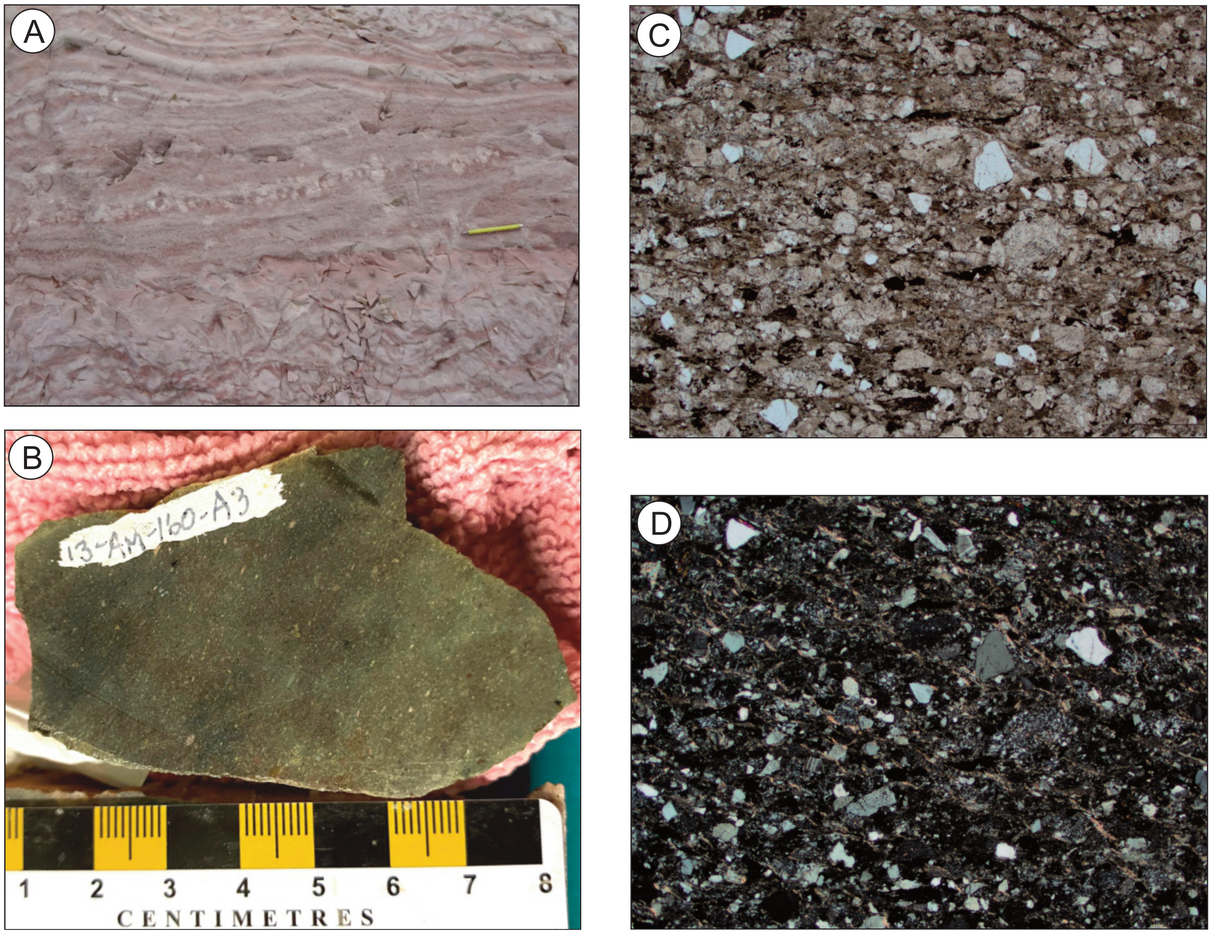

Plate 1. *A) Field photograph; B) Hand sample; C, D) Photomicrograph (in plane-polar and cross-polar light, respectively) of sample 13AM160A.*

13AM284

Sample 13AM284 is from the west side of Sweet Bay, north of Maiden Hair Cove. The rock unit is thick-bedded, coarse-grained sandstone fining upward to medium-grained sandstone (Plate 3A-D). Very coarse basal sandstone locally scours into underlying beds and contains some larger clasts that may be extra-basinal. Locally, sandstone dykes emanate downward from the coarse basal part of a bed. Petrographically, the rock is classified as a quartzo-litho-feldspathic sandstone.

13AM332

Sample 13AM332 is from the east side of Sweet Bay, just south of Cutler Head (Figure 2). The rock unit is a thick-bedded, pebbly sandstone having pebbles commonly up to 2 cm in diameter (Plate 3A). It is interpreted to occur near the top of the Connecting Point Group, and is likely the product of terrestrial (alluvial/fluvial) deposition. Petrographically, it is classified as a quartzo-lithic sandstone (*see* Plate 4B, C).

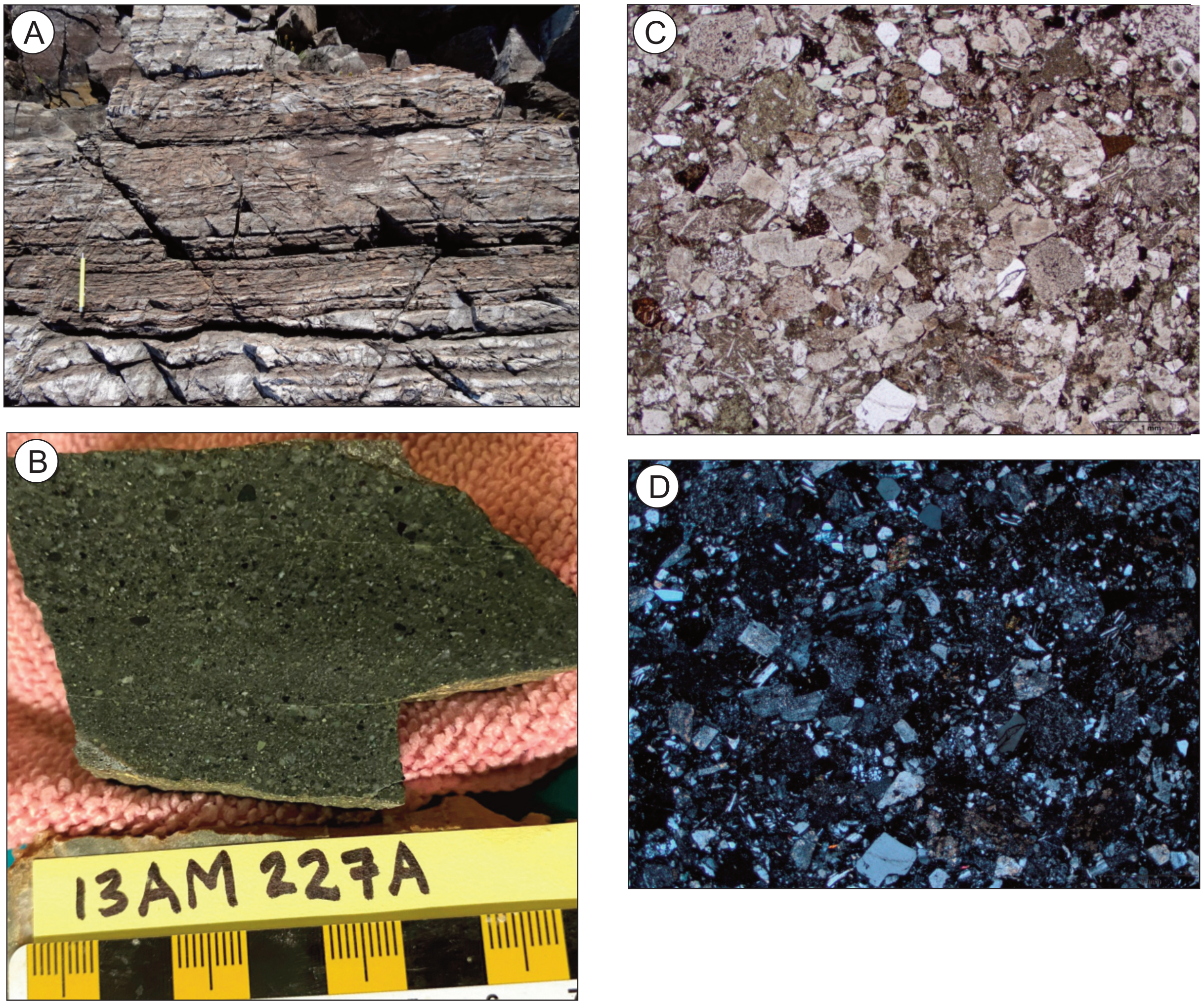

Plate 2. *A) Field photograph; B) Hand sample; C, D) Photomicrograph (in plane-polar and cross-polar light, respectively) of sample 13AM227A.*

13AM427

Sample 13AM427 is from the east side of Southern Bay, about 7 km southwest of Summerville. The rock unit is mainly green-grey siliceous siltstone interbedded with 10-cm thick tuffaceous sandstone beds (Plate 5A, B); its relative stratigraphic position is unknown. The tuffaceous sandstone was targeted, rather than the siliceous siltstone, for detrital zircon sampling. Petrographically, it is classified as a quartzo-litho-feldspathic sandstone (Plate 5C, D).

ANALYTICAL METHODS

Heavy-mineral separates were produced by Overburden Drilling Management (Ottawa, ON) using electric-pulse disaggregation (EPD). The heavy mineral separates typically contained zircon, apatite and pyrite. The mineral separates were mounted in epoxy and polished to reveal the central portions of grains. A combination of optical microscopy and optical cathodoluminescence was used characterize zircon populations and to identify targets for laser ablation. Colourless to

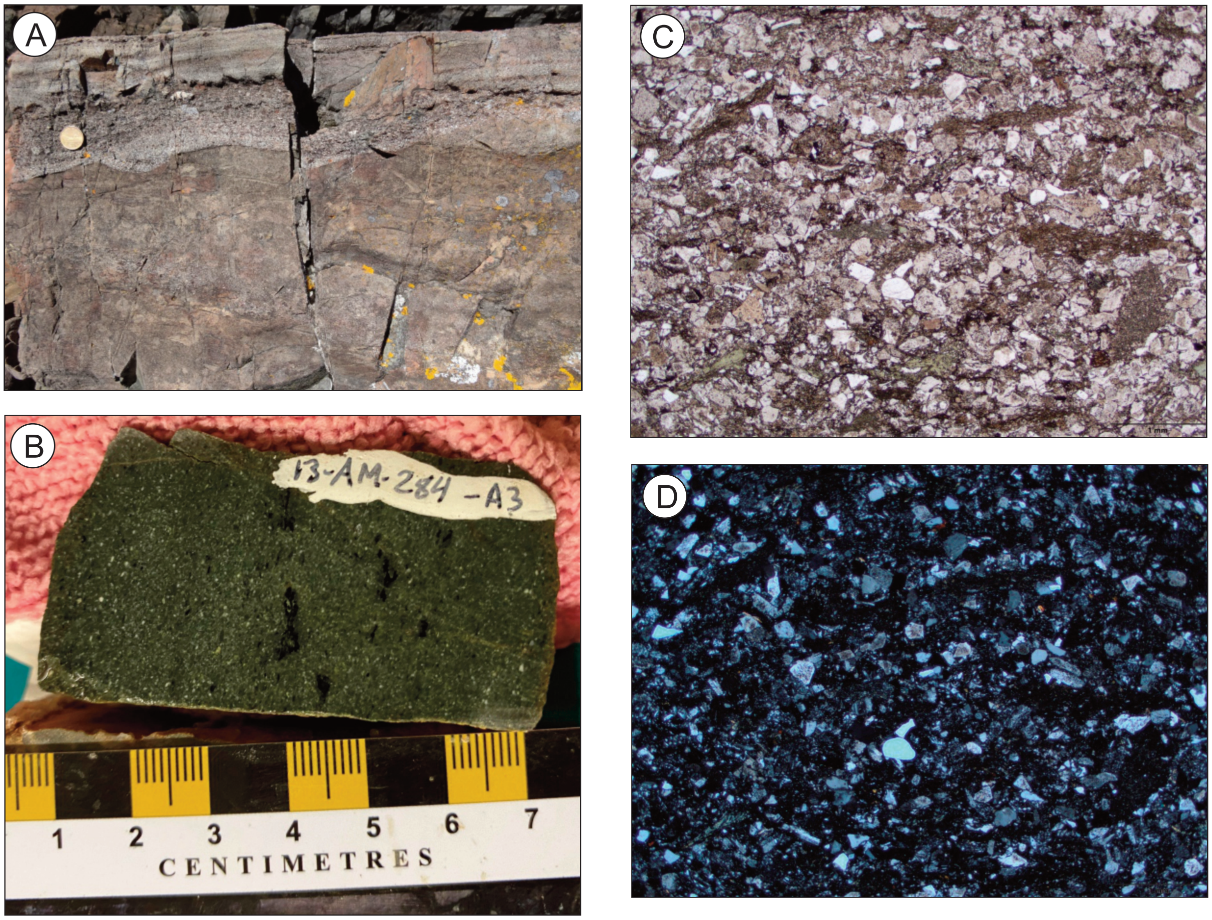

Plate 3. *A) Field photograph; B) Hand sample; C, D) Photomicrograph (in plane-polar and cross-polar light, respectively) of sample 13AM284.*

pale-brown unfractured grains yielded the most concordant data but representatives of all grain colours were sampled to ensure an unbiased assessment of the detrital zircon population.

U–Pb zircon geochronology data were collected at the University of New Brunswick Micro-Analysis of Natural Trace-element and Isotope Systematics (MANTIS) laboratory using an Applied Spectra Inc. RESOlution™ M-50 193 nm excimer laser system coupled Agilent 7700x and 8900 ICPMS. Ablation was performed in a large-volume Laurin Technic Pty S-155 cell connected to the ICP-MS using Nylon tubing and two in-line 'squid' smoothing devices. Sensitivity and plasma robustness were tuned on each ICP-MS platform using NIST610 glass. All zircon ablations were performed using an on-sample energy (fluence) of 3 J/cm^2, a laser firing rate of 4 Hz, and a beam size of 17–24 µm. Each analysis consisted of 30 seconds of ablation followed by a gas background of 30 seconds. Samples and standards were distributed through the sequence to correct for instrument drift and mass bias. The FC-1 zircon (Paces and Miller, 1993) was used as a primary standard for all U–Pb measurements and age determinations, whereas Plesovice zircon was run as an unknown for quality control (QC) purposes; the measured age of 337 ± 2 Ma for Plesovice zircon was within error of the accepted value of 337.13 ± 0.37 Ma (Sláma *et al.*, 2008). Approximate concentrations for U, Th and Pb isotopes were calculated using NIST610 as primary standard and assuming 48% Zr in zircon.

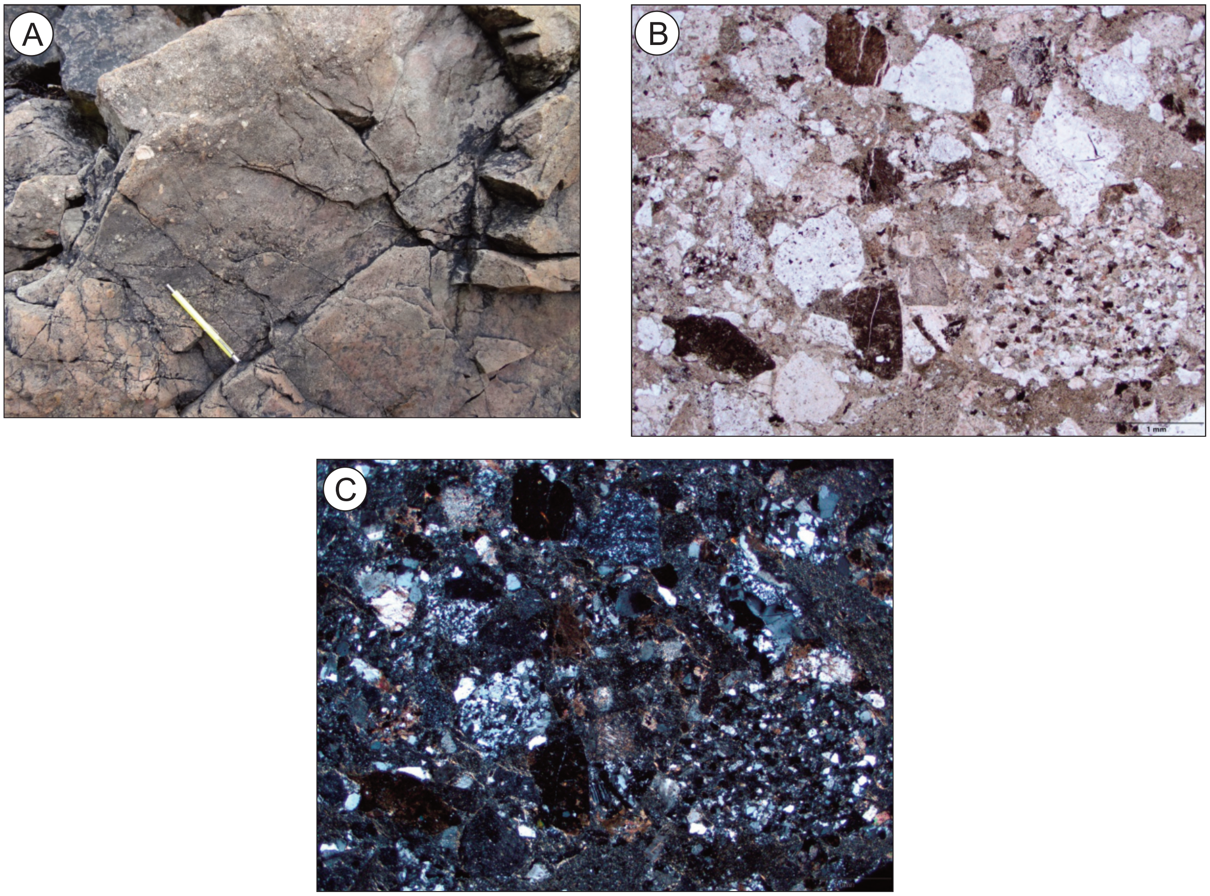

Plate 4. *A) Field photograph; B) Hand sample; C) Photomicrograph (in plane-polar and cross-polar light, respectively) of sample 13AM332A.*

Offline data reduction was performed using the Iolite 3.7 software with the "VizualAge" data reduction scheme (DRS). This data reduction includes a calculation of ^{204}Pb-corrected isotope ratios based on the terrestrial Pb–Pb evolution model of Kramers and Tolstikhin (1997).

MAXIMUM DEPOSITIONAL AGE (MDA) CALCULATION METHODOLOGY

MDA calculations follow the procedures and recommendations outlined by Vermeesch (2021a, b). This unbiased, statistical approach uses the single-grain concordia ages, as per Ludwig (1998) to avoid ambiguities involving the three isotopic chronometers conventionally used in age determinations ($^{206}Pb/^{238}U$, $^{207}Pb/^{235}U$ and $^{207}Pb/^{206}Pb$). It employs a minimum age model to determine the 'maximum likelihood age' (MLA) and advocates for use of a concordia distance filter (log-ratio-based discordance filter) to minimize the removal of grains deemed as discordant.

The unfiltered isotopic data and age calculations are in Appendices B through F. Concordia plots are displayed at both 'recent to 3.0 Ga' and 'recent to 1.0 Ga' scales so that both the entire age distribution and the youngest age cluster can be visualized (Appendix G). The age distribution for each sample is represented using Kernel density estimation plots, which apply an algorithm to

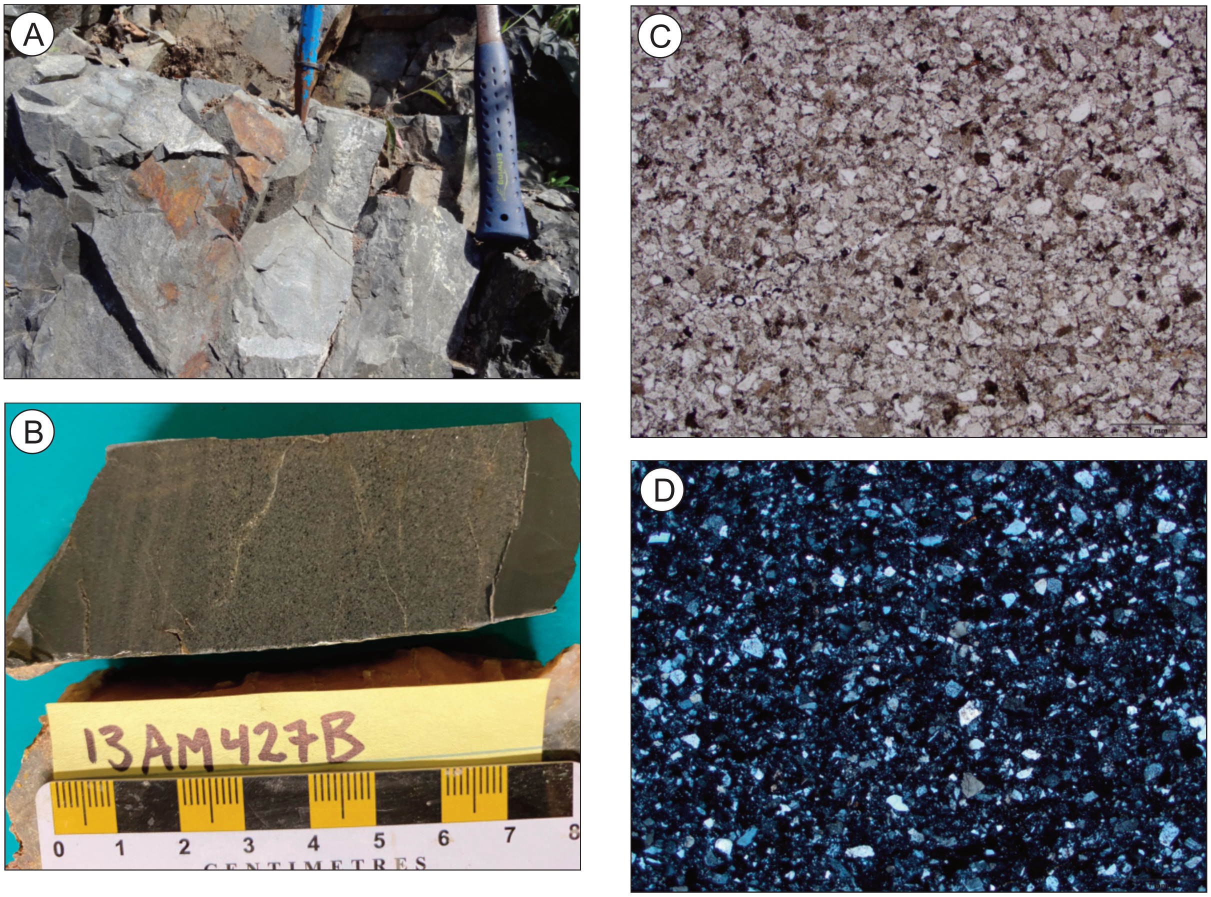

Plate 5. *A) Field photograph; B) Hand sample; C, D) Photomicrograph (in plane-polar and cross-polar light, respectively) of sample 13AM427B.*

the density distributions that effectively smooths the density distribution curve without changing the position of the peaks or its overall shape (Figure 3).

RESULTS

13AM160A

The calculated single-grain concordia ages for this sample range between 587and 2792 Ma. Of the 119 zircons analyzed, 77 passed the concordia distance filter. Most grains (61%, or 73 grains) are Neoproterozoic, 16 are Mesoproterozoic, 6 grains are Paleoproterozoic and three grains are Archean in age. Of the Neoproterozoic grains, 13 are Tonian, 38 are Cryogenian and 42 are Ediacaran. The most prominent age peak is at 610 Ma, with small peaks at 640 and 730 Ma, between 1000 and 1600 Ma, at 2000 and at 2700 Ma (Figure 3A). The maximum depositional age of the rock is estimated at 603.2 ± 3.3 Ma (at 2SE).

13AM227

The calculated single-grain concordia ages for this sample range between 576 and 2022 Ma. Of the 142 grains analyzed, 100 grains passed the concordia distance filter. Of those 100 grains,

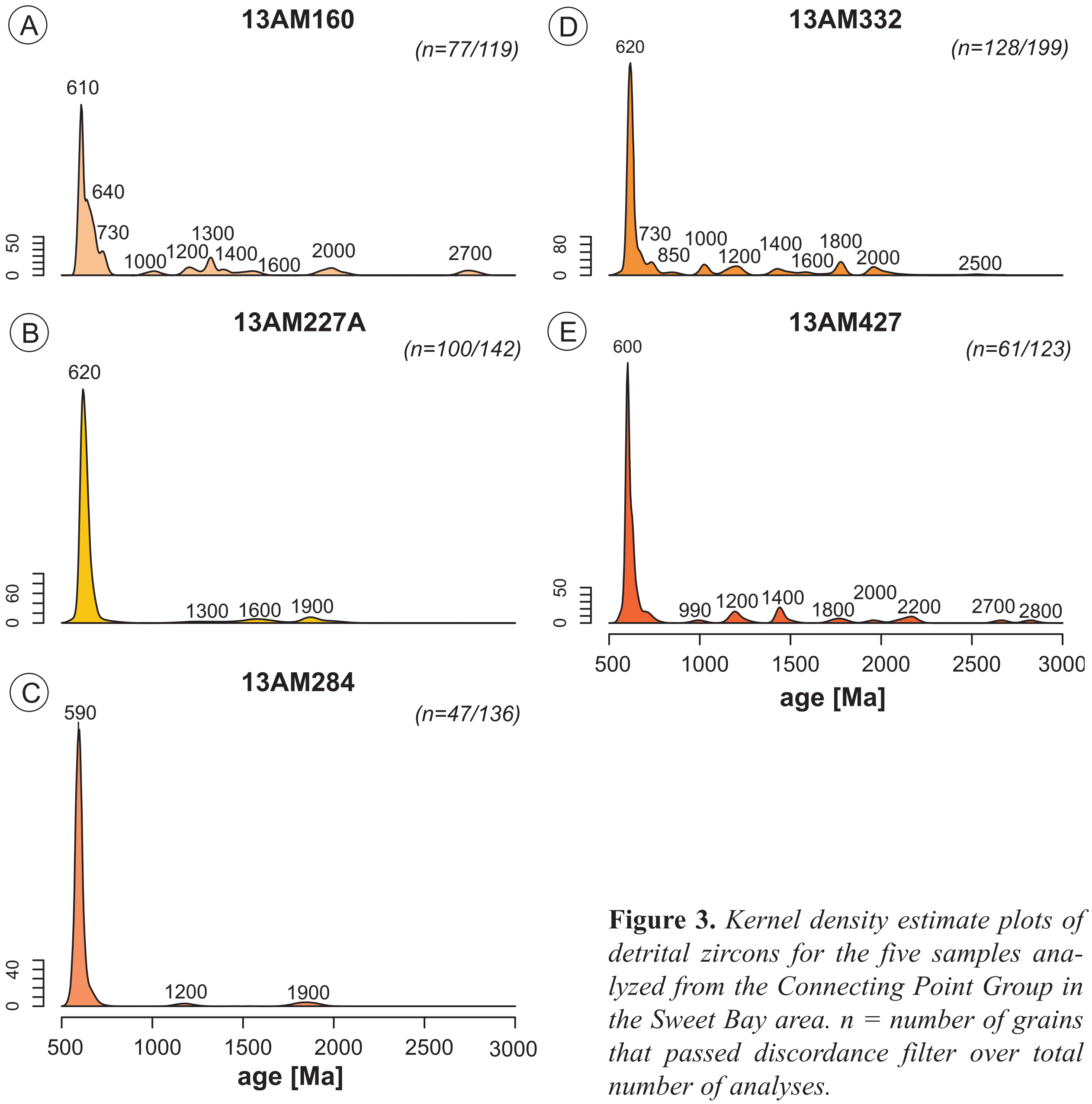

Figure 3. *Kernel density estimate plots of detrital zircons for the five samples analyzed from the Connecting Point Group in the Sweet Bay area. n = number of grains that passed discordance filter over total number of analyses.*

nine are Paleoproterozoic, seven are Mesoproterozoic, four are Tonian, 44 are Cryogenian and 78 are Ediacaran. The most prominent age peak is at 620 Ma, with small peaks 1300, 1600 and 1900 Ma (Figure 3B). The maximum depositional age of the rock is 611.8 ± 1.8 Ma (at 2SE).

13AM284

The calculated single-grain concordia ages for this sample range between 558 and 4119 Ma (the latter analysis was highly discordant and contained high common lead (^{204}Pb)). Of the 136 grains analyzed, 47 passed the concordia distance filter. One grain is Archean, three are Paleoproterozoic, two are Mesozoic, two are Tonian, 15 are Cryogenian and 113 are Ediacaran.

The most prominent age peak is at 590 Ma, with small peaks at 1200 and 1900 Ma (Figure 3C). The maximum depositional age of the rock is 584.9 ± 3.3 Ma (at 2SE).

13AM332

The calculated single-grain concordia ages for this sample range between 557 and 2527 Ma. Of the 199 grains analyzed, 128 passed the concordia distance filter. Two are Archean, 18 are Paleoproterozoic, 24 are Mesoproterozoic, 11 are Tonian, 35 are Cryogenian and 109 are Ediacaran. The most prominent age peak is at 620 Ma, with intermittent small peaks between 730 and 2000 Ma, and a very small peak at 2500 Ma (Figure 3D). The maximum depositional age of the rock is 602.6 ± 2.5 Ma (at 2SE).

13AM427

The calculated single-grain concordia ages for this sample range between 570 and 2823 Ma. Of the 123 grains analyzed, 61 passed the concordia distance filter. Three are Archean, eight are Paleoproterozoic, 11 are Mesoproterozoic, four are Tonian, 27 are Cryogenian and 70 are Ediacaran. The most prominent age peak is at 600 Ma, with intermittent small Proterozoic peaks at 990, 1200, 1400, 1800, 2000 and 2200 Ma, and two small Archean peaks at 2700 and 2800 Ma (Figure 3E). The maximum depositional age of the rock is 598.5 ± 2.2 Ma (at 2SE).

DISCUSSION

Four of the five samples yielded MDAs (using the Maximum Likelihood Age method of Vermeesch, 2021) of >600 Ma (within error), as anticipated based on existing U–Pb (TIMS; zircon) constraints between 620 and 600 Ma for rocks of the Connecting Point Group. Sample 13AM284, however, yielded a younger MDA of 584.9 ± 3.3 Ma. It therefore seems likely, then, that the Connecting Point Group contains a component of marine strata that is significantly younger than the previously interpreted age range of deposition. A possible explanation for the young age of detrital zircon at sample site 13AM284 is the presence of an unrecognized unconformity. About 2 km north of the sample site (Station 15AM096; *see* Figure 2), a possible faulted unconformity was noted (Plate 6A), but mapping at 1:50 000-scale failed to trace the structure laterally. An immature sandstone with a scouring, erosional base (Plate 6B, C) was noted west of this unconformity but a genetic or chronological link between these features has not been demonstrated.

RECOMMENDATIONS

Related future research should include detailed stratigraphic and sedimentological analysis of the Connecting Point Group in the Sweet Bay area. Continuity of the *ca.* 610 Ma olistostrome and the possible unconformity referred to here should both be explored. Such work should be conducted with supporting structural analysis and targeted sampling of select units for further detrital zircon analysis. In addition, the detrital zircon data presented here should be studied further for provenance implications.

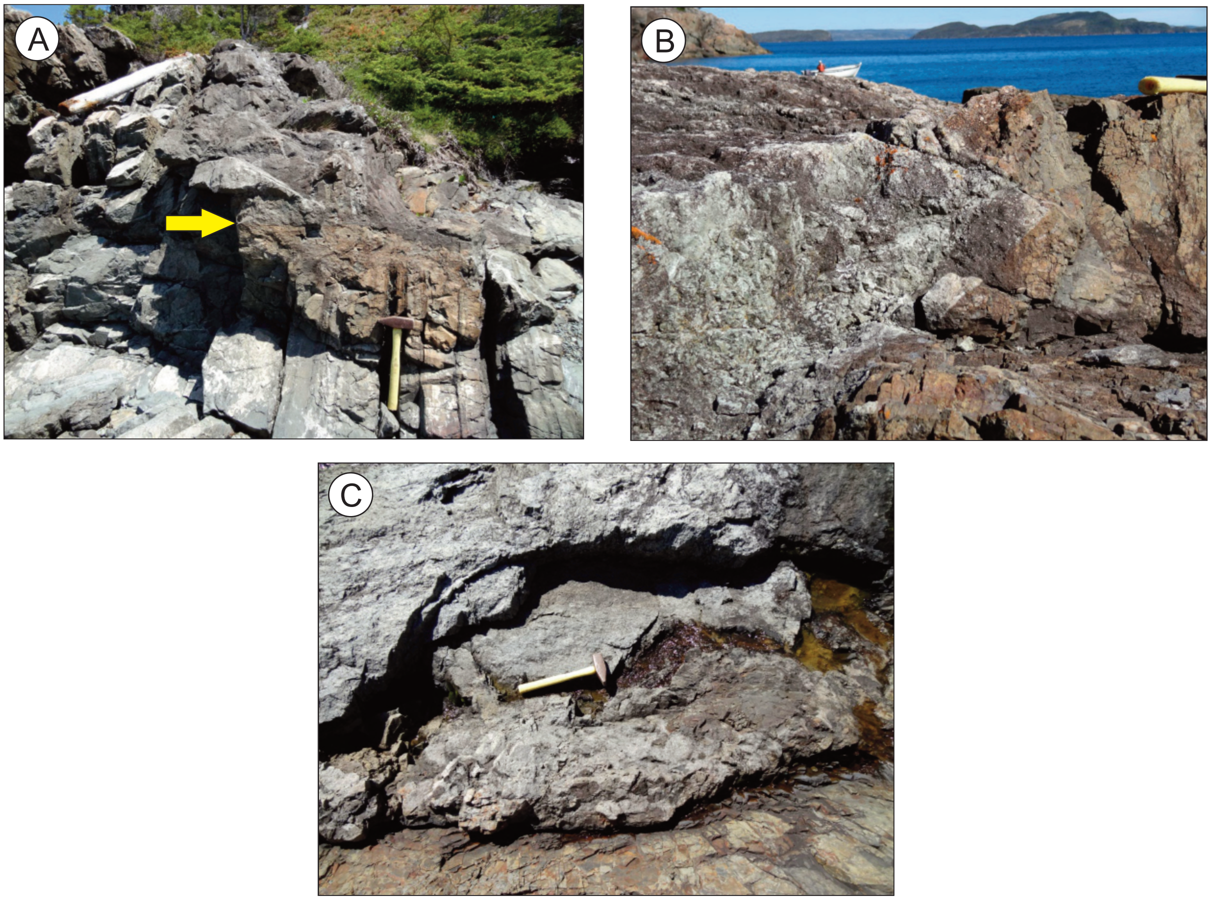

Plate 6. *A) Possible faulted unconformity (yellow arrow) between thin-bedded, grey-green fine-grained sandstone to siltstone (lower half of photo) and crudely stratified, grey, medium- to coarse-grained sandstone (view to the east; Station 15AM096 on Figure 2); B) Medium- to coarse-grained grey sandstone appears to cut or scour into grey-green fine-grained siltstone (view to the north; Station 15AM093 on Figure 2); C) Pebble- to boulder-sized rip-up clasts of underlying grey-green siltstone in basal layer of overlying coarse-grained, pale-grey sandstone (Station 15AM093).*

NOTES ON THE DATABASE

Location data is reported in Table 1. Abbreviations used in the appendices are defined in Table 2. Appendix A contains the maximum depositional age estimates. Isotopic data for each sample is in appendices B through F. Concordia plots (at two scales) are provided for each sample in Appendix G. Analyses of reference materials are in appendices H through K.

ACKNOWLEDGMENTS

Alana Hinchey reviewed this Open File Report. Santiago Serna-Ortiz provided photomicrographs and assisted with sedimentary rock classification.

Table 1. Sample locations

Sample	Location
13AM160A	48.396685° North; -53.582682° West
13AM227A	48.507128° North; -53.733142° West
13AM284	48.524205° North; -53.657782° West
13AM332	48.505028° North; -53.605567° West
13AM427B	48.403677° North; -53.620583° West

Table 2. Abbreviations used in the appendices

Abbreviation	Explanation
z	zircon
bl	blue
gy	grey
ylw	yellow
dk	dark
SE	standard error
Disc	discordance
Diff	difference
ppm	parts per million

REFERENCES

Christie, A.M.
1950: Geology of Bonavista map-area, Newfoundland (summary account). Department of Mines and Technical Surveys. Geological Survey of Canada, Paper 50-7, 50 pages and map (Map 50-7A).

Colman-Sadd, S.P., Hayes, J.P. and Knight, I.
1990: Geology of the Island of Newfoundland (digital version of Map 90-01), Scale: 1:1 000 000. Government of Newfoundland and Labrador, Department of Mines and Energy, Geological Survey Branch, Open File NFLD/2192.

Dec, T., O'Brien, S.J. and Knight, I.
1992: Late Precambrian volcaniclastic deposits of the Avalonian Eastport basin (Newfoundland Appalachians): petrofacies, detrital clinopyroxene geochemistry and palaeotectonic implications. Precambrian Research, Volume 59, pages 243-262.

Garzanti, E.
2019: Petrographic classification of sand and sandstone. Earth-Science Reviews, Volume 192, pages 545-563.

Hayes, A.O.
1948: Geology of the area between Bonavista and Trinity bays, eastern Newfoundland. Geological Survey of Newfoundland, Bulletin 32 (Part 1), pages 1-37.

Jenness, S.E.
1963: Terra Nova and Bonavista map-areas, Newfoundland (2D E1/2 and 2C). Geological Survey of Canada, Memoir 327, 184 pages.

Knight, I. and O'Brien, S.J.
1988: Stratigraphy and sedimentology of the Connecting Point Group and related rocks, Bonavista Bay, Newfoundland: an example of a Late Precambrian Avalonian basin. *In* Current Research. Government of Newfoundland and Labrador, Department of Mines, Mineral Development Division, Report 88-1, pages 207-228.

Kramers, J.D. and Tolstikhin, I.N.
1997: Two terrestrial lead isotope paradoxes, forward transport modelling, core formation and the history of the continental crust. Chemical Geology, Volume 139, pages 75-110.

Ludwig, K.R.
1998: On the treatment of concordant uranium-lead ages. Geochimica et Cosmochimica Acta, Volume 62, pages 665-676.

Mills, A.J.
2014: Preliminary results from bedrock mapping in the Sweet Bay area (parts of NTS map areas 2C/5 and 2C/12), western Bonavista Peninsula, Newfoundland. *In* Current Research. Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Report 14-1, pages 135-154.

Mills, A.J., Calon, T. and Peddle, C.
2016a: Preliminary investigations into the structural geology of the Bonavista Peninsula, northeast Newfoundland. *In* Current Research. Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Report 16-1, pages 133-152.

Mills, A.J., Dunning, G.R. and Langille, A.
2016b: New geochronological constraints on the Connecting Point Group, Bonavista Peninsula, Avalon Zone, Newfoundland. *In* Current Research. Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Report 16-1, pages 153-171.

Mills, A.J., Dunning, G. and Sandeman, H.
2021: Age-constrained arc- to rift-magmatism in northwestern and central Avalon Terrane,

Newfoundland, and implications for lithostratigraphy. Canadian Journal of Earth Sciences. https://doi.org/10.1139/cjes-2019-0196

Mills, A.J., Normore, L., Gomez, N., Dunning, G.R., and Lowe, D.G.
2024: A tale of two basins: Juxtaposition of the Ediacaran fossil-bearing St. John's Basin against the Ediacaran glaciovolcanic Bonavista Basin on the Bonavista Peninsula, Avalon Zone, Newfoundland. Atlantic Geoscience, Volume 60, pages 131-150. https://doi.org/10.4138/atlgeo.2024.007

Mills, A. and Sandeman, H.A.
2021: Lithostratigraphy and lithogeochemistry of Ediacaran alkaline basaltic rocks of the Musgravetown Group, Bonavista Peninsula, northeastern Newfoundland, Canada: An extensional volcanogenic basin in the type-Avalon terrane. Atlantic Geology, Volume 57, pages 207-234. https://doi.org/10.4138/atlgeol.2021.010

O'Brien, S.J.
1994: On the geological development of the Avalon Zone in the area between Ocean Pond and Long Islands, Bonavista Bay (parts of NTS 2C/5 and NTS 2C/12). *In* Current Research. Government of Newfoundland and Labrador, Department of Mines and Energy, Geological Survey Branch, Report 94-1, pages 187-199.

Paces, J.B., and Miller Jr., J.D.
1993: Precise U-Pb ages of Duluth complex and related intrusions, northeastern Minnesota: Geochronological insights to physical, petrogenetic, paleomagnetic and tectonomagmatic processes associated with the 1.1 Ga midcontinent rift system. Journal of Geophysical Research: Solid Earth, Volume 98(B8), pages 13997-14013.

Sláma, J. Košler, J., Condon, D.J., Crowley, J.L., Gerdes, A., Hanchar, J.M., Horstwood, M.S., Morris, G.A., Nasdala, L., Norberg, N., and Schaltegger, U.
2008: Plešovice zircon – a new natural reference material for U–Pb and Hf isotopic microanalysis. Chemical Geology, Volume 249(1-2), pages 1-35.

Vermeesch, P.
2021a: Maximum depositional age estimation revisited. Geoscience Frontiers, Volume 12, pages 843-850.

2021b: On the treatment of discordant detrital zircon U-Pb data. Geochronology, Volume 3, pages 247-257.

APPENDICES

Appendices A–F and H–K are included in the OF_002C_0252 zip folder as Comma Separated Value (.csv) files and Appendix G as a pdf.

APPENDIX A: Maximum Depositional Age Estimates
APPENDIX B: Detrital Zircon Isotopic Analyses for Sample 13AM160A
APPENDIX C: Detrital Zircon Isotopic Analyses for Sample 13AM227A
APPENDIX D: Detrital Zircon Isotopic Analyses for Sample 13AM284
APPENDIX E: Detrital Zircon Isotopic Analyses for Sample 13AM332A
APPENDIX F: Detrital Zircon Isotopic Analyses for Sample 13AM427B
APPENDIX G: Concordia Plots
APPENDIX H: Analyses of Primary Zircon Reference Material (FC-1)
APPENDIX I: Analyses of Secondary Zircon Reference Material (TEMORA-2)
APPENDIX J: Analyses of Additional Zircon Reference Material (91500)
APPENDIX K: Analyses of Glass Trace Element Reference Material