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CANADIAN GEOSCIENCE MAP 160

GEOLOGY

NIPPERS HARBOUR AND PARTS OF HORSE ISLANDS, CAPE ST. JOHN, AND LITTLE BAY ISLAND

Newfoundland and Labrador

NTS 2-E/13 and parts of NTS 2-E/12, NTS 2-E/14, and NTS 2-L/4

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ABSTRACT

Northeastern Baie Verte Peninsula (Newfoundland and Labrador, NTS 2-E/13, parts of NTS 12-I/4, 2-E/14, and 2-E/12) is underlain by the Neoproterozoic to Ordovician Ming's Bight Group, Cambrian ophiolite of the Betts Cove Complex, submarine Ordovician ophiolite cover of the Snooks Arm Group, and a continental overlap assemblage including Ordovician-Silurian Burlington plutonic suite, Stocking Harbour intrusive suite, and the Silurian Confusion Bay plutonic suite and Cape St. John Group. Three mines have operated in this area including two Cu volcanogenic massive-sulphide deposits in the Betts Cove Complex (Tilt Cove and Betts Cove mines), and gold in iron-formation in the Snooks Arm Group (Nugget Pond mine). Four phases of regional deformation affected this area, including: D_1 restricted to a northwest-directed reverse fault in the Betts Cove Complex related to ophiolite obduction; D_2 regional, penetrative deformation accompanied by greenschist metamorphism; D_3 related to open upright cross folds; and D_4 in the north, related to recumbent folding coeval with extensional faults, accompanied by an amphibolitic metamorphic overprint.

RÉSUMÉ

Le sous-sol de la partie nord-est de la péninsule Baie Verte (Terre-Neuve-et-Labrador, SNRC 2-E/13 et des parties de SNRC 12-I/4, 2-E/14 et 2-E/12) est constitué du Groupe de Ming's Bight du Néoprotérozoïque à l'Ordovicien, des ophiolites du Complexe de Betts Cove du Cambrien, de la succession sous-marine de couverture des ophiolites du Groupe de Snooks Arm de l'Ordovicien, ainsi que d'un assemblage de recouvrement continental incluant la suite plutonique de Burlington de l'Ordovicien-Silurien, la suite intrusive de Stocking Harbour, la suite plutonique de Confusion Bay et le Groupe de Cape St. John, tous du Silurien. Trois mines ont été exploitées dans cette région dont deux gisements de sulfures massifs volcanogènes riches en cuivre, dans le Complexe de Betts Cove (mines Tilt Cove et Betts Cove), et un gisement d'or encaissé dans des formations de fer, dans le Groupe de Snooks Arm (mine Nugget Pond). Quatre phases de déformation régionales ont touché la région, dont : D_1, limitée à une faille inverse à vergence nord-ouest dans le Complexe de Betts Cove et reliée à l'obduction des ophiolites; D_2, une déformation pénétrative régionale accompagnée d'un métamorphisme du faciès des schistes verts; D_3, reliée à des plis transversaux, ouverts et droits; et D_4, dans la partie nord, associée à des plis couchés et à des failles d'extension contemporaines et accompagnée d'une surimpression métamorphique du faciès des amphibolites.

ABOUT THE MAP

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North American Datum 1983

Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications. Elevations above mean sea level are expressed in metres (NTS 2-E/13) and feet (NTS 2-E/12, 2-E/14, 2-L/4)

Magnetic declination 2015, 19°51'E, decreasing 11.6' annually.

This map is not to be used for navigational purposes.

Title photograph: Recumbent F_4 fold of Cape St. John Group. Confusion Bay, Newfoundland and Labrador. Photograph by S. Castonguay. 2014-111

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Data may include additional observations not portrayed on this map.
See documentation accompanying the data.

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The published map is distributed as a Portable Document File (PDF), and may contain a subset of the overall geological data for legibility reasons at the publication scale.

ABOUT THE GEOLOGY

Descriptive Notes

The Nippers Harbour map area in the northeast part of Baie Verte Peninsula (Newfoundland and Labrador) is one of three new 1:50 000 scale maps in this area that are based on new and compiled bedrock geological (including geochronological and lithogeochemical data) and remotely sensed data (Skulski et al., 2015a, b). This part of the Newfoundland Appalachians is underlain by five tectonostratigraphic entities including: Neoproterozoic to Early Paleozoic rocks of the Laurentian continental margin (Ming's Bight Group); Cambrian ophiolite (Betts Cove and Pacquet complexes); Lower Ordovician ophiolite cover (Snooks Arm Group); and Upper Ordovician to Silurian continental, volcano-plutonic rocks (Burlington plutonic suite, Confusion Bay plutonic suite and Cape St. John Group). The IUGS time scale of Cohen et al. (2013) is utilized herein.

TECTONOSTRATIGRAPHY AND SETTING

The Ming's Bight Group (unit nPOMB) is part of the Fleur de Lys Supergroup and correlates with the Rattling Brook Group to the west (Hibbard, 1983). It comprises pelite, semipelite, psammite, and minor metaconglomerate with small pods of mafic amphibolite and fuchsite actinolite schist. The metaclastic rocks are associated with larger panels of massive to pillowed, tholeiitic metabasalt and amphibolite, termed Pelly Point schist by Hibbard (1983) and these are herein correlated with the ca. 560 Ma Birchy Complex (unit nPBm; van Staal et al., 2013). Originally described as a continental margin promontory (Hibbard, 1983), the Ming's Bight Group has since been recognized as an extensional core complex that exposes the Laurentian continental margin (Anderson et al., 2001).

The Cambrian Betts Cove Complex represents the best preserved and most complete section of ophiolite crust on Baie Verte Peninsula (Bédard et al., 2000b). The Pacquet complex to the west comprises correlative dismembered ophiolite. A sheared serpentinite (unit ЄMs) at the structural base of the Betts Cove Complex is overlain and in fault contact with intrusive rocks including layered ultramafic cumulate rocks (unit ЄBHu), cumulate gabbro and pyroxenite (unit ЄBHg), massive gabbro (unit ЄBHm), late intrusive gabbro (unit ЄBHlg) dated at 488.6 +3.1/-1.8 Ma (location 22, Table 1), and sheeted boninite dykes (unit ЄBHs). The contact with the volcanic section is typically transitional and characterized by mixed sheeted dykes and pillowed boninite (unit ЄBHbs). The Betts Head Formation (unit ЄBHb), in the lower volcanic section includes sparsely porphyritic and spherulitic boninite pillow lavas and breccia units that are chemically subdivided into low- and intermediate-Ti varieties (Bédard et al., 2000b, and references therein). In contrast to the stratigraphy defined by Bédard et al. (2000b), the present authors include the volcanic rocks of the Mount Misery Formation (unit ЄMMm) in the Betts Cove Complex, rather than in the Snooks Arm Group (Skulski et al., 2010). The Mount Misery Formation is composed of plagioclase-phyric, pillowed island-arc tholeiitic basalt flows and breccia units that are interbedded with, and chemically transitional to the intermediate-Ti boninite units.

The Lower to Middle Ordovician Snooks Arm Group (Bédard et al., 2000b; Skulski et al., 2010) overlies the Betts Cove and Pacquet complexes. The Scrape Point Formation rests paraconformably to locally disconformably on underlying ophiolite crust. The basal Nugget Pond member (unit OSPl) comprises a local, basal sedimentary breccia with clasts of pillow basalt and chert cemented by quartz and magnetite (Sangster et al., 2007), overlain by jasper iron-formation interbedded with mafic volcaniclastic rocks. These are covered by volcanic-derived turbiditic siltstone, wacke and crystal- to lapilli-tuff units (unit OSPs) and pillowed, tholeiitic basalt (unit OSPm) and related volcaniclastic rocks (unit OSPv). The overlying Bobby Cove Formation includes a lower calc-alkaline pillow basalt and andesite (unit OBCm), overlain by a regionally distinctive marker unit (Prairie Hat member; unit OBCc) consisting of clinopyroxene-phyric to megacrystic, intermediate-, calc-alkaline crystal tuff to tuff breccia. The Prairie Hat member is overlain by a 470 ± 4 Ma (location 16, Table 1) felsic crystal tuff (unit OBCf), and an upper sequence of mafic volcaniclastic (unit OBCv) and turbiditic, mafic epiclastic rocks (unit OBCe). An iron-formation marker unit (unit OBCi) lies at the top of the Bobby Cove Formation and consist of banded jasper or quartz-magnetite iron-formation. The Venams Bight Formation consists of tholeiitic, pillowed basalt and related breccia (unit OVBm). The overlying Balsam Bud Cove Formation consists of black, graptolitic shale and turbiditic wacke (unit OBBs) covered by a felsic volcanic unit (unit OBBf) including a 467 ± 4 Ma (location 14, Table 1) rhyolite overlying the Betts Cove Complex, and 470 ± 4 Ma (location 15, Table 1) lapilli tuff overlying the Pacquet complex. Thick-bedded, volcanic-derived conglomerate forms the upper part of the formation at Betts Cove. The Round Harbour Formation marks the top of the Snooks Arm Group and consists of pillowed tholeiitic basalt and volcanogenic sedimentary rocks (unit ORHm). Numerous synvolcanic, tholeiitic gabbro sills and dykes intrude the Snooks Arm Group (unit OSAg) and boninite units of the Pacquet complex.

Silurian (Llandoverian) plutonic rocks of the Burlington plutonic suite intrude the ophiolite complexes and the Snooks Arm Group cover. These include calc-alkaline, hornblende-biotite quartz diorite (unit SBqd) and biotite±hornblende granodiorite (unit SBgd) dated at 441 ± 1.2 Ma (location 9, *see* Skulski et al., 2015b). The Stocking Harbour intrusive suite (unit SSHg) intrudes the Burlington plutonic suite and includes peraluminous, biotite±muscovite tonalite-granodiorite-trondhjemite and muscovite-garnet leucogranodiorite (Epstein, 1983). The Wenlockian to Ludlovian Confusion Bay plutonic suite (Cape Brulé Porphyry, Dunamagon granite, Reddits Cove gabbro, Seal Island Bight syenite, and La Scie granite) and Cape St. John Group are coeval and share common tholeiitic to alkaline parental magmas. The Cape Brulé Porphyry is a composite early subvolcanic pluton comprising tholeiitic, two feldspar–biotite–quartz-phyric monzogranite (unit SCBp) dated at 429 ± 4 Ma (location 6, Table 1), with a melanocratic, coarse-grained, granodiorite to monzogranite phase (unit SCBi), intrusive breccia (unit SCBix), and younger quartz-feldspar porphyry-aplite ring dyke (unit SCBd). An angular unconformity separates the Cape St. John Group from the underlying Snooks Arm Group, Burlington plutonic suite, and Pacquet complex. A lenticular lower sedimentary sequence (Beaver Cove formation; unit SBCs) comprises red-buff-weathering arkose and conglomerate. This is overlain by amygdaloidal tholeiitic basalt, alkaline basalt and hawaiite flows of the Long Pond formation (unit SLPm). These are covered by welded rhyolitic tuff of the Goat Pond formation (unit SGPw) dated at 427.8 ± 0.6 Ma (location 5, Table 1). Overlying these are rhyolitic tuff breccia with jasper and fuchsite clasts in a crystal-tuff matrix of the Red Cliff Pond formation (unit SRCPb) and a younger rhyolitic tuff breccia with blocks of basalt, rhyolite, and felsic tuff in a mafic, highly magnetic matrix (Goss Pond formation; unit SGPb). These are in turn overlain by fine-grained rhyolitic to comenditic tuff (Binch Pond formation; unit SBPt) and amygdaloidal basalt, alkaline basalt, hawaiite and transitional basalt of the Mathis Pond formation (unit SMPm). Overlying intermediate to felsic lapilli tuff units are subdivided into the Armchair Pond formation (unit SAPl) containing black lapilli, bombs, and recrystallized fiamme; and the Little Caplin Cove formation (unit SLCl) with beige lapilli. These are overlain by a 426.1 ± 0.5 Ma (location 2, Table 1) flow-banded rhyolite that includes K-feldspar–phyric rhyolite (Welsh's Pond formation; unit SWPr) that grades westward into tuff breccia, and overlying, comparatively aphyric flow-banded, high-K rhyolite of the Blanche Point formation (unit SBPr). A welded, high-K, quartz–two-feldspar–magnetite felsic tuff (Carolina Point formation; unit SCPr) is overlain by a white, high-K, K-feldspar porphyritic lapilli tuff with elongate sericitized pumice lapilli (Brent's Cove formation; unit SBCl). These are overlain by a thin, amygdaloidal aphyric basalt unit (Stakes Pond formation; unit SSPm) and an upper flow-banded aphyric rhyolite (La Scie formation; unit SLSr). Younger phases of the Confusion Bay plutonic suite include the medium- to coarse-grained Dunamagon monzogranite (unit SDgr) dated at 427.2 ± 1.4 Ma (location 4, Table 1), equigranular to layered Reddits Cove gabbro (unit SRg), fine- to medium-grained, Seal Island Bight syenite (unit SSIB) dated at 426.3 ± 1.1 Ma (location 3, Table 1), and LaScie granite (unit SLSG) locally with abundant mafic enclaves (unit SLSGa).

Two caldera-collapse cycles are recognized in the Cape St. John Group and related Confusion Bay plutonic suite (this study). The Cape Brulé Porphyry is interpreted as a subvolcanic, caldera-related granite. Evidence for high-level emplacement include prominent quartz plus two-feldspar porphyritic character in a fine-grained groundmass, presence of miarolitic cavities, reverse compositional zoning with a melanocratic core (unit SCBix) and leucocratic rim (unit SCBp), roof pendants of ophiolitic crust, dykes and plugs of intrusive felsic breccia (unit SCBix), and a half-ring dyke (unit SCBd) of granite porphyry. The extrusive equivalent of the Cape Brulé Porphyry (429 ± 4 Ma; location 6, Table 1) is the precollapse welded tuff of the Goats Pond formation (unit SGPw; 427.8 ± 0.6 Ma; location 5, Table 1). The first cycle of caldera collapse may be marked by deposition of volcanic breccia units; initially with abundant ophiolite and cover-related basement xenoliths (unit SRCPb) and later with cognate xenoliths (unit SGPb) culminating with caldera-fill tuff (unit SBPt). Resurgence of the caldera resulted in a ring dyke forming in a trap-door caldera uplift (unit SCBd) followed by eruption of mildly peralkaline rhyolitic tuff (unit SBPt). A period of intracaldera resurgence involved eruption of lapilli tuff units (units SAPl and SLCl), followed by eruption of flow-banded rhyolite domes (units SWPr at 426.1 ± 0.5 Ma; location 2, Table 1, and SBPr). The second caldera collapse event may be distal (King's Point caldera at 427 ± 2 Ma; Coyle, 1990) and involved eruption of high-K welded ash-flow tuff (unit SCPr), eruption of high-K lapilli tuff (unit SBCl), and followed by later resurgence and eruption of rhyolite domes (unit SLSr).

ECONOMIC GEOLOGY

Three mines have operated in the Nippers Harbour map area (Sangster et al., 2007, and references therein). Copper-rich, ophiolite-hosted volcanogenic massive sulphide was mined in the Tilt Cove area, where ore lenses were hosted by the Betts Head and Mount Misery formations. The Betts Cove deposit comprises copper-rich massive sulphide hosted by Betts Head formation boninite and underlying sheeted dykes. The Nugget Pond mine is a past-producing gold mine where mineralization was hosted by quartz-albite-carbonate alteration in iron-formation in the Nugget Pond member of the Scrape Point Formation (Snooks Arm Group).

TECTONOMETAMORPHIC EVOLUTION

At least four phases of regional deformation have affected the rocks of the eastern Baie Verte Peninsula (DeGrace et al., 1976; Hibbard, 1983; Stella, 1987; Tremblay et al., 1997; Anderson et al., 2001; Castonguay et al., 2009; Skulski et al., 2010, among others). In general, rocks show a general increase in strain and metamorphic grade from south to north across the map area.

Structures related to D_1 (D_e of Hibbard, 1983) are weakly developed or poorly preserved. In the Betts Cove Complex, a northwest-directed reverse fault, interpreted as a D_1 obduction-related structure (Tremblay et al., 1997; Bédard et al., 2000b), juxtaposes the Betts Head and Mount Misery formations against cumulate peridotite, sheeted dykes, and serpentinite. The D_1 phase is interpreted as related to obduction of ophiolite rocks, arc collision of the Baie Verte Oceanic Tract, and attempted subduction of the autochthonous margin during the Taconic Orogeny (Waldron et al., 1998; van Staal et al., 2007). Post-D_1, pre-D_2 north- to northwest-dipping brittle-ductile normal faults were interpreted by Tremblay et al. (1997) to mark most of the contact between the northern Betts Cove Complex and the Cape St. John Group, and southward, between the talc-serpentine schist and the Snooks Arm Group or Cape Brulé Porphyry.

Penetrative D_2 deformation (D_m of Hibbard (1983); D_1 of Anderson et al. (2001)) is accompanied by greenschist-facies metamorphism. In the southern part of the peninsula, S_2 is a steep to moderately northeast- to northwest-dipping spaced cleavage. Mesoscopic F_2 folds are rarely observed, but reversal of pillow tops and map-scale distribution of marker horizons suggest that macroscopic F_2 folds are present. In the northern part, the S_2 schistosity is axial planar to a series of major close to tight, upright to overturned east- to northeast-trending F_2 folds. The D_2 fabrics are associated with ductile to brittle-ductile south- to southeast-directed shear zones, such as the fault that juxtaposes the Cape St. John Group and Cape Brulé Porphyry against the Betts Cove Complex (Tremblay et al., 1997; Bédard et al., 2000b). The D_3 deformation is characterized by open, upright F_3 cross folds that vary in style and fold plunge depending on the orientation of earlier structures. These north-trending folds are locally associated with a subvertical axial-planar cleavage. The D_2 and D_3 structural phases are interpreted to form part of a progressive deformation associated with the Salinic Orogeny (Skulski et al., 2010) that led to strain partitioning in an overall sinistral transpressional regime (Waldron et al., 1998). Salinic deformation and metamorphism are locally constrained to be less than 426 Ma (location 2, Table 1; age of D_2 deformed upper Cape St. John Group) and as young as 417 Ma (location 41 and 103, Table 1; $^{40}Ar/^{39}Ar$ hornblende and biotite ages). The later age (417 Ma) constrains the age of metamorphism of the ca. 440 Ma phase of the Burlington plutonic suite (units SBgd and SBqd), insofar as it is a depositional basement to the ca. 427 Ma King's Point volcanic complex in southeastern Baie Verte Peninsula.

The fourth deformation phase (D_L of Hibbard (1983); $D_{2–3}$ of Anderson et al. (2001)) is recognized in the northern part of the map area. It is characterized by shallowly inclined to recumbent, open to tight F_4 folds that are interpreted as cogenetic with southeast-dipping ductile-brittle extensional shear zones (Anderson et al., 2001). An axial-planar S_4 fabric, mainly formed by transposition of S_2, dips shallowly to the southeast. D_4 is locally the dominant structure in the Ming's Bight Group, where it is associated with an amphibolite-facies metamorphic overprint (with $^{40}Ar/^{39}Ar$ hornblende ages from 405 Ma (location 65, Table 1) to 359 Ma (location 59, Table 1); 385 Ma titanite (Location 30, Table 1), and $^{40}Ar/^{39}Ar$ muscovite from 365 Ma (location 82, Table 1) to 358 Ma (location 84, Table 1); Anderson et al., 2001), which has also affected the northwestern exposed part of the Cape St. John Group. Later (D_3 of Anderson et al., 2001) moderately to steeply south- and north-dipping ductile-brittle normal faults overprint contacts of the Ming's Bight Group. The D_4 phase is interpreted to have initiated progressive extensional unroofing of the Ming's Bight Group during an overall dextral strike-slip (transpressional to transtensional) regime (Waldron et al., 1998; Anderson et al., 2001). Several northeast-trending faults occur in the southwestern part of the map area. They affect the Silurian intrusions with systematic apparent dextral offsets and are probably related to the Green Bay Fault, running offshore Notre Dame Bay (Hibbard, 1983).

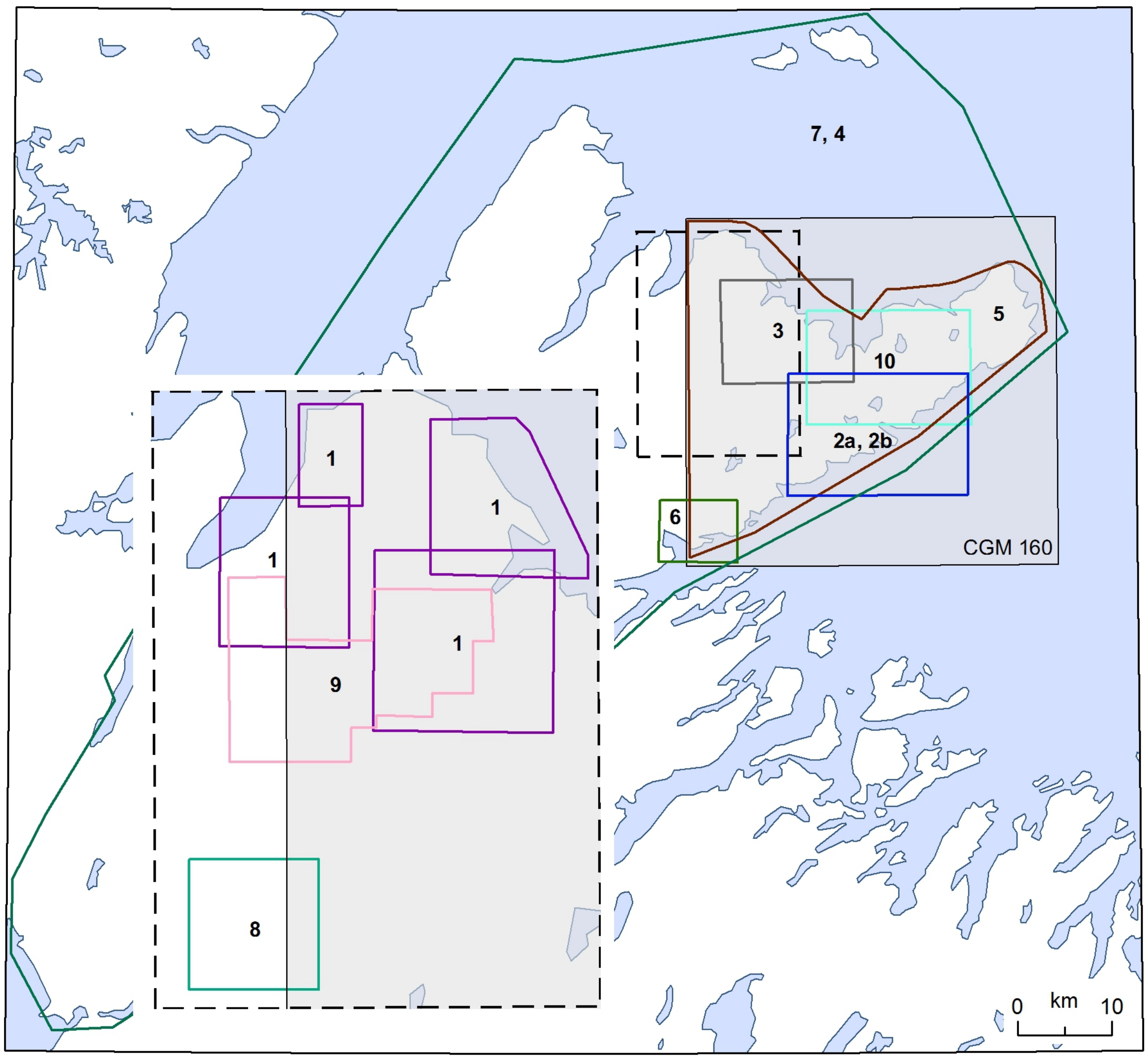

Figure 1. Map sources: 1 = Anderson, 1998; 2a = Bédard et al., 1999; 2b = Bédard et al., 2000b; 3 = Coates, 1970; 4 = Colman-Sadd and Crisby-Whittle; 5 = DeGrace et al., 1976; 6 = Epstein, 1983; 7 = Hibbard, 1983; 8 = Piercey, 1996; 9 = Sheppard et al., 1987; 10 = Stella, 1987.

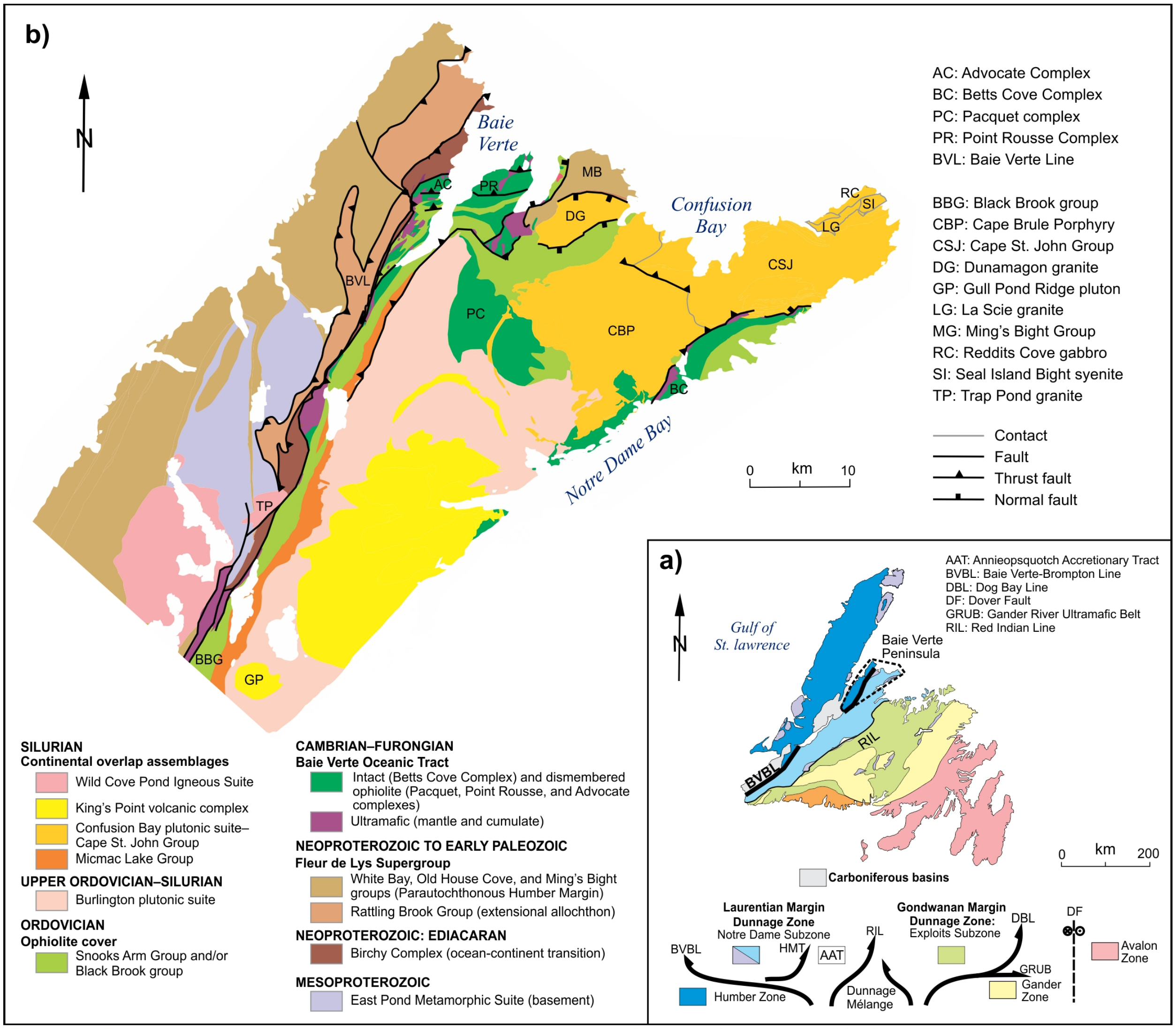

Figure 2. **a)** Tectonic map of Newfoundland and **b)** simplified geological map of the Baie Verte Peninsula (*modified from* Hibbard, 1983; Skulski et al., 2010; van Staal et al., 2013).

Location	Method	Mineral	Rock type	Code	Age (Ma)	Interpretation	Note	Reference
2	U/Pb-TIMS	Zircon	Flow-banded rhyolite	SWPr	426.1 ± 0.5	Crystallization age		Skulski et al., 2012
3	U/Pb-TIMS	Zircon	Coarse-grained syenite	SSIB	426.3 ± 1.1	Crystallization age		Skulski et al., 2012
4	U/Pb-TIMS	Zircon	Monzogranite	SDgr	427.2 ± 1.4	Crystallization age		Skulski et al., 2012
5	U/Pb-TIMS	Zircon	Welded tuff	SGPw	427.8 ± 0.6	Crystallization age		Skulski et al., 2012
6	U/Pb SHRIMP	Zircon	Quartz-feldspar monzogranite	SCBp	429 ± 4	Crystallization age		Skulski et al., 2012
14	U/Pb SHRIMP	Zircon	Rhyolite flow	OBBf	467 ± 4	Crystallization age		Skulski et al., 2010
15	U/Pb SHRIMP	Zircon	Felsic lapilli tuff	OBBf	470 ± 4	Crystallization age		Skulski et al., 2010
16	U/Pb SHRIMP	Zircon	Felsic tuff	OBCc	470 ± 4	Crystallization age		Skulski et al., 2010
22	U/Pb-TIMS	Zircon	Coarse-grained quartz gabbro	ЄBHlg	488.6 +3.1/-1.8	Crystallization age		Dunning and Krogh, 1985
30	U/Pb-TIMS	Titanite	Biotite monzogranite	SDgr	385 ± 1	Metamorphism		Skulski et al., 2012
32	U/Pb-TIMS	Rutile	Chlorite schist (shear zone)	nPOMB	380 ± 2	Cooling age		Anderson et al., 2001
33	U/Pb-TIMS	Microlite	Pegmatite cuts F_3 fold	nPOMB	355 ± 2	Cooling age		Anderson et al., 2001
40	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Granodiorite	SBgd	421 ± 5	Metamorphic cooling age	*See* note 3.	Dallmeyer and Hibbard, 1984
41	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Granodiorite	SBqd	417 ± 5	Metamorphic cooling age	*See* note 3.	Dallmeyer and Hibbard, 1984
44	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Schist	OVBm	357 ± 5	Metamorphic cooling age	*See* note 3.	Dallmeyer and Hibbard, 1984
46	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Schist	nⱣBm	369 ± 5	Metamorphic cooling age	Recalculated as 4 step plateau (98% ^{39}Ar); *see* note 2.	Dallmeyer, 1977
48	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Schist	OVBm	352 ± 5	Metamorphic cooling age	*See* note 3.	Dallmeyer and Hibbard, 1984
59	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Schist	nⱣBm	359 ± 5	Metamorphic cooling age	*See* note 3.	Dallmeyer and Hibbard, 1984
60	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Mafic dyke	SDgr	379 ± 2	Metamorphic cooling age	*See* note 3.	Anderson et al., 2001
61	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Mafic dyke	nPOMB	382 ± 8	Metamorphic cooling age	*See* note 3.	Anderson et al., 2001
62	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Mafic dyke	nPOMB	390 ± 9	Metamorphic cooling age	Fault-bounded mafic sliver; *see* note 3.	Anderson et al., 2001
63	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Gabbro	OSu	477 ± 6		*See* note 3.	Anderson et al., 2001
64	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Amphibolite	OSu	379 ± 21	Metamorphic cooling age	Amphibolite mylonite, fault sliver; *see* note 3.	Anderson et al., 2001
65	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Amphibolite	OBCe	405 ± 8	Metamorphic cooling age	Polydeformed amphibolite; *see* note 3.	Anderson et al., 2001
66	$^{40}Ar/^{39}Ar$ furnace step-heating	Amphibole	Amphibolite	OBBs	384 ± 5	Metamorphic cooling age	Mylonitic amphibolite; *see* note 3.	Anderson et al., 2001
78	$^{40}Ar/^{39}Ar$ laser step-heating	Muscovite	Schist	SMPm	379.9 ± 2.1	Metamorphic cooling age	Pseudo-plateau, 81% gas released, 1 step dropped.	Castonguay et al., 2010
81	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Pegmatite	nPOMB	365 ± 3	Metamorphic cooling age	*See* note 4.	Anderson et al., 2001
82	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Schist	nPOMB	365 ± 3	Metamorphic cooling age	Muscovite defines S_4; *see* note 4.	Anderson et al., 2001
83	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Schist	nPOMB	361 ± 3	Metamorphic cooling age	Big Brook shear zone; *see* note 4.	Anderson et al., 2001
84	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Pegmatite	nPOMB	358 ± 3	Metamorphic cooling age	Deformed pegmatite dyke; *see* note 4.	Anderson et al., 2001
85	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Schist	nPOMB	364 ± 3	Metamorphic cooling age	Muscovite defines S_4; *see* note 4.	Anderson et al., 2001
86	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Schist	nPOMB	362 ± 3	Metamorphic cooling age	Muscovite defines S_4; *see* note 4.	Anderson et al., 2001
87	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Schist	nPOMB	361 ± 3	Metamorphic cooling age	*See* note 4.	Anderson et al., 2001
88	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Pegmatite	nPOMB	364 ± 2	Metamorphic cooling age	Deformed pegmatite; *see* note 4.	Anderson et al., 2001
89	$^{40}Ar/^{39}Ar$ furnace step-heating	Muscovite	Schist	nPOMB	366 ± 3	Metamorphic cooling age	Muscovite defines S_4; *see* note 4.	Anderson et al., 2001
91	$^{40}Ar/^{39}Ar$ laser step-heating	Muscovite	Felsic phyllite	OBBf	369.3 ± 2.0	Metamorphic cooling age	Combined plateau from two aliquots, 86% gas released.	Castonguay et al., 2010
93	$^{40}Ar/^{39}Ar$ furnace step-heating	Biotite	Schist	OVBm	342 ± 5	Metamorphic cooling age	*See* note 3.	Dallmeyer and Hibbard, 1984
103	$^{40}Ar/^{39}Ar$ furnace step-heating	Biotite	Granodiorite	SBgd	417 ± 10	Metamorphic cooling age	Discordant spectrum; reported plateau age (6 steps); *see* note 3.	Dallmeyer and Hibbard, 1984
104	$^{40}Ar/^{39}Ar$ furnace step-heating	Biotite	Schist	nPOMB	352 ± 5	Metamorphic cooling age	Total gas age; *see* note 2.	Dallmeyer, 1977
105	$^{40}Ar/^{39}Ar$ furnace step-heating	Biotite	Schist	nPOMB	339 ± 4	Metamorphic cooling age	Four-step plateau age; *see* note 3.	Dallmeyer and Hibbard, 1984
106	$^{40}Ar/^{39}Ar$ furnace step-heating	Biotite	Granite	SDgr	346 ± 5	Metamorphic cooling age	Reported plateau age (5 step); *see* note 3.	Dallmeyer and Hibbard, 1984
108	$^{40}Ar/^{39}Ar$ laser step-heating	Biotite	Schist	SMPm	378.6 ± 2.1	Metamorphic cooling age	Pseudo-plateau, 35% gas released.	Castonguay et al., 2010

Notes

1 $^{40}Ar/^{39}Ar$ ages (new and historical data) have been calculated using a total ^{40}K decay constant of 5.463E-10 (Min et al., 2000). Some plateau ages (indicated in table) have been recalculated using Isoplot version 3.7 of Ken Ludwig using recalculated ages of steps (in light of revised decay constant and internal standard ages) using Noah Mclean's ArArReCalc_7-31-09.

2 Recalculated using age of Biotite standard SB-2 as 164 Ma revised from original value of 160.2 Ma in light of revised ^{40}K decay constant (note 1).

3 Recalculated using an age of MMhb-1 hornblende standard of 523.1 Ma (Renne et al., 1998) revised from original data calculated using an age of MMhb-1 of 519.5 Ma (Alexander et al., 1978).

4 Recalculated using an age of MMhb-1 hornblende standard of 523.1 Ma (Renne et al., 1998) revised from original data calculated using an age of MMhb-1 of 520 Ma (Samson and Alexander, 1987).

Table 1. Geochronological data.

Location	Name	Status	Commodity	Secondary commodity
1	Betts Cove mine	Past producer	Copper	Gold, zinc
2	Tilt Cove mine	Past producer	Copper	Gold, nickel, silver, zinc
3	Nugget Pond mine	Past producer	Gold	Copper, silver

Table 2. Past-producing mines.

Location	Name	Commodity	Secondary commodity
6	Foote Pond	Copper	Zinc, gold, silver
7	Rogues Harbour	Copper	Gold, lead
13	Nippers Harbour Copper	Copper	Iron
27	Mount Misery	Copper	Gold, copper, zinc, silver
40	Long Pond (Nudulama)	Copper	Gold, lead, iron,
41	Muirs Pond	Copper	Silver, gold, iron, nickel, cobalt
44	Mud Pond	Gold	Copper, nickel, talc

Table 3. Drilled prospects.

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Coordinate System

Projection: Universal Transverse Mercator
Units: metres
Zone: 21
Horizontal Datum: NAD83
Vertical Datum: mean sea level

Bounding Coordinates

Western longitude: 56°00’00”W
Eastern longitude: 55°27’00”W
Northern latitude: 49°43’00”N
Southern latitude: 50°03’00”N

Data Model Information

This Canadian Geoscience Map does not conform to either the Bedrock or Surficial Mapping Geodatabase Data Models. The author may have included a complete description of the feature classes and attributes in the Data\Data Model Info folder.

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ACCORD DE LICENCE