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SHARED STRUCTURAL HISTORY BETWEEN THE GANDER GROUP AND BAY d'ESPOIR GROUP, SOUTH-CENTRAL NEWFOUNDLAND

G.S. Santos
Regional Geology Section

ABSTRACT

The structural architecture of the Bay d'Espoir Group is described based on fieldwork in the Twillick Brook (NTS 2D/04) and St. Alban's (NTS 1M/03) map areas. The earliest deformation event, D_1, is largely responsible for the map pattern of the group,which resulted in the folding and local transposition of beds, and the formation of a foliation parallel to the northeast-striking axial plane of isoclinal folds. A second D_2 event resulted in the formation of open to isoclinal folds and northwest-striking axial planes. A final D_3 event, led to the formation of a widespread horizontal cleavage parallel to the axial plane of recumbent folds in the southern units of the Bay d'Espoir Group.

This structural architecture, characterized by three distinct deformation events, is also observed in the sliver of the Gander Group preserved within the Great Gull Lake (NTS 2D/06) map area. This similarity indicates that the Bay d'Espoir Group and the Gander Group share a common structural history. In the Great Gull Lake area, the contact between these two groups is marked by a pronounced aeromagnetic anomaly and the presence of dismembered metaperidotite lenses, which collectively suggest the existence of an oceanic suture. D_1 is interpreted as the closure of an oceanic basin leading to the formation of this suture. The second D_2 event remains poorly constrained. The third and final D_3 event is interpreted as extensional. Previous mapping in the Twillick Brook map area indicated the Mathews Pond Granodiorite and the Rocky Bottom Tonalite are synkinematic with D_3 structures, indicating a significant Silurian extensional event in central Newfoundland.

INTRODUCTION

In this report, the structural architecture of the Bay d'Espoir Group is described based on data collected during the 2023 and 2024 field seasons in the Twillick Brook (NTS 2D/04) and St. Alban's (NTS 1M/03) map areas (Figure 1), and then compared to the structural features observed on three traverses covering the Gander Group–Bay d'Espoir Group contact in the Great Gull Lake (NTS 2D/06) map area. The relationship between the Gander and Bay d'Espoir groups is key to understanding the evolution of Ganderia. Colman-Sadd (1980b) correlated the Bay d'Espoir and Gander groups and proposed that they were deposited in the same Ordovician back-arc basin developing concurrently in the eastern margin of the Iapetus Ocean. More recently, van Staal *et al.* (2021) correlated the Bay d'Espoir Group to several other metasedimentary and metavolcanic units across the northern Appalachians, interpreting them as overlying the metasediments of the Gander Group and Penobscot-related ophiolites.

A recent airborne aeromagnetic survey (Kilfoil, 2020) detected a prominent magnetic linear anomaly at the contact between the Gander and Bay d'Espoir groups (Figure 2). This aeromagnetic anomaly is also the location of several dismembered metaperidotite bodies (Blackwood and Green, 1982; Zagoreviski *et al.*, 2010). This contact was investigated based on three detailed traverses made during the 2024 field season. The main goals were to map the geology and identify the structural architecture of the contact between the Gander Group and the Bay d'Espoir Group, a key relationship to understanding the geology of Ganderia.

REGIONAL GEOLOGY

Both the Gander and Bay d'Espoir groups are components of the sedimentary cover of Ganderia (Figure 1), a major terrane in the northern Appalachians (van Staal and Barr, 2012). Having rifted from the Amazonian margin of Gondwana between 505–495 Ma (van Staal *et al.*, 1996; Shultz *et al.*, 2008), Ganderia drifted across the Iapetus Ocean until its final collision with the composite Laurentia margin during the Salinic orogeny (van Staal and Barr, 2012). During this drift, the leading edge of Ganderia was likely the basement of two arc-back-arc systems (van Staal *et al.*, 2021). Alternatively, Waldron *et al.* (2018, 2022) proposed Ganderia arrived in composite Laurentia in at least four distinct terranes.

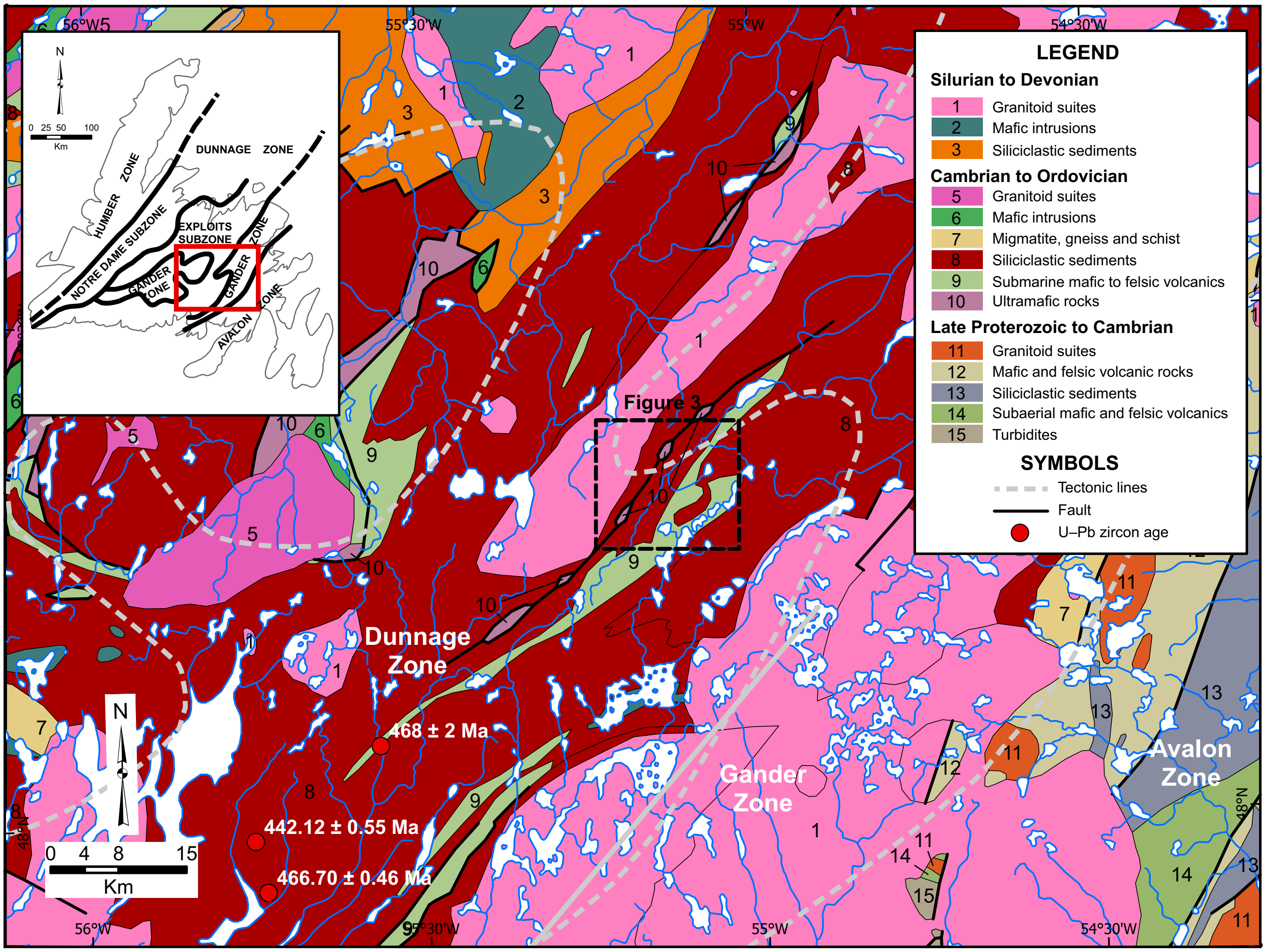

Figure 1. *Simplified regional geology of south-central Newfoundland (modified after Colman-Sadd* et al.*, 1990) showing the location of the study area. All plotted ages are U–Pb in zircon (Colman-Sadd* et al.*, 1992; Westhues, 2022).* See *text for details.*

The earliest of the two arcs is the 515–485 Ma Penobscot arc (Zagorevski *et al.*, 2010). Subsequent rifting separated the active Penobscot arc from the passive Gander margin facing the Iapetus Ocean, resulting in the *ca.* 510–494 Ma opening of the Penobscot back-arc basin (Colman-Sadd *et al.*, 1992; van Staal, 1994; Zagorevski *et al.*, 2010; Sandeman *et al.*, 2012). The passive Gander margin became the deposition site of the Gander Group (van Staal, 1994; Zagorevski *et al.*, 2010). The Gander Group is dominated by a quartz-rich arenite, with subordinate psammite, pelite, siltstone, mafic volcanic rocks, and intermediate volcanic rocks becoming stratigraphically thicker up-section (O'Neill, 1991; O'Neill and Colman-Sadd, 1993). The base of the Gander Group is younger than *ca.* 535 Ma (O'Neill, 1991; Henderson *et al.*, 2018), and detrital zircon ages in the upper part of the group indicate deposition before *ca.* 507 Ma (Willner *et al.*, 2014). Closure of the Penobscot back-arc basin is constrained by the *ca.* 474 Ma Partridgeberry Hills granite (Colman-Sadd *et al.*, 1992) during the events of the Penobscot orogeny (Colman-Sadd *et al.*, 1992). Closure of the Penobscot back-arc basin may have been caused by the shallowing of the subducting Iapetus slab (van Staal *et al.*, 2009).

During the Ordovician, the collapsed Penobscot arc became the basement of a second arc, the 478–474 Victoria arc (Tucker *et al.*, 1994; Valverde-Vaquero *et al.*, 2000; Zagorevski *et al.*, 2010). A significant slab-roll back episode led to rifting of the arc and the formation of the Tetagouche–Exploits back-arc basin *ca.* 475–465 Ma (van Staal *et al.*, 2003; Valverde-Vaquero *et al.*, 2006). The passive side of the Tetagouche–Exploits back-arc basin is considered to be the deposition site of the Bay d'Espoir Group (van Staal *et al.*, 2021), which is deemed to disconformably overlying the older Gander Group (*e.g.*, Williams and Piasecki, 1990). The Bay d'Espoir Group comprises

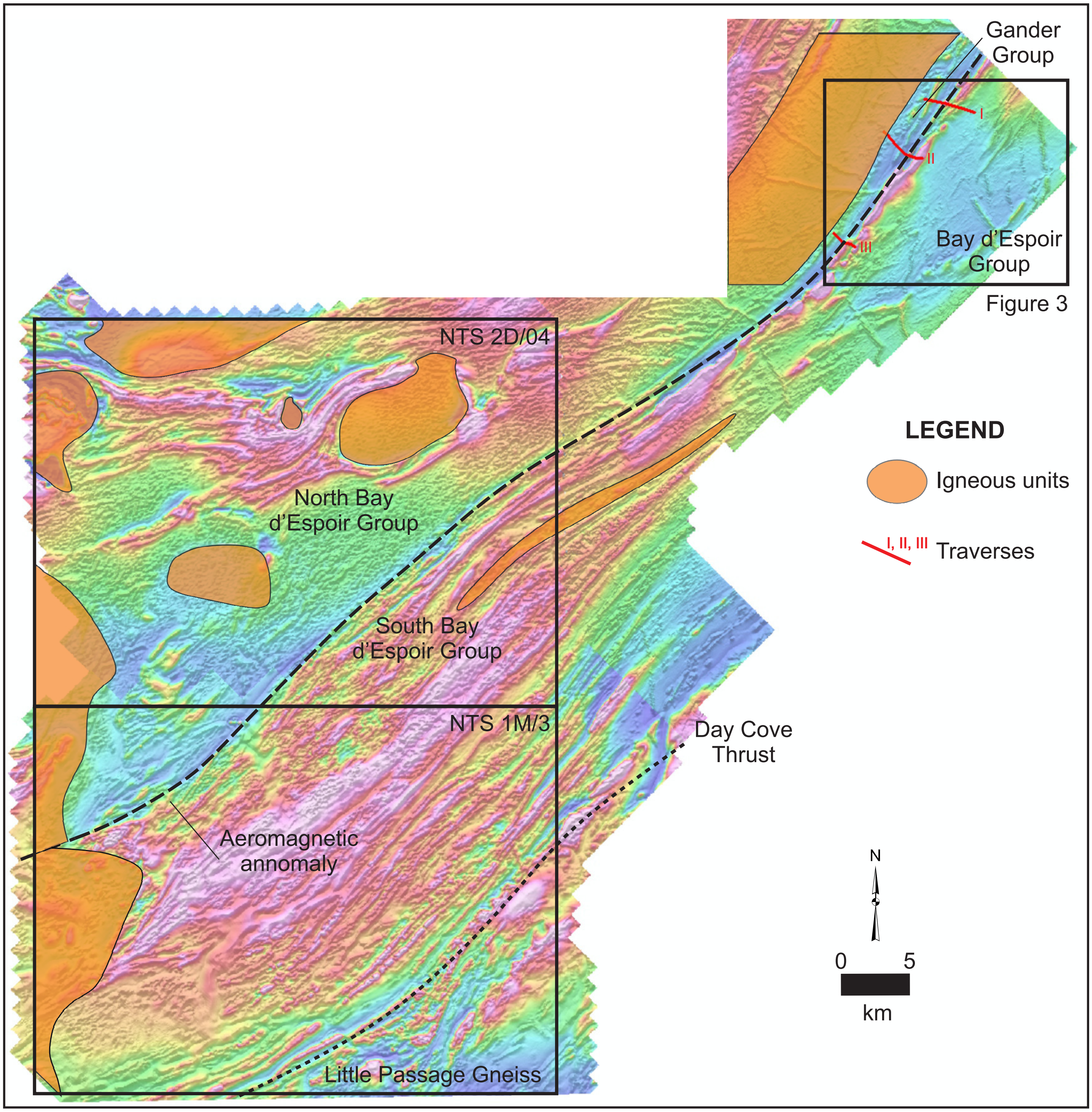

Figure 2. *First vertical derivative of the aeromagnetic survey analytical signal draped over the grey scale of the 10° magnetic tilt for the St. Alban's, Twillick Brook and Great Gull Lake areas (Kilfoil, 2020), highlighting the distinction between north and south Bay d'Espoir Group. The Day Cove Thrust marks the southern limit of the Bay d'Espoir Group (*see *Westhues and Anderson, 2018; Westhues, 2022).*

metasedimentary and subordinate metavolcanic rocks Colman-Sadd, 1980a, b; Colman-Sadd *et al.*, 1992; Westhues and Hamilton, 2018; Santos, 2024). Paleontological and geochronological constraints for the Bay d'Espoir Group are limited. Boyce *et al.* (1993) reported deformed trilobite pygidium in a shale suggesting a 470–467 Ma age range. Colman-Sadd *et al.* (1992) reported a U–Pb TIMS date of 468 ± 2 Ma age for a metarhyolite. Westhues (2022) reported U–Pb TIMS dates of 442.12 ± 0.55 Ma for a felsic metavolcanic sample, and 466.70 ± 0.46 Ma for a dacite. The Popelogan–Victoria arc collided with composite Laurentia between 455–450 Ma in the Taconic 3 orogeny, with in subduction stepping back into the Tetagouche–Exploits back-arc basin (van Staal *et al.*, 1998, 2009). Final closure of the Tetagouche–Exploits back-arc basin took place *ca.* 430 Ma during the events of the Salinic orogeny (van Staal, 1994; van Staal *et al.*, 2003).

GEOLOGY OF THE STUDY AREA

The local geology and the location of the traverses are highlighted in Figure 3. The traverses are roughly parallel to each other and are oriented northwest–southeast. The traverses cover, from northwest to southeast, rocks assigned to the Gander Group, dismembered metaperidotite and the Bay d'Espoir Group. All three of these units were observed in traverses I and II. Traverse III only covers the Gander Group and the metaperidotite. In the description that follows, all colours refer to fresh surfaces.

GANDER GROUP

Gander Group rocks are best exposed in traverses II and III. At the northwest edge of the study area, the group consists of a white, medium-grained meta-arenite (Plate 1A). Clasts are well rounded and well sorted. This meta-arenite contains up to 10% biotite and muscovite, likely of metamorphic origin.

Towards the southeast, this white mica-rich meta-arenite grades into interbedded muscovite–biotite–garnet ± staurolite schist and fine-grained psammitic schist (Plate 1B). Beds of both lithologies are 10–30-cm thick. Both the modal proportion and grain size of garnet and staurolite porphyroblasts in the schist increase towards the contact with the metaperidotite. Garnet and staurolite porphyroblasts form up to 20 and 30% of the schist, with grain size up to 3 mm for garnet and up to 1 cm for staurolite. Beds of the psammitic

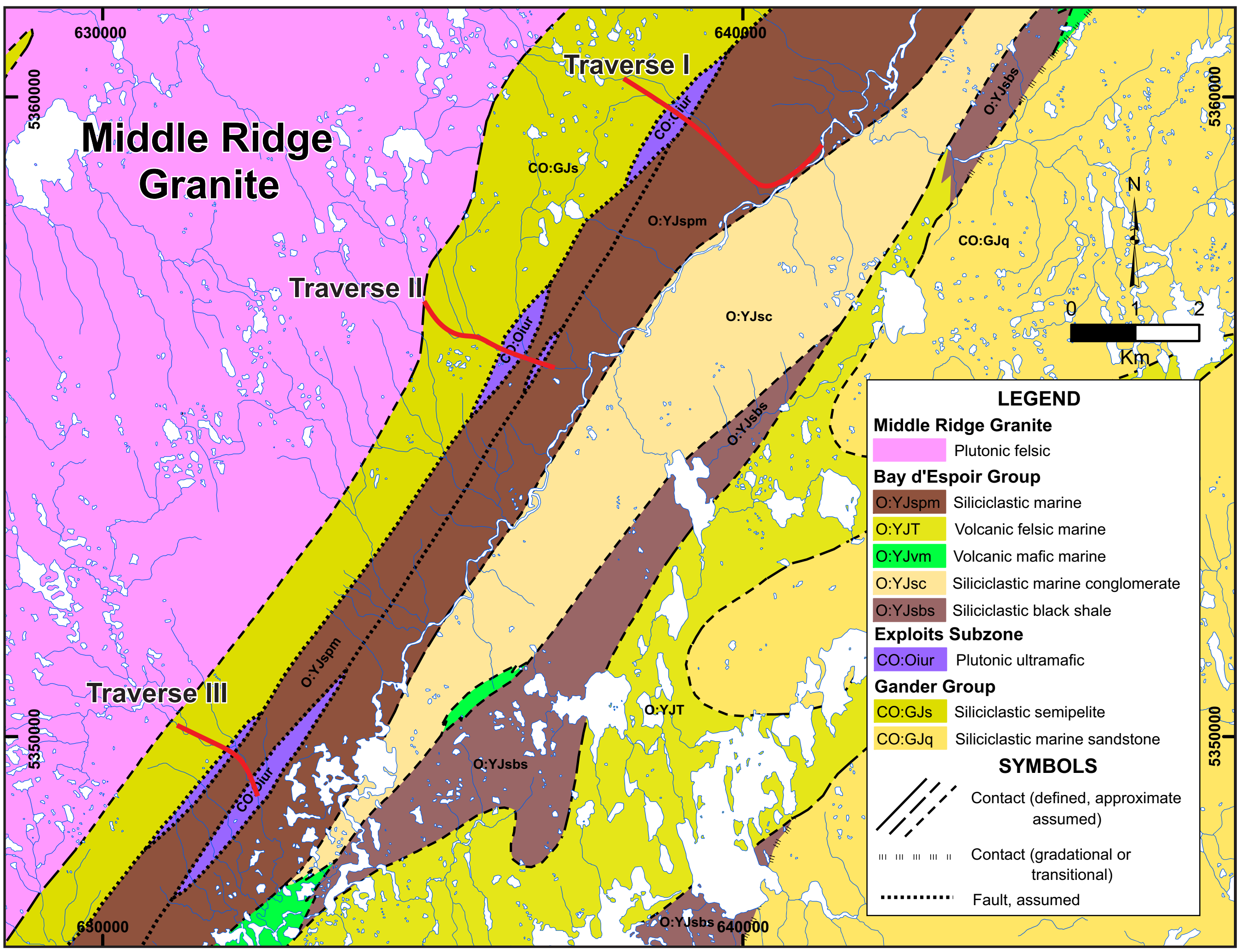

Figure 3. *Regional geology of the study area (Blackwood and Green, 1982; Colman-Sadd* et al.*, 1990). A description of the geology is provided by Blackwood and Green (1982).*

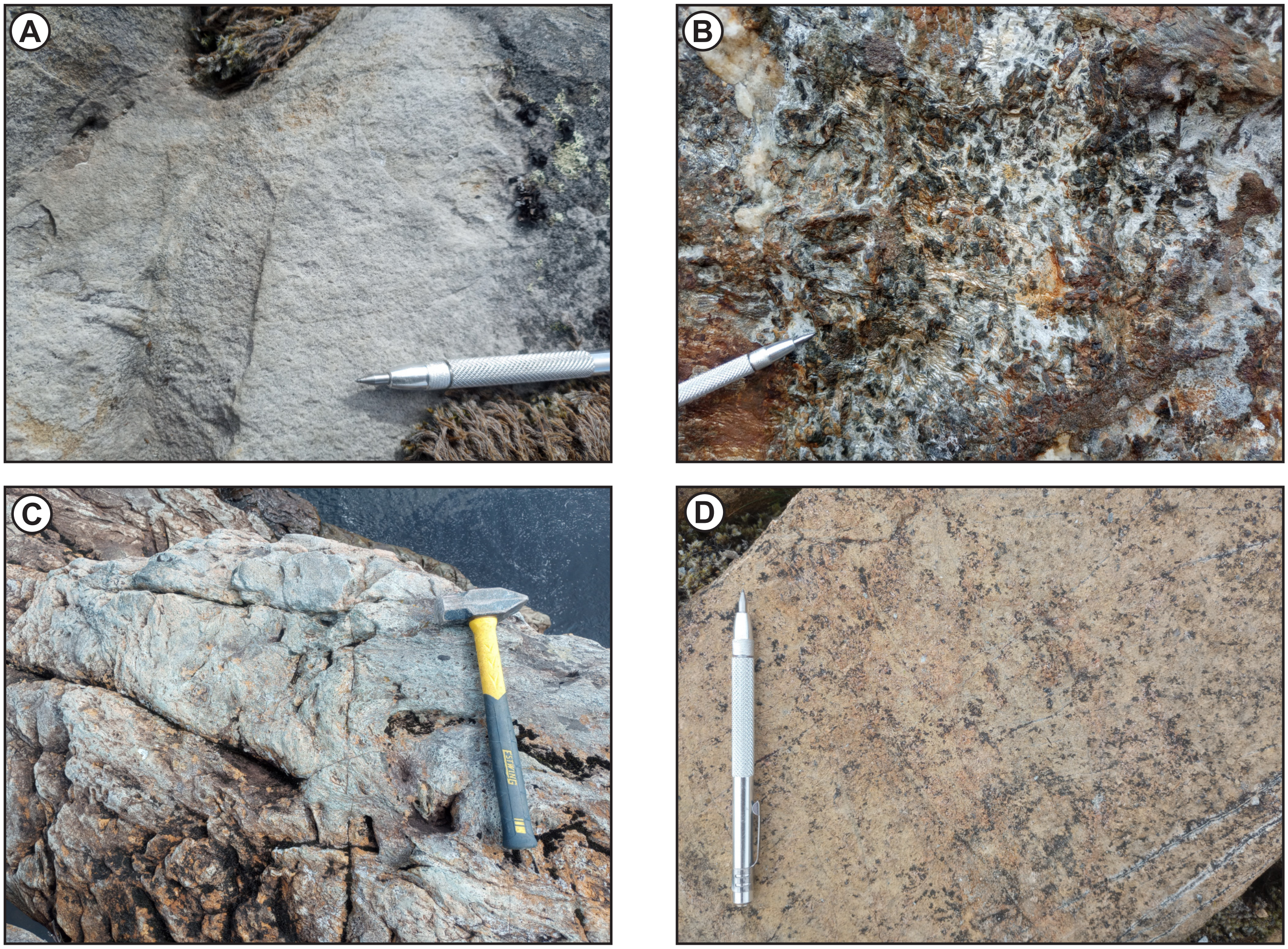

Plate 1. *Geology of the contact between the Gander Group and Bay d'Espoir Group in the study area. A) White, medium-grained meta-arenite of the Gander Group; B) Garnet–staurolite mica schist, Gander Group in proximity with the metaperidotite. Both garnet and staurolite form porphyroblasts, with staurolite reaching up to 1 cm in length; C) Green to light green chlorite–tremolite greenschist rock. This lithology was observed between the Gander Group and metaperidotite on traverses II and III; D) Fine- to medium-grained metaharzburgite, a typical outcrop of the metaperidotite on traverse I. Orthopyroxene grains are darked and show higher relief. Two serpentine veins can be seen in the bottom right corner of the picture.*

schist near the metaperidotite contact are typically in the ~5 cm range, and are often boudinaged. The contact between the Gander Group and the metaperidotite was not observed. However, close to the metaperidotite in traverse II, a heavily brecciated psammitic schist was observed containing clasts of a grey muscovite schist and a brown, fine-grained arenite. The presence of this breccia between the two lithologies indicates the contact is tectonic.

METAPERIDOTITE

In traverses II and III, the northwestern edge of the metaperidotite is marked by a green to light-green, chlorite–tremolite-greenschist (Plate 1C). This lithology is strongly foliated and contains cm-scale clasts of metaperidotite. The metaperidotite outcrops as a series of dismembered lenses, ranging between 10–100 m in length. Strain in this unit increases towards the southwest, with metaperidotite ranging from undeformed in traverse I to mylonitic in traverse III. The dominant lithology in the metaperidotite unit is a medium-grained harzburgite (Plate 1D). The harzburgite is predominantly olivine and orthopyroxene with small but varying amounts of clinopyroxene. The harzburgite is characteristically interlayered with variably serpentinized dunite and rarer orthopyroxenite, varying from centimetre to decimetre scale in thickness. In traverse II, the metaperidotite is crosscut by a network of 5–10-cm-wide shear zones, anastomosing around less strained 10–30-cm-wide ellipsoidal domains (Plate 1E). These shear zones are largely composed of serpentine and talc, with minor amounts of

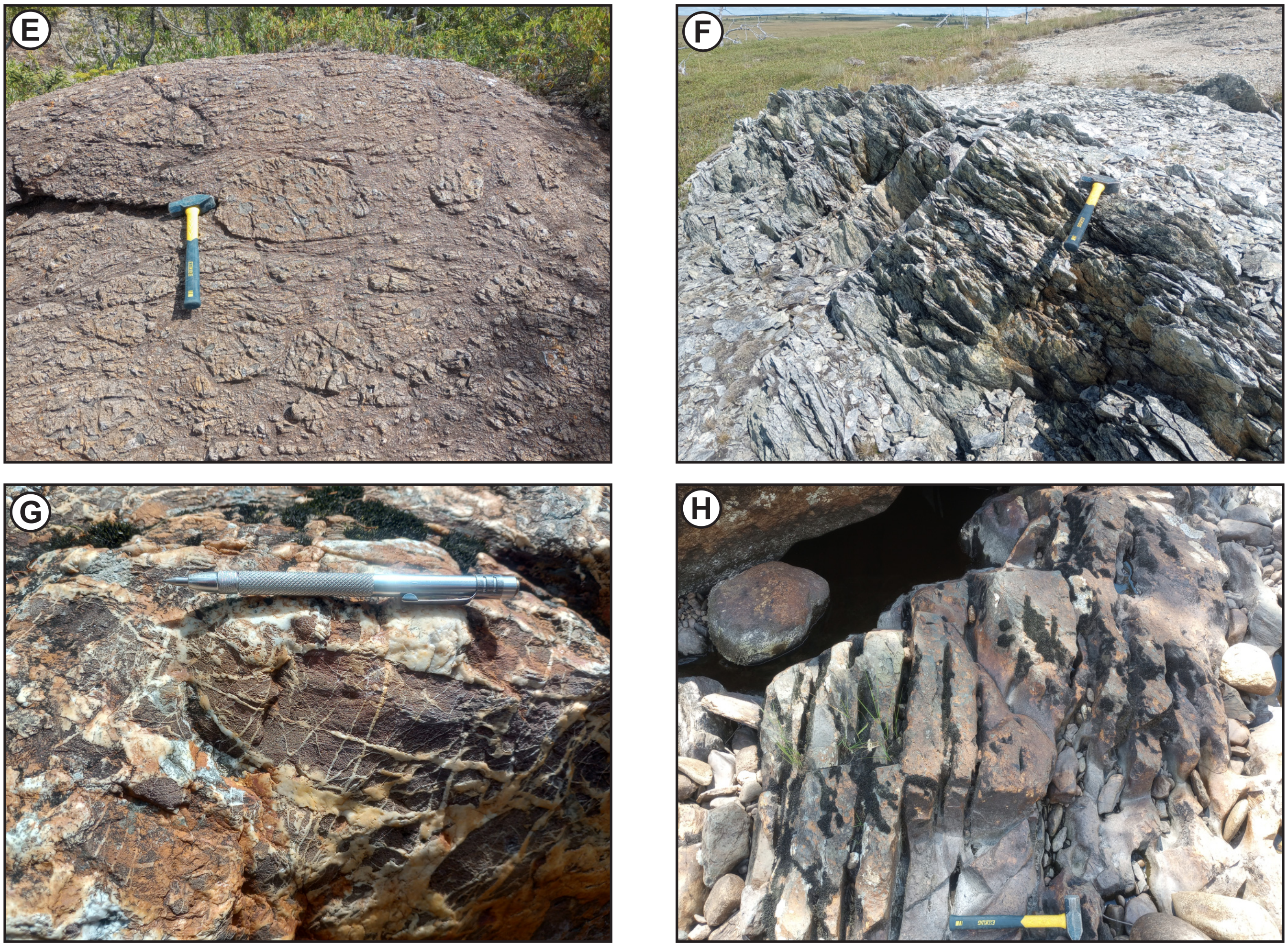

Plate 1. (Continued) *E) Sheared metaperidotite, with high-strain domains anastomosing around decimetre-scale lower strain domains; F) Ultramafic mylonite, observed on traverse III. The mylonite consists of serpentine, talc and small amounts of chlorite and epidote; G) Cataclasite between the metaperidotite and the metasedimentary rocks of the Bay d'Espoir Group. Clasts of metaperidotite and meta-arenite were observed; H) Interbedded fine-grained meta-arenite and meta-argillite of the Bay d'Espoir Group. This lithology is typical of the St. Joseph's Cove Formation of the Bay d'Espoir Group.*

chlorite and orthopyroxene relics. The metaperidotite in traverse III is mylonitized (Plate 1F), with the low-strain domains observed in traverse II completely obliterated. This ultramafic mylonite consists of serpentine, talc, and minor amounts of chlorite and epidote. A strongly brecciated metaperidotite was observed close to the brecciated psammitic shist on traverse II, further supporting a tectonic contact between the Gander Group and the metaperidotite. The metaperidotite is separated from the Bay d'Espoir Group in the southeast by a cataclasite (Plate 1G).

BAY d'ESPOIR GROUP

Metasedimentary rocks assigned to the Bay d'Espoir Group outcrop to the southeast of the metaperidotite. They consist of a light blue to blue slate, with 2–20-cm-thick beds of a blue, fine-grained meta-arenite forming up to 10% of the outcrop (Plate 1H). The meta-arenite contains ~2% of disseminated euhedral pyrite grains. This interbedded slate and meta-arenite are similar to Unit 2 of the St. Joseph's Cove Formation, described in detail by Santos (2024).

STRUCTURAL ARCHITECTURE

For the present discussion, the Bay d'Espoir Group is divided into two structural domains. The North Steady Pond and Salmon River Dam formations (Colman-Sadd, 1978, 1979, 1980a; Santos, 2024) are grouped as the north Bay d'Espoir Group, and the St. Joseph's Cove, Riches Island and Isle Galet formations (Westhues, 2017a, b; Westhues and Hamilton, 2018; Santos, 2024) are grouped as the south Bay d'Espoir Group (Figure 2). The same aeromagnetic anomaly that separates the Bay d'Espoir and Gander groups in the Great Gull Lake (NTS 2D/06) map area separates the north and south Bay d'Espoir groups in the St. Alban's (NTS 1M/13), Twillick Brook (NTS 2D/04) maps areas (Figure 3). The structural features of the Bay d'Espoir Group in the St. Alban's (NTS 1M/13) and Twillock Brook (NTS 2D/04) areas are described and compared to the structural fabric observed in the study area

Multiple planar and linear structural fabrics have been identified and interpreted as three distinct deformation events (D_1–D_3). Bedding, foliations (S_1–S_3), fold axis (L_{f1}–L_{f3}), crenulation lineation (L_{c1}–L_{c3}), and mineral stretching lineation (L_{x1}) associated with each deformation event are summarized in Figure 4. Given the predominance of units with interbedded meta-arenite and meta-argillite/slate, the original bedding can frequently be observed, forming a useful structural datum.

BAY d'ESPOIR D_1

S_1 is mainly a cleavage in meta-argillite and slates. In outcrop, S_1 (Figure 4B) is sub-parallel to bedding (Figure 4A), but shows more scattered strikes. This is likely due to cleavage refraction in the Salmon River Dam, St. Joseph's Cove and Riches Island formations, which are dominated by facies of interbedded meta-arenite and meta-argillite/slate and is reflected in the larger scatter observed in the south compared with the north Bay d'Espoir Group.

F_1 folds (Plate 2A) dominate the map pattern (Santos, 2024), and are tight to isoclinal, with axal planes (axial planar crenulation measured on F_1 hinges, *see* Plate 2B) generally dipping steeply to southeast (Figure 4B, D). F_1 fold axis plunge shallowly to northeast (~15°; Figure 4B, D). An F_1-related crenulation is widespread across all formations in the Bay d'Espoir Group. This L_{c1} is broadly parallel with L_{f1} but shows more scatter (Figure 4B, D).

D_1 deformation locally resulted in zones of high strain, where thin (<5 cm) meta-arenite beds embedded in meta-argillite are boudinaged, attenuated and folded (Plate 2C). These folds are isoclinal, with axial planes parallel to the S_1 foliation and F_1 axial planes. These high-strain zones were mainly observed in the slate-rich Riches Island Formation.

BAY d'ESPOIR D_2

D_2-related structures are less prominent than D_1 and D_3 structures. S_2 is a weak cleavage, at high angle with bedding and S_1 (Plate 2D, Figure 4C, G). D_2 folds are markedly different in the north and south Bay d'Espoir Group. In the north Bay d'Espoir Group, F_2 are tight to isoclinal, with steep axial planes (axial planar crenulation) oriented northwest–southeast (Plate 2E). F_2 fold axis plunges moderately to southeast (Plate 2F, Figure 4C, G), with a parallel crenulation axis. F_2 folds can be seen in the map pattern of units 9 and 10 of the Salmon River Dam Formation (Santos, 2024). Refolded F_1 folds were observed in two outcrops in harmonic F_2 M-folds. D_2 is less pronounced in the south Bay d'Espoir Group, with observable structures largely restricted to a weakly developed crenulation, and rare parasitic folds in the meta-argillites of the St Joseph's Cove Formation and the slates of the Riches Island Formation. In the south Bay d'Espoir Group, F_2 folds are open, with an axial plane and fold axis showing similar orientation as in the north Bay d'Espoir Group (Figure 4C, G). L_{c2} is more scattered compared to L_{c1}, spread along a girdle parallel to the northwest–southeast axial plane.

BAY d'ESPOIR D_3

D_3 structures show the least amount of scatter when compared to D_1 and D_2 structures. S_3 consists of a strong horizontal crenulation observed in meta-argillite, slate and schist across both the north and south Bay d'Espoir Group (Plate 2G, Figure 4D, H). F_3 is recumbed, varying from open to close, with fold axis plunging shallowly (<10°) to the southwest (Plate 2H, Figure 4D, H). These folds were only observed in the south Bay d'Espoir Group, particularly in the Riches Island Formation. A crenulation axis parallel to F_3 fold axis can be observed on S_1 and bedding in both the north and south Bay d'Espoir groups (Figure 4D, H).

STUDY AREA D_1

S_1 is generally parallel to bedding (Figure 5A), consisting of a strong cleavage and schistosity in the Gander Group (Figure 5B) and a weak cleavage in the Bay d'Espoir Group (Figure 5F). S_1 in the Gander Group, metaperidotite and Bay d'Espoir Group are parallel, steeply dipping to the southeast. L_1 stretching and mineral alignment lineations are defined by staurolite porphyroblasts and stretched muscovite and biotite grains in the Gander Group (Plate 3C, Figure 4B). This lineation has moderate to steep (30–80°) plunge to southeast. D_1 folds were only observed in the Gander Group (Plate 3A). This F_1 fold is open, with axial plane (axial planar crenulation) dipping moderately to east-northeast, with a shallow (~5°) fold axis plunging to the southwest. A weak D_1 crenulation axis was measured in S_1 in both the Gander (Figure 5B) and Bay d'Espoir groups (Figure 5G), with shallow (<10°) plunges to the northeast.

In the metaperidotite, S_1 consists of a mylonitic foliation (Plate 1F, Figure 5E). S-C fabrics in sheared metaperidotite are consistent with dextral shearing (Plate 3D). Serpentine grains and mm-scale chlorite aggregates define a strong mineral stretching lineation. This lineation is parallel

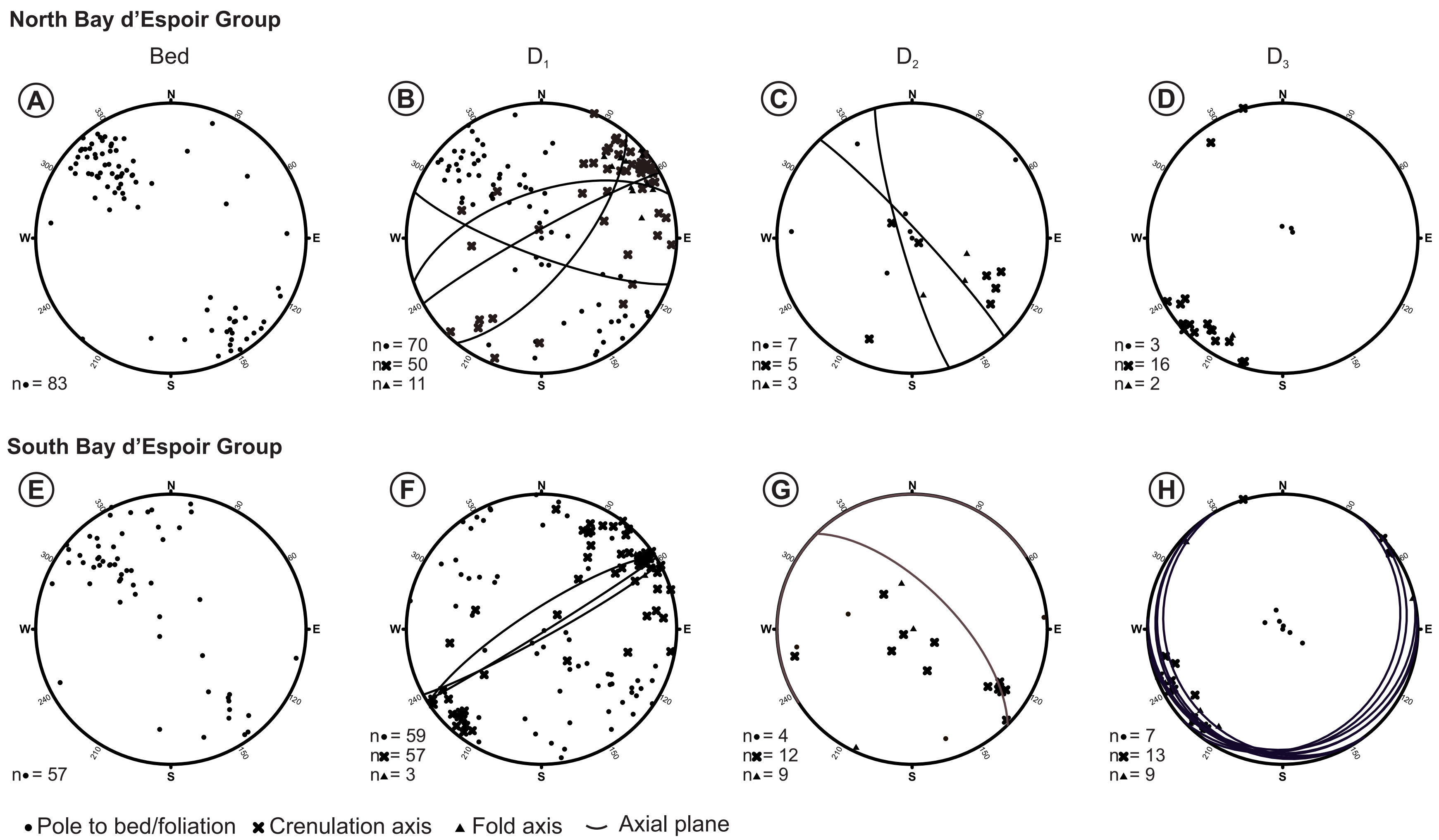

Figure 4. *Structural data from the Bay d'Espoir Group. Folded beds (A) and foliation, crenulation lineation, fold axis and axial planes related to D_1 (B), D_3 (C) and D_3 (D) events in the North (A, B, C and D respectively) and South Bay d'Espoir Group (E, F, G and H respectively) are shown.*

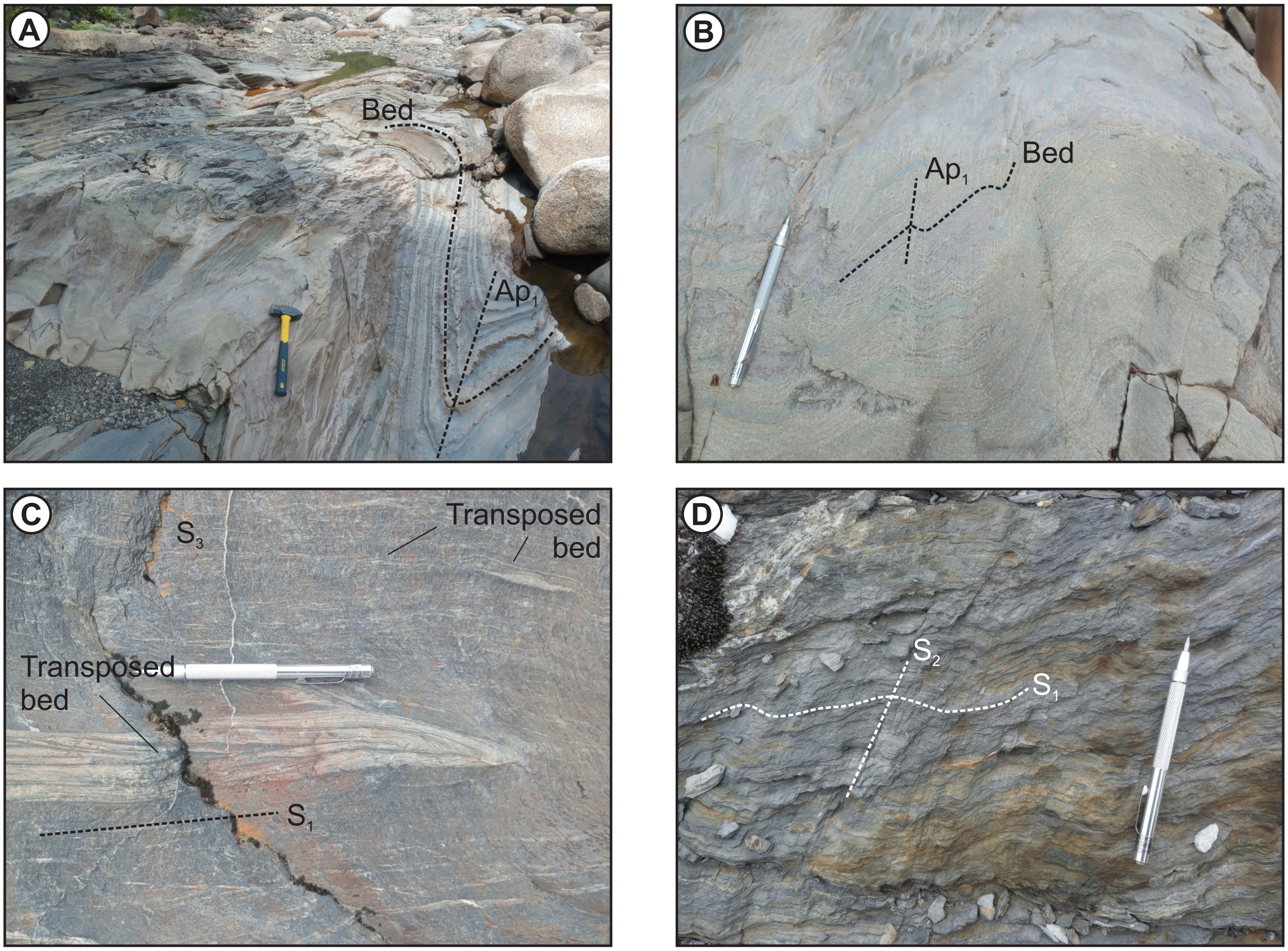

Plate 2. *Structural features of the Bay d'Espoir Group. A) F_1 folds in the St. Joseph's Cove Formation. When observed in outcrop, these folds are closed to isoclinal, with amplitude in the order of ~5 m. F_1 axial planes dip steeply to the southeast, with fold axis plunging shallowly to northeast; B) Detail view of a fold hinge in the same outcrop pictured in (A), showing a well-developed F_1 axial plane; C) Transposed bed of fine-grained meta-arenite embedded in the slate of the Riches Island Formation. The isoclinal folds preserved in the meta-arenite have axial plane parallel with the S_1 foliation in the slate. Thinner, boudinaged meta-arenite beds are also visible; D) Open F_2 folds in the slates of the Riches Island Formation, with an S_2 dipping steeply to northeast.*

to the mineral stretching lineation measured in the Gander Group (Figure 5B, E). In one outcrop in traverse I, the meta-arenite contains ~5–10-cm-thick bed-parallel shear zones, with S-C fabrics consistent with dextral shearing (Plate 3F).

STUDY AREA D_2

D_2 structures are the least preserved. S_2 consists of a weak schistosity defined by aligned muscovite and biotite in the Gander Group (Figure 5D). This foliation is subvertical, striking northwest–southeast. S_1 foliation in both the Gander and Bay d'Espoir groups (Figure 5H) shows a weak D_2 crenulation. The measured crenulation axis plots along a steep northwest–southeast girdle. No D_2 structures were identified in the metaperidotite.

STUDY AREA D_3

S_3 consists of a shallow to horizontal weak schistosity defined by aligned muscovite and biotite grains in the Gander Group (Figure 5D) and a strong crenulation in the slates of the Bay d'Espoir Group (Figure 5I). D_3 crenulation axis in the S_1 foliation is ubiquitous (Plate 3B), with shallow plunges (<15°) to the southwest. Locally, a single F_3 fold axis was measured in a parasitic fold in the Bay d'Espoir Group, plunging shallowly to northeast.

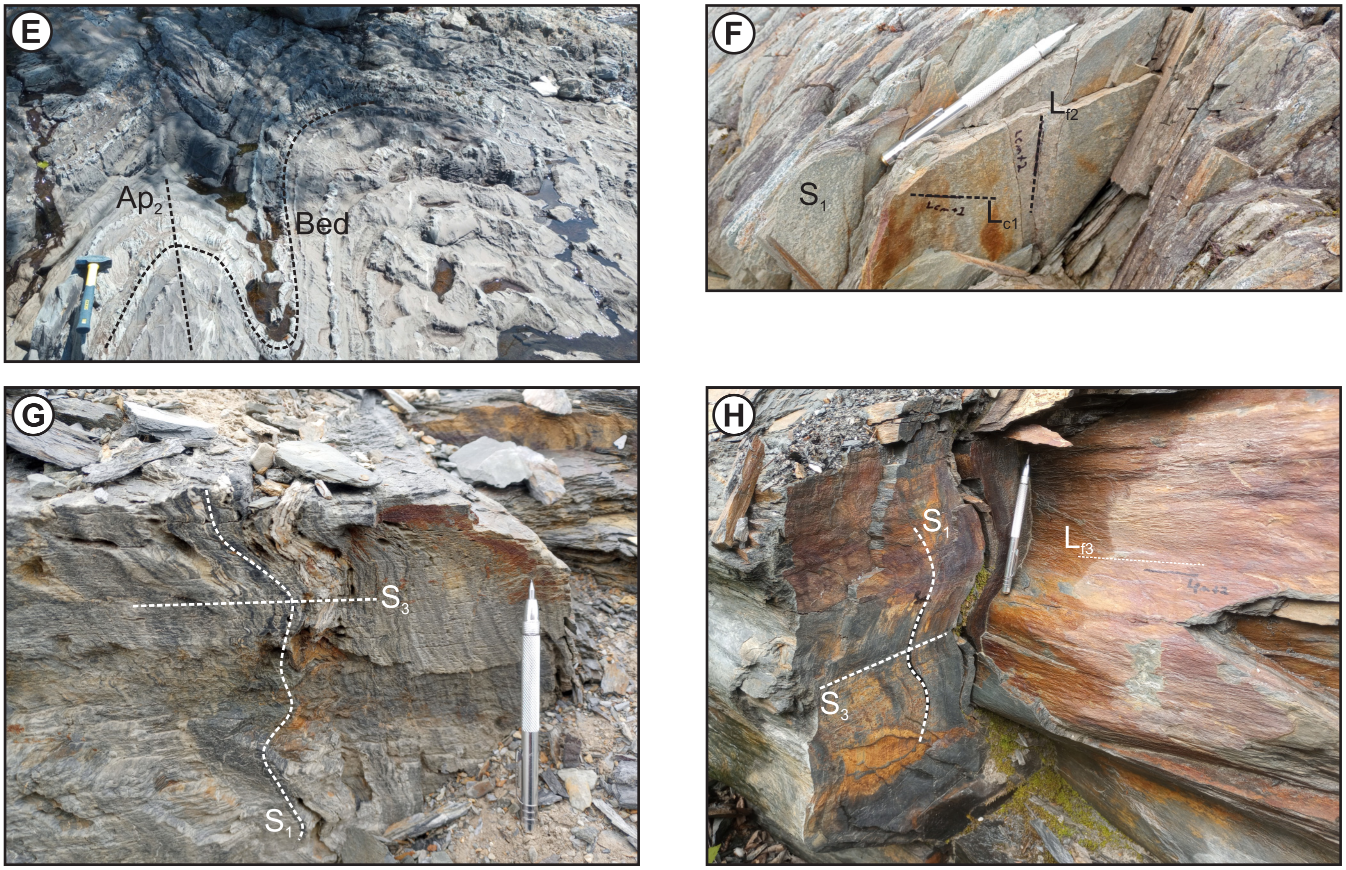

Plate 2 (Continued). *E) Close F_2 M-folds in the interbedded meta-arenite and meta-argillite of the Salmon River Dam Formation; F) Shallow northeast plunging L_{c1} and steep southeast plunging L_{f2} visible in the slates of the North Steady Pond Formation. S_3 intersecting S_1 at a high angle, forming open folds in the slates of the Riches Island Formation; H) F_3 folds in the slates of the Riches Island Formation, showing a subhorizontal axial plane and fold axis.*

DISCUSSION AND CONCLUSIONS

Based on the descriptions here, the structural architecture indicating three deformation events in the Bay d'Espoir Group in the St. Alban's (NTS 1M/03) and Twillick Brook (NTS 2D/04) map areas is similar to the structural architecture in the slice of Gander Group preserved in the Great Gull Lake (NTS 2D/06) area.

The presence of amphibolite-facies metapelitic rocks in the Gander Group, metaperidodites and ultramafic mylonites in the contact between the Gander and Bay d'Espoir groups indicates that D_1 was a major tectonic event. The most plausible interpretation for a major aeromagnetic anomaly where peridotites are exhumed and deformed would be an oceanic suture. The higher metamorphic grade observed northwest of the contact further suggests the Gander Group was part of the lower plate. An oceanic suture would have major implications for the origin of the Bay d'Espoir Group, as the same aeromagnetic anomaly forms the contact between the Salmon River Dam and St. Joseph's Cove formations, previously interpreted as part of a conformable sequence. Although the contact itself is not exposed in the Twillick Brook–St. Alban's area, Westhues (2022) identified dismembered metaperidotites pods within the metasedimentary rocks of the St. Joseph's Cove Formation. The currently available evidence points to D_1 structures forming during the closure of an oceanic basin.

The origin of D_2 remains unclear. Structures related to this event are the least preserved in the study area, and the northwest–southwest orientation of the major D_2 features is unusual in the Appalachians in Newfoundland. Furthermore, this is the only identified deformation stage where structures are markedly different between the north and south Bay d'Espoir groups. More field data is required to formulate a plausible hypothesis for its origin. The predominance of shallow to horizontal D_3 features suggests an extensional event. Santos (2024) interpreted the *ca.* 419 Ma (H. Sandeman, pers. comm., 2024) Matthews Pond Granodiorite and *ca.* 420 Ma (H. Sandeman, pers. comm., 2024) Rocky Bottom Tonalite in the Twillick Brook map

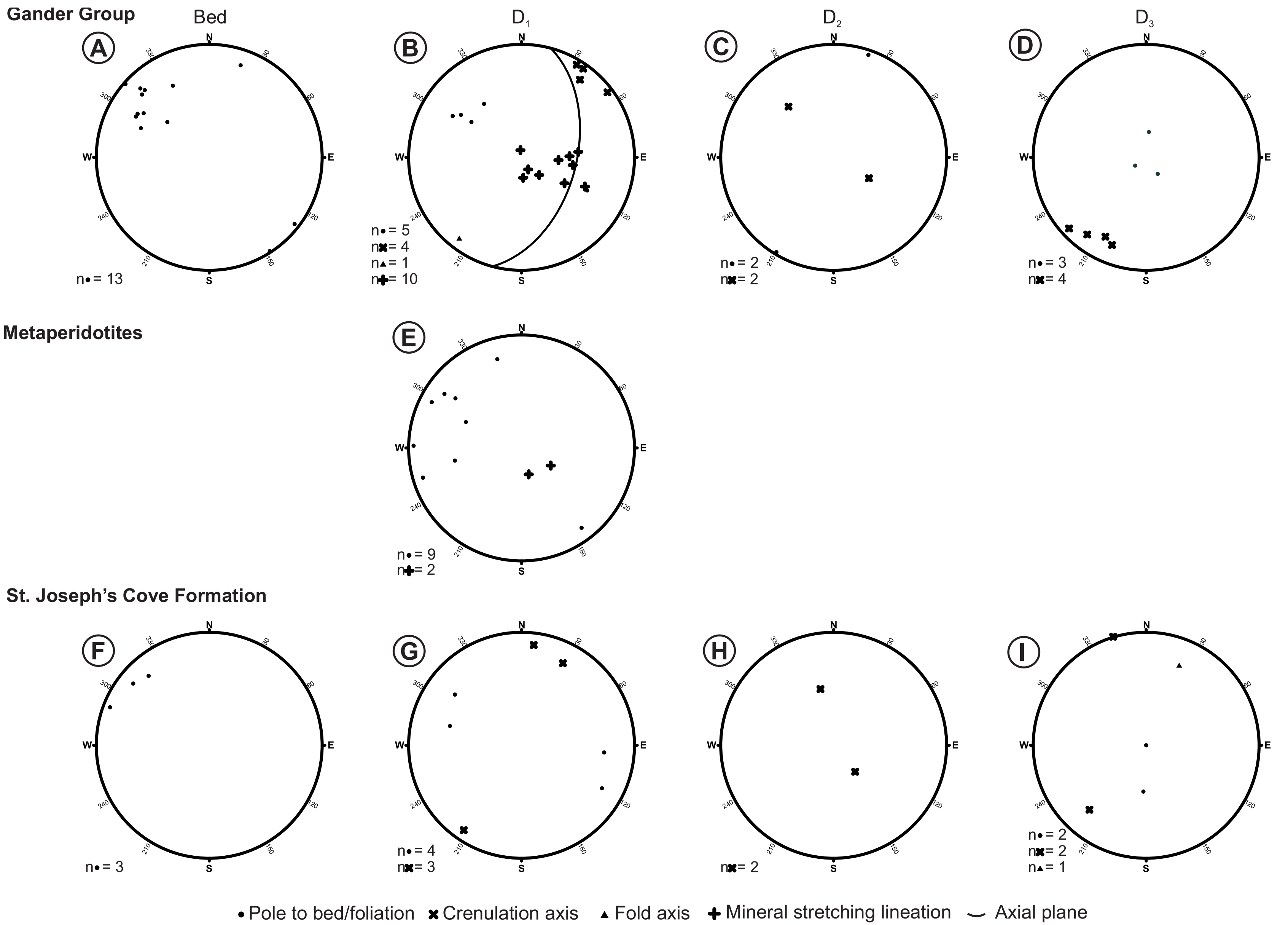

Figure 5. *Structural features from the study area. Folded beds (A) and foliation, crenulation lineation, fold axis, axial planes, and mineral stretching lineation related to D_1 (B), D_2 (C) and D_3 (D) in the Gander Group; (E) Foliation and mineral stretching lineation preserved in the metaperidotite pods deformed along the Gander Group–Bay d'Espoir contact. Folded beds (F) and foliation, crenulation lineation and fold axis related to D_1 (G), D_2 (H) and D_3 (I) in the Bay d'Espoir Group.*

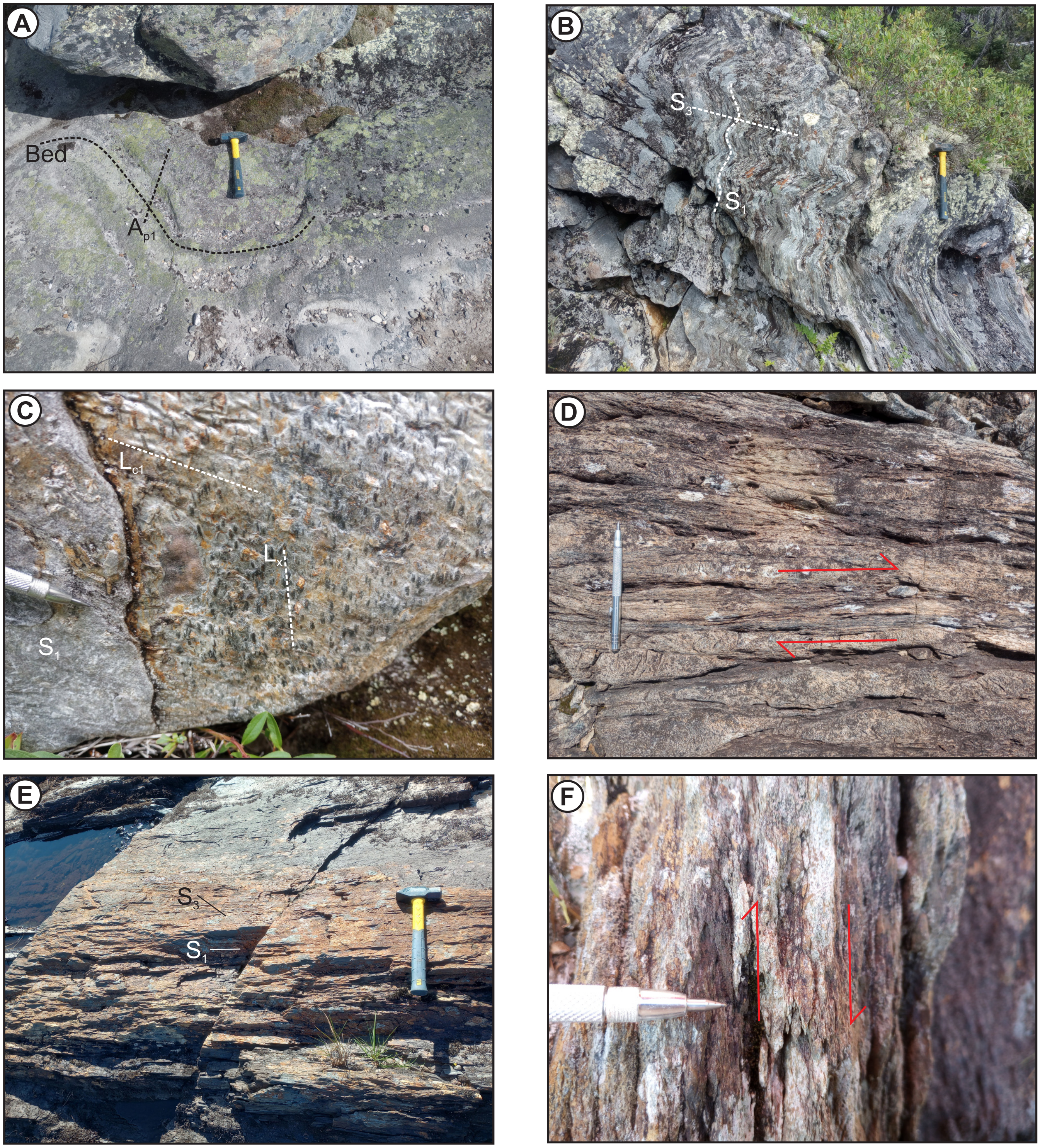

Plate 3. *Structural features of the contact between the Gander Group and Bay d'Espoir Group. A) Open F_1 folds in the meta-arenite of the Gander Group, with axial plane steeply dipping to east-southeast; B) Open F_3 folds in the interbedded meta-arenite and pelitic schist of the Gander Group; C) Porphyroblastic garnet–staurolite shist in the Gander Group, showing a shallow L_{c1} and a steep mineral stretching lineation defined by aligned staurolite porphyroblasts; D) Sheared metaperidotite, consistent with dextral kinematics; E) Steep S_1 and subhorizontal S_3 in an interbedded meta-arenite and slate of the Bay d'Espoir Group; F) Sheared meta-arenite of the Bay d'Espoir Group, with S-C fabrics consistent with dextral kinematics.*

area as syn-kinematic with D_3 structures. If this interpretation is correct, this points to the presence of a significant Silurian extensional event in central Newfoundland.

The results presented here indicate the metasedimentary and metavolcanic rocks of the Bay d'Espoir Group preserve three distinct deformational events. The same three events have also been identified in the sliver of the Gander Group preserved between the Middle Ridge Granite and the Bay d'Espoir Group in the Great Gull Lake (2D/06) map area. The presence of exhumed metaperidotite and mylonitic serpentinite lenses along the contact further indicates the contact is tectonic, likely an oceanic suture. The nature of this contact would also imply the Bay d'Espoir Group as presently defined could be split into at least two distinct units, here provisionally referred to north and south Bay d'Espoir Group. Additional detailed detrital geochronology on the metasedimentary rocks is needed to correlate the north Bay d'Espoir Group and the Gander Group. Combined with thermobarometry on the garnet–staurolite shist of the Gander Group and the metaperidotite, detrital geochronology will provide robust constraints on the timing of D_1 and further contribute to our understanding of the tectonic history of Ganderia.

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