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STRATIGRAPHY OF THE TYPE AREA OF THE EARLY ORDOVICIAN CATCHERS POND GROUP, SOUTHWESTERN GREEN BAY (NTS 12H/9 MAP AREA), NEWFOUNDLAND

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ABSTRACT

The Early Ordovician strata of the Catchers Pond Group are divisible into five informal lithostratigraphic units in the type area. These divisions are regionally disposed by complex fold structures and offset by numerous faults. The older lithostratigraphic units are preferentially altered and mineralized.

INTRODUCTION

The Early Ordovician Catchers Pond Group forms a narrow discontinuous belt that extends for over 30 km within the districts of Baie Verte–Springdale and adjacent Green Bay South. Disposed between the regionally extensive Green Bay and Lobster Cove faults of west-central Newfoundland (Figure 1), this complexly deformed and regionally metamorphosed unit of deep-marine volcanosedimentary strata is tectonically situated within the Notre Dame Subzone of the Dunnage Zone (Williams, 1995).

The Catchers Pond Group crops out northwest of the terrestrial strata of the Early Silurian Springdale Group (O'Brien, 2009a) and underlying Middle to Late Ordovician rocks of the Buchans–Robert's Arm volcanic belt (O'Brien, 2009b). It lies southeast of the Silurian terrestrial strata found in the Kings Point Complex, the Sheffield Lake Complex and the Micmac Lake Group (Coyle, 1992). The southwesternmost exposure of the Catchers Pond Group examined in this study occurs northeast of the Early–Middle Ordovician Hungry Mountain Complex at Sheffield Lake (Whalen and Currie, 1988), an ophiolite-bearing igneous complex that structurally overlies the Buchans–Robert's Arm volcanic belt.

The Catchers Pond Group is most extensively developed, best exposed and lithologically diverse in the northeastern part of its outcrop belt near the type area of Catcher's Pond (Figure 1). In the southwest, where the group is generally poorly exposed, variably sized enclaves of altered basalt and rare felsic tuff occur within the posttectonic plutonic rocks of the Topsails intrusive suite. Based on the outcrop pattern of the mainly Silurian plutonic rocks and the Ordovician and older stratified rocks, it appears as if the top of the Topsails intrusion generally dips gently northeastward below the type area of the Catchers Pond Group (Figure 1). With the exception of some high-level bosses and appendages, the Silurian plutonic rocks are thought to lie buried at depth beneath these Ordovician cap rocks.

GENERAL GEOLOGY

The bedrock geology of the region surrounding Catcher's Pond is, of course, dominated by the Early Ordovician strata of the Catchers Pond Group, although adjacent map units contain much younger and older rocks (Figure 2). Younger units of terrestrial stratified rocks are represented by the Kings Point Complex (Unit KPs), which is observed along the northwest margin of the map area. They are also manifested by the Springdale Group (Unit SPG), which is well exposed in the extreme southeast part. North and east of Catcher's Pond, undated marine stratified rocks have been locally assigned to the Lushs Bight Group (Unit LBli). These are probably older than the rocks seen within the Catchers Pond Group (*cf.* Kean *et al.*, 1995). Some relatively small bodies of undated intrusive rocks have been assigned to a syntectonic suite (hosted by the Catchers Pond Group) and a posttectonic suite (also emplaced into younger rock groups).

MID PALEOZOIC INTRUSIVE ROCKS

Surrounding Catcher's Pond, mafic and felsic sheet intrusions belonging to the posttectonic suite (Unit Tm and Unit Td) are mapped as having intruded parts of the Springdale Group, the Kings Point Complex, the Catchers Pond Group and the Lushs Bight Group (Figure 2). In the Indian

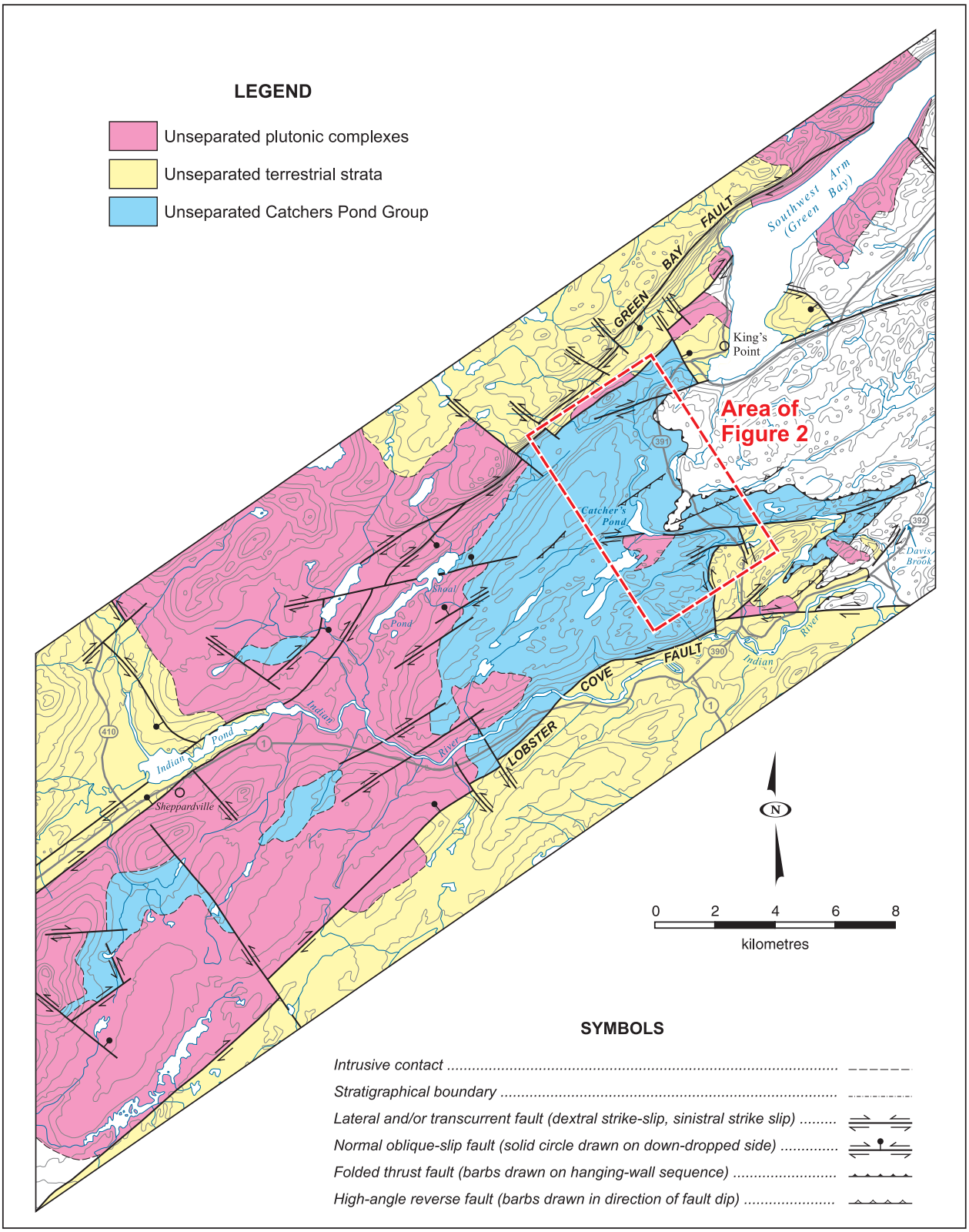


Figure 1. *Simplified geological map showing the regional disposition of the Ordovician Catchers Pond Group and adjacent Silurian or younger rocks. The uncoloured area in the extreme southwest is underlain by the Hungry Mountain Complex, whereas, the uncoloured area northeast of the Catchers Pond Group is underlain by the Lushs Bight Group. Plutonic rocks that intruded the latter unit on the south side of Southwest Arm are pre-Silurian in age. The area of Figure 2 is illustrated.*

River–Shoal Pond area, farther southwest, similar rocks were emplaced into the oldest known body of posttectonic granodiorite in the Topsails intrusive suite (Whalen and Currie, 1988; O'Brien, 2009a).

Plutonic and hypabyssal rocks, typical of Units Tm or Td, are observed to have intruded previously folded strata in the Springdale Group [E560672 N5485466] and previously foliated schist in the Catchers Pond Group [E556581 N5485288]. Constrained only by the youngest of the known dated intrusions in the *ca.* 432–424 Ma Topsails intrusive suite (Whelan and Currie, 1988), they are herein postulated to range from the Late Silurian to the Early Devonian. Units Tm microgranite and Td diorite are strongly fractured and altered near steeply dipping brittle faults that are typically oriented northeastward and northwestward in the map area (Figure 2) and throughout the Green Bay–Lobster Cove fault system (Figure 1). Pyritic quartz–feldspar porphyry and later diabase dykes are offset along the east-northeast-trending Chasm Fault (Figure 2).

Intrusive rocks, belonging to the syntectonic suite, are well exposed in the area south of Silver Pond (Figure 2). Northwest-trending gabbro dykes (Unit Tgb), in this part of the Catchers Pond Group, crosscut regionally folded and thrust-faulted strata, yet they locally display a dyke-parallel schistosity intruded by sheets of isotropic gabbro. Folded sills of Unit Tgb gabbro are also present farther north near Harry's Brook, where they occupy the crestal regions of some northeast-trending regional fold structures and are offset by the east-northeast-trending Southwest Brook Fault (Figure 2). Unit Tgb intrusions are thought to have crystallized in the Early Silurian, as they are presumed to be related to the syntectonic felsic porphyries that have been dated at *ca.* 437 Ma near the former Hammerdown gold mine (Ritcey *et al.*, 1995).

MID PALEOZOIC STRATIFIED ROCKS

Most of the regionally extensive Kings Point Complex is located northwest of the Green Bay Fault on the southern Baie Verte Peninsula, where it is mainly composed of felsic volcanic and subvolcanic intrusive rocks (Miller and Abdel-Rahman, 2003). The maximum known age range of Kings Point felsic volcanism is Early-Mid Silurian (429–425 Ma; Coyle, 1990). Unit KPs lies on the down-dropped southeastern side of the Green Bay Fault (Figure 1), although it is locally transected and tectonically fragmented by several strands of the regional fault zone (Figure 2). It contains distinctive pyritic ash-flow tuffs that Miller and Abdel-Rahman (2003) considered to be some of the youngest volcanic rocks within the volcanoplutonic complex.

Within the area mapped, right-side-up Unit KPs volcanic rocks dip moderately and strike regionally northwestward. These strata are, however, locally re-oriented into a northeast–southwest trend immediately north of the intrusive contact with Unit Tm microgranite and felsic porphyry. This suggests that the Topsails intrusive suite near Muir's Pond is emplaced into the limb of a northeast-trending fold located near the structural margin of the Kings Point Complex. Along the valley containing the headwater ponds of upper Harry's Brook (Figure 2), the original intrusive relationship of Unit Tm is modified by several generations of later brittle faults. Here, the stratified rocks of the Kings Point Complex have been ejected southeastward toward the main tract of the Catchers Pond Group by lateral displacement on northwest-trending strike-slip faults, a dextral structure located east of Paddy's Brook and a sinistral structure west of the Harry's Brook headwaters.

The volcanosedimentary rocks of the Springdale Group, which occur north of the Lobster Cove Fault (Figure 1), are strongly contrasted with the stratified rocks in the Kings Point Complex, as the former contains copious amounts of polymict conglomerate and interstratified basalt but an insignificant thickness of felsic pyroclastic strata. Furthermore, the maximum known age range of Springdale felsic volcanism within the main depositional basin (Early-Late Silurian; 435–422 Ma; Chandler *et al.*, 1987; Coyle, 1990) exceeds that of the felsic centre in the Kings Point Complex.

South of the Catcher's Valley, the mutual boundaries of the Springdale Group and the Catchers Pond Group are marked by a complex set of conjugate northwest- and northeast-trending brittle faults that are terminated by the notably linear Chasm Fault (Figure 2). Springdale Group strata were regionally folded, displaced by northwest-dipping reverse faults, and intruded by Unit Td diorite and Unit Tm felsic porphyry prior to being offset by the northwest-trending, steeply southwest-dipping, drag-folded faults. Quartz–feldspar porphyry and syenitic microporphyry bodies intruded near the faulted margin of the Springdale Group illustrate a subvertical, north–south-trending set of quartz-filled shear veins together with an associated slickenlined set of subhorizontal quartz–carbonate–pyrite veins.

STRATIGRAPHY OF THE CATCHERS POND GROUP (TYPE AREA)

The Catchers Pond Group has been separated into five internal lithostratigraphic divisions in the northeasternmost part of the group (Figure 1 and Figure 2 legend). All five divisions have been mapped on 1:25 000 scale within the

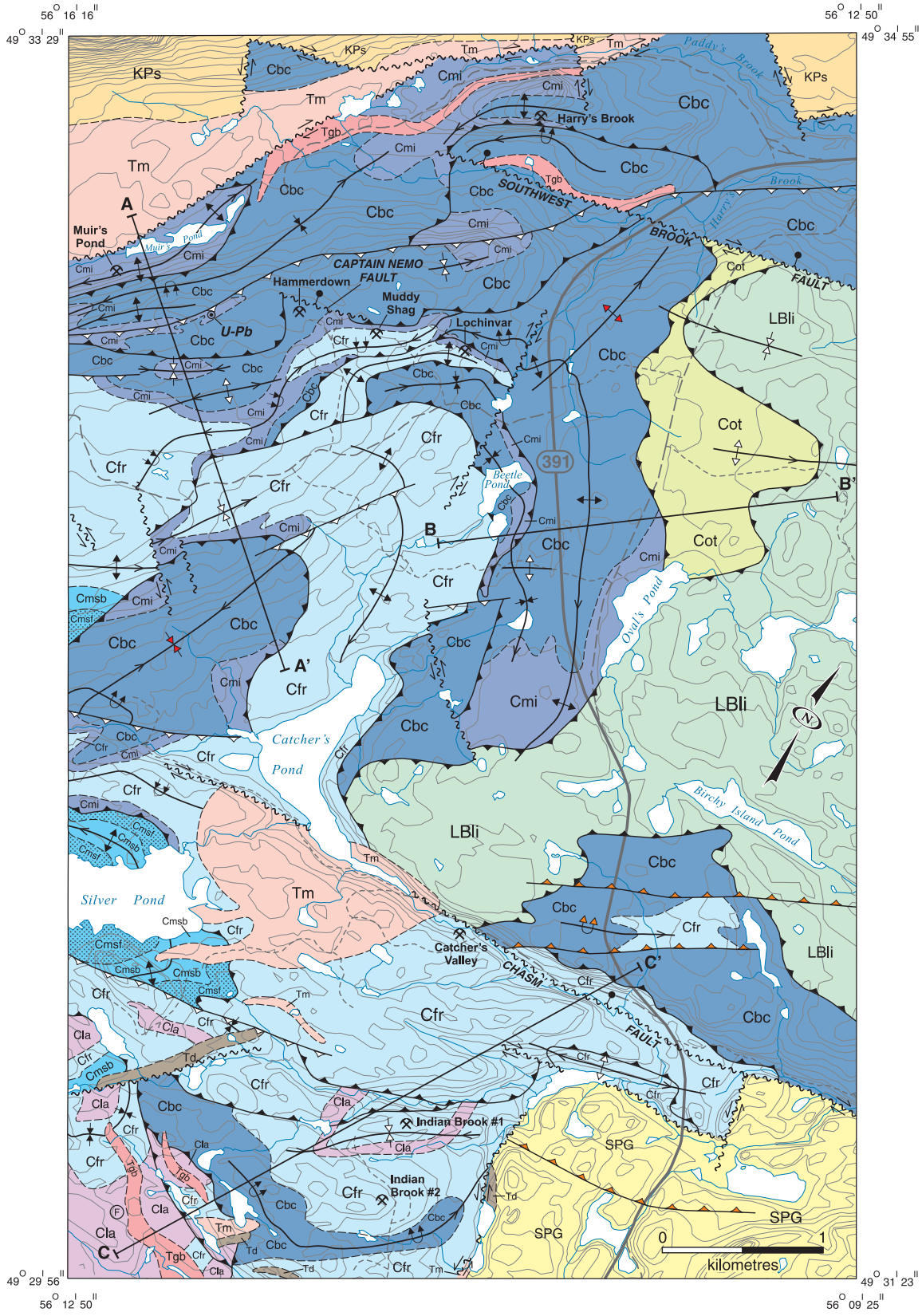


Figure 2. *Detailed geological map of the type area of the Catchers Pond Group showing the disposition of proposed informal lithostratigraphic divisions. Adjacent parts of older and younger rock units are also depicted.*

LEGEND FOR FIGURE 2

POSTTECTONIC INTRUSIVE ROCKS
Late Silurian to Early Devonian?
TOPSAILS INTRUSIVE SUITE

Tm — Dominantly fine-grained, equigranular, biotite microgranite; subordinate quartz–feldspar porphyry intruded by aplite veins and diabase dykes; zones of secondary jasper, hematite and ferroan carbonate near joints and fractures

Td — Dominantly medium-grained, equigranular, quartz diorite; subordinate diorite porphyry distinguished by coarse plagioclase phenocrysts; zoned veins composed of fibrous quartz and ferroan carbonate near late faults

SYNTECTONIC INTRUSIVE ROCKS
Early Silurian?
TOPSAILS INTRUSIVE SUITE

Tgb — Dominantly intrusive sheets of medium-grained, equigranular to porphyritic, schistose to isotropic gabbro; nested gabbroic bodies and composite diabase intrusions emplaced into the crestal areas of regional folds

STRATIFIED ROCKS
Early to Late Silurian?
KINGS POINT COMPLEX

KPs — Dominantly terrestrial felsic pyroclastic rocks, including poorly stratified ash tuff, fine-grained crystal tuff rich in resorbed quartz prisms, flow-layered lithic-crystal tuff, banded ignimbrite, minor sedimentary breccia and red sandstone; intruded by hornblende potassium-feldspar porphyry and quartz hematite veins; numerous pyritic gossans

SPRINGDALE GROUP

SPG — Dominantly terrestrial mafic volcanic and sedimentary rocks, including amygdaloidal basalt and flow-top breccia; basalt breccia and mafic tuff; minor, polylithic breccia having mixed blocks of vesicular basalt and banded felsic tuff; polymictic boulder conglomerate grading to red sandstone rich in basalt clasts; intruded by hematized felsic porphyries crosscut by slickenlined quartz-hematite veins

Early Ordovician
CATCHERS POND GROUP

Cms — Mainly subaqueous mafic extrusive, epiclastic sedimentary and felsic tuffaceous strata; the lower subdivision [Cmsb] contains massive basaltic andesite, andesite breccia, pillow breccia and mafic tuff, all having abundant matrix-disseminated carbonate; minor, interbedded sandstone turbidite, siliceous argillite and ribboned chert associated with individual mafic volcanic flows; rare, feldspathic wacke having outsized detrital clasts of basalt and rhyolite; mafic volcanic strata at the base of Unit Cms conformably overlie coarse felsic pyroclastic deposits within the uppermost part of Unit Cfr; the upper subdivision [Cmsf; patterned] is mostly massive quartz-phyric crystal tuff, graded polylithic felsic breccia, and minor rhyolite agglomerate and tuff; for full description of Unit Cms, refer to Legend in O'Brien (2009).

Cla — Mainly limestone-bearing pillowed basalts and basalt breccia; a lower Cla lenticle is mostly composed of non-magnetic chloritic basalt that is, in places, conformably underlain by flow-banded rhyolite assigned to Unit Cfr; an upper Cla lenticle dominated by pillow lava and pillow breccia locally contains fossiliferous interbeds of bioclastic limestone; secondary red jasper horizons are restricted to a very thin horizon of carbonate-rich basalt and felsic crystal tuff located at the top of Unit Cla; outcropping only in the eastern part of the Catchers Pond Group, Unit Cla mafic volcanic rocks are conformably underlain and overlain by felsic volcanic rocks assigned to Unit Cfr

Cfr — Mainly cyclic sequences of coarsening-upward felsic pyroclastic rocks and lutaceous sedimentary strata; in the lower part of the unit, fine quartz-feldspar crystal tuff and laminated ash tuff are commonly ferroan carbonate-altered and weathered to pitted limonite [locally, they are jasperitized and pyrite or chalcopyrite-bearing]; overlying stratiform rhyolite bodies and glassy autobrecciated flows are intruded by dykes and sills of quartz-feldspar porphyry; succeeding tuffaceous wacke is gradational to laminated phyllite; throughout the middle part of the unit, and commonly where Cfr strata are intercalated with Cla basalt lenticles, coarse felsic breccias are marked by blocks of flow-banded rhyolite, eutaxitically foliated ignimbrite and quartz–feldspar porphyritic intrusions; associated felsic lithic tuffs show slump folds and typically display argillite rip-up clasts; in the upper part of the unit, particularly in the sequence below Unit Cmsb basalt, coarse crystal tuff is feldsparphyric, carries bedded blocks of quartz-phyric tuff and limestone, and is capped by monolithic rhyodacite breccia; for full description of Unit Cfr, refer to Legend in O'Brien (2009).

Early Ordovician
CATCHERS POND GROUP (continued)

Cmi — Mainly interstratified mafic extrusive rocks and intermediate pyroclastic strata forming a thin, laterally continuous sequence within the western part of the Catchers Pond Group; at the base of Unit Cmi, plagioclase-phyric dacitic crystal tuff and chloritized quartz-eye tuff crosscut by amygdaloidal mafic minor intrusions and succeeded by carbonate-altered pillow breccia; volcanic breccia and polylithic tuff containing altered blocks of vesicular basalt, felsic lapillistone, perlitically fractured obsidian and other spherulitic vitroclasts; overlying flow-layered welded tuff marked by zones of agate-bearing lithophysae; at the top of Unit Cmi, glassy intermediate pyroclastic strata succeeded by a bimodal mafic felsic tuff sequence that is commonly replaced by massive jasper or intruded by hematite-bearing quartz veinlets; disseminated chalcopyrite and sphalerite are locally present in Unit Cmi within zones of sericitic, chloritic or carbonaceous schist; for full description of Unit Cmi, refer to Legend in O'Brien (2009).

Cbc — Mainly plagioclase-porphyritic pillowed basalt, interflow ferruginous chert and multiple diabase dykes; abundant gabbroic sills having variolitic or chilled margins; basaltic breccia made up of relatively pristine and silicified volcanic fragments hosting pyrite or chalcopyrite-bearing gossans at depositional contacts with massive basalt flows; in places, deformed pyrite–sericite–quartz veinlets in silicified chloritic basalt; very locally, in the upper part of Unit Cbc, and especially near its conformable boundary with Unit Cmi, jasperitized basalt flows display laminated interbeds of hematitic chert, crosscutting quartz–feldspar-porphyry dykes, and abundant matrix-disseminated carbonate; near its faulted contact with the Springdale Group, sucrose basalt from Unit Cbc contains open spaced, fibred and slickenlined veins of quartz, calcite, hematite, ferroan carbonate, chlorite, clinozoisite, epidote, chalcopyrite and pyrite; for full description of Unit Cbc, refer to Legend in O'Brien (2009).

CATCHERS POND GROUP ?

Cot — Mainly massive basalt transitional to mylonite (such Cot rocks may be partial equivalents of Unit Cbc or represent older parts of the Catchers Pond Group?); in the east, minor intervals of banded siliceous argillite and magnetic mafic tuff (possibly lower Western Arm Group?)

Late Cambrian or older?
LUSHS BIGHT GROUP

LBli — Mainly massive basalt flows and less common pillowed lava; mafic volcanic rocks transitional to chlorite schist; syntectonic layered gabbros and younger diabase dykes

type area (Figure 2 map) and four of them are also present in the Indian River–Shoal Pond area farther southwest (O'Brien, 2009a). The outcrop pattern of these divisions is locally complex; nowhere within the map area are all of them seen within a stratigraphically continuous succession. Generally, however, the oldest lithostratigraphic divisions dominate the northern part of the region and the youngest lithostratigraphic divisions are restricted to the south. The one published absolute-age date in the map area (Ritcey *et al.*, 1995; Figure 2), taken together with the biostratigraphic data reported from the sole fossil locality (O'Brien and Szybinski, 1989; Figure 2) confirm this relationship.

Neither the stratigraphic base nor the top of the Catchers Pond Group is exposed in the type area. The omission of certain stratigraphic divisions characterizes areas of the group adjacent to older and younger stratified units (Figure 2).

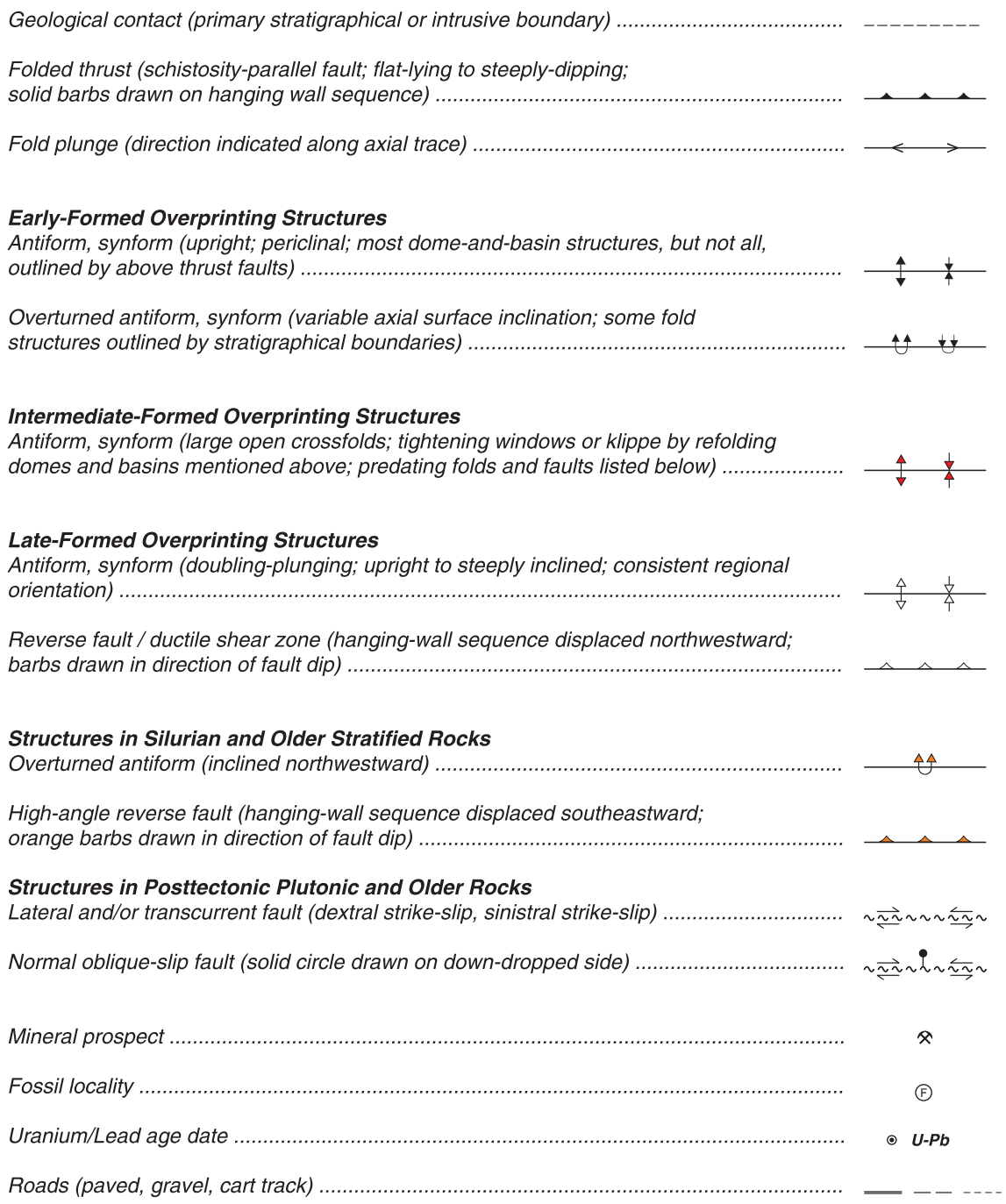
MAPPING METHOD

In the area surrounding Catcher's Pond, the group is host to at least six volcanogenic massive sulphide prospects that are mostly situated within the lower part of the Catchers Pond stratigraphy (Figure 2). Accordingly, in addition to systematic surveying of natural bedrock exposures, map-unit distribution was determined by information gleaned from abundant drilling and trenching records, integrated with the writer's interpretation of the numerous high-resolution geophysical surveys carried out by mineral exploration companies. Access to non-confidential geological maps detailing the lithological variation of the Catchers Pond Group proved to be invaluable (*e.g.*, Moore *et al.*, 2002).

PREVIOUS STRATIGRAPHIC WORK

Although it was not the purpose of the Moore *et al.* (2002) report to stratigraphically divide the Catchers Pond Group and to chart its internal stratigraphic boundaries, these workers did envisage the group as generally being tripartite. In the ground between Sheppardville and Catchers Pond (Figure 1), they considered the Catchers Pond Group to be made up of an older unit named the Indian Brook sequence, an intermediate unit named the Batters Brook sequence and, possibly, a younger unit named the Shoal Pond sequence. Consequently, despite being locally faulted and folded, they deemed that the Catchers Pond Group generally became younger on traversing across strike from the southeast toward the northwest.

SYMBOLS FOR FIGURE 2



The Indian Brook and Batters Brook sequences are conformable (Moore *et al.*, 2002), although both are depicted as being in faulted contact with the Shoal Pond sequence and the Springdale Group. The distribution of the northwest-facing Indian Brook and Batters Brook sequences is shown as being regionally controlled by a generally northeast-plunging, Z-shaped fold pair, which also affected the conformably overlying 'Hammerdown Basalt', in the area northeast and northwest of Catcher's Pond.

Felsic, intermediate and mafic volcanic rocks lying southeast of the 'Hammerdown Basalt', near the exploration trenches at the Hammerdown prospect, were described in detail by Gaboury *et al.* (1996), who demonstrated that this

lithotectonic sequence was structurally repeated and offset near the Captain Nemo Fault. Such rocks are similar to strata found within the two intermediate divisions of the Catchers Pond succession in the Indian River–Shoal Pond area (O'Brien, 2009a). The 'Hammerdown Basalt' was included in the Lushs Bight Group by Gaboury *et al.* (1996) and Moore *et al.* (2002), although it has been assigned to the lower Catchers Pond Group in this paper, pending further geochemical results.

INTERNAL STRATIGRAPHIC DIVISIONS

Listed in ascending order, and valid for the type area, the five lithostratigraphic divisions of the Catchers Pond Group are: 1) a division dominated by basalt flows and inorganic chert (Unit Cbc), 2) a division dominated by mafic and intermediate pyroclastic rocks (Unit Cmi), 3) a division dominated by felsic pyroclastic strata and rhyolite flows (Unit Cfr), 4) a division dominated by limestone-bearing pillowed basalts and andesitic breccias (Unit Cla), and 5) a division dominated by mafic to intermediate flows and volcaniclastic sedimentary rocks (Unit Cms).

Unit Cbc

The oldest observed division of the Catchers Pond Group (Figure 2) is characterized by plagioclase-porphyritic calc-alkaline basalt, pillow lava and interflow green chert. The volcanic rocks have been intruded by high-level gabbro sill complexes and localized swarms of diabase dykes. Unit Cbc comprises the lower part of the Indian Brook sequence of Moore *et al.* (2002) and dominates that unit.

In the area north of the Indian River (O'Brien, 2009a), Unit Cbc is estimated to have a primary stratigraphic thickness of approximately 1300 m. In the type area, where the same division is thought to be equally extensive at surface, it is much more structurally fragmented, occupying numerous imbricate thrust sheets and forming several klippe lying above the younger strata of the Catchers Pond Group (Figures 2 and 3).

In places, mafic volcanic rocks within Unit Cbc contain abundant matrix-disseminated calcite and are exceedingly schistose. Folded pyrite–sericite–quartz veinlets are ubiquitous in sheared chloritic basalt; chalcopyrite-bearing basalt is typically pervasively silicified. The development of secondary carbonate becomes common in the middle and upper part of this division.

Pillow breccias in the uppermost part of Unit Cbc are crosscut by pretectonic quartz–feldspar-porphyry dykes near its conformable boundary with the overlying intermediate tuffs of Unit Cmi. At this stratigraphic position, jasperitized Cbc basalts display crosslaminated interbeds of red hematitic chert.

Unit Cmi

The intermediate pyroclastic and bimodal mafic and felsic strata of Unit Cmi form the most lithologically unique division of the Catchers Pond Group. They comprise a relatively thin and laterally continuous succession extending throughout the Indian River–Shoal Pond region and the western part of the type area (O'Brien, 2009a; Figure 2). Although commonly fault-bounded (Figure 3), this division probably did not exceed 350 m in original thickness.

Unit Cmi has a medium-intensity aeromagnetic signature that is distinct from the relatively strong signal of certain underlying Cbc basalts and the much weaker signal given from all younger divisions of the Catchers Pond Group. Though exposure is good and geophysical coverage is excellent, this division has not been recognized south of Catcher's Pond (Figure 2).

At the stratigraphic base of Unit Cmi, plagioclase-phyric, dacitic crystal tuff and green, chloritized, quartz-eye tuff are crosscut by thin mafic sills and amygdaloidal mafic dykes. These are typically succeeded by carbonate-altered or jasperitized pillow breccia. In the middle part of the unit, coarse volcanic breccias are distinguished by several textural types of rhyolite clasts, variably silicified felsic pyroclastic blocks and incompletely lithified bombs of vesicular mafic tephra. Such subaqueous strata are overlain by an extremely glassy interval of flow-layered welded tuff. At the stratigraphic top of Unit Cmi, a fine-grained, thin-bedded bimodal sequence of mafic and felsic lithic tuff has obsidian-rich interbeds of dacitic crystal tuff.

Disseminated chalcopyrite and sphalerite are locally present in Unit Cmi within zones of sericitic, chloritic or carbonaceous schist. In other localities, particularly within the bimodal tuff sequence, Cmi strata have been intruded by hematite-bearing quartz veinlets and are locally replaced by massive jasper.

Unit Cfr

Unit Cfr is generally composed of cyclic sequences of coarsening-upward felsic pyroclastic rocks and associated lutaceous sedimentary strata, with or without the presence of stratiform rhyolite bodies. This division contains the most voluminous pyroclastic deposits and the thickest rhyolite flows in the Catchers Pond Group. West of the type area, it is estimated to display a total thickness as great as 500 m (O'Brien, 2009a). In all locations in the area mapped, the unit begins with a relatively fine-grained, laminated to thin-

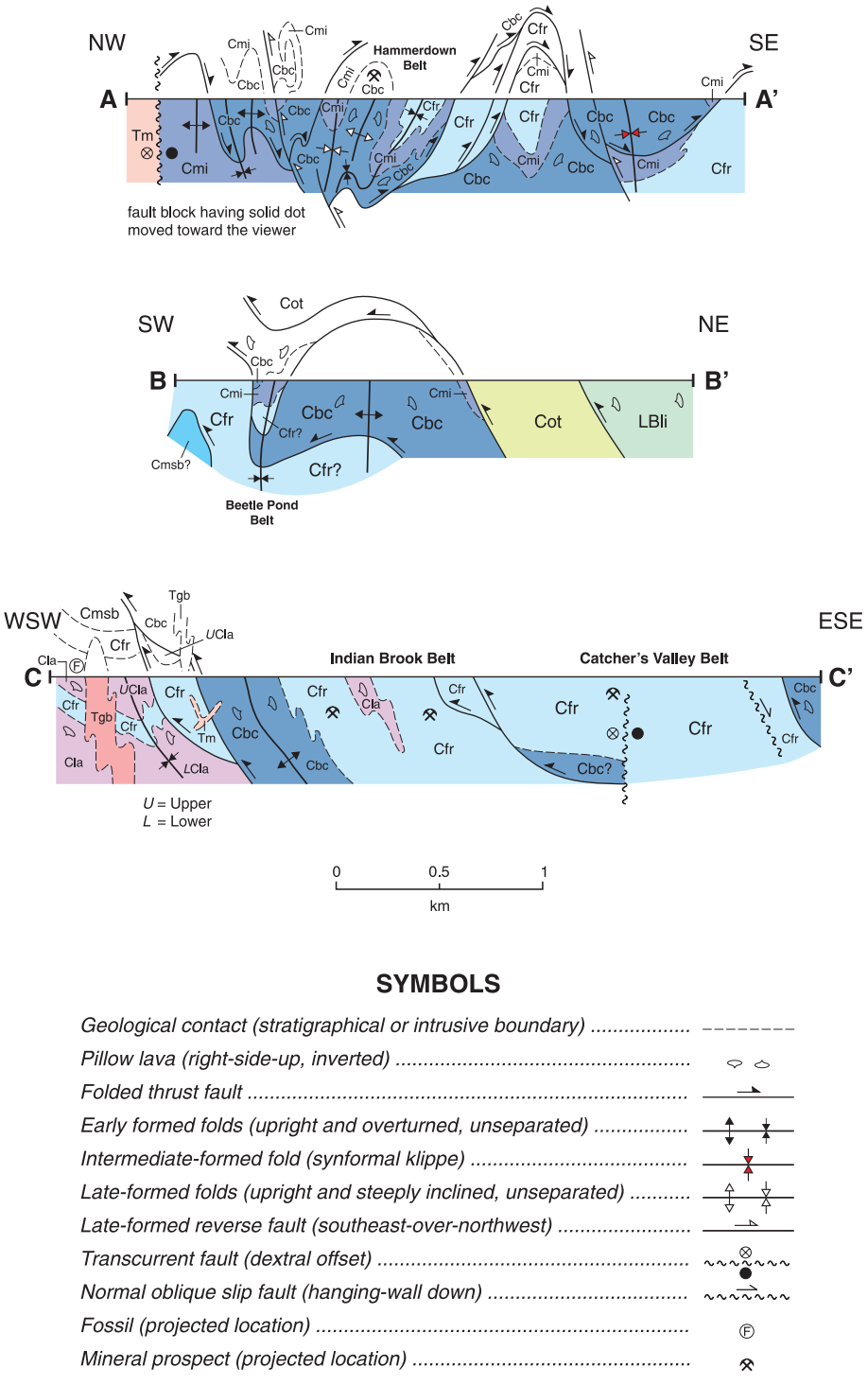


Figure 3. *Representative cross-sections of the type area of the Catchers Pond Group constructed without horizontal exaggeration. Vertical exaggeration is about x 1.5. The lines of section for the AA', BB' and CC' cross-sections are shown on Figure 2. Some of the symbols shown in Figure 3 are different than those listed under the Symbols for Figure 2. Legend as for Figure 2.*

bedded succession of felsic lithic tuff, quartz-phyric crystal tuff and graphitic ash tuff. These siliceous rocks are representative of most of the Batters Brook sequence of Moore *et al.* (2002) and host all or some of the base-metal mineralization at the Lochinvar and Muddy Shag prospects (Figure 2).

In the northern part of the type area, where Unit Cfr conformably overlies Unit Cmi, the section above the basal sequence is mostly composed of coarse-grained, feldspar-phyric crystal tuff interstratified with thick units of coarse felsic breccia. Here, the aphyric, quartz-phyric, flow-folded and autobrecciated rhyolites characteristic of Indian Arm–Shoal Pond area were apparently not deposited in the lower part of Unit Cfr. However, it is possible that some of the massive rhyolite bodies may have been structurally excised from Unit Cfr in the ground west of Beetle Pond (Figures 2 and 3), where the entire division has a combined structural–stratigraphic thickness of approximately 150 to 250 m.

In the southern part of the type area of the Catchers Pond Group, there are two localities where Unit Cfr is thought to have directly succeeded Unit Cbc and where Unit Cmi was not deposited. Moreover, in this region, the Cfr division is made up of three felsic volcanic lenticles that are regionally intercalated with basalt flows (Figure 2). All of these lenticles are dominated by quartz–feldspar crystal tuff along with a subordinate amount of felsic tuff and volcanic breccia. The coarsest volcanic breccias are marked by blocks of flow-banded rhyolite, eutaxitically foliated ignimbrite and quartz–feldspar-porphyritic intrusions; thixotropically deformed felsic tuffs contain argillite rip-up clasts.

The lowest Cfr lenticle, which is at least 250 m thick, is commonly ferroan carbonate-altered, pyrite-bearing and weathered to pitted limonite. Near the Indian Brook and Catcher's Valley prospects (Figures 2 and 3), a contained felsic crystal tuff displays abundant chalcopyrite mineralization and, locally, it is completely replaced by red jasper. Southwest of Silver Pond, the lowest Cfr lenticle includes a laterally discontinuous flow-banded rhyolite unit about 150 m thick that occurs along strike from Unit Cmi. Thus, the basal Cfr sequence of fine-grained crystal tuff may possibly be a partial lateral equivalent of the older Cmi division.

In contrast, the stratigraphically higher lenticles are much less areally extensive and the sum of the thicknesses of the two of them may only come to half of that of the lower lenticle. The uppermost lenticle of Unit Cfr, which lies conformably below Unit Cmsb basalt and contains blocks of limestone in coarse crystal tuff, is capped by monolithic rhyodacite breccia.

Unit Cla

Limestone-bearing pillowed basalts, graded basalt breccia and overlying basaltic andesite flows comprise two lenticles of Unit Cla in the type area of the Catchers Pond Group (Figure 2). Outcropping only in the eastern part of the group, this division is best developed to the south and east of the area mapped.

The lower lenticle of Unit Cla is mostly composed of a thoroughly recrystallized chloritic basalt, which has a very low-intensity aeromagnetic signal. Near the Indian Brook #1 prospect, where this lenticle is less than 100 m thick, it is observed to be interstratified with the limonitic crystal tuffs of the basal Cfr succession (Figure 3). However, immediately east of the area shown in Figure 2, the lower lenticle of Unit Cla has a combined stratigraphic–structural thickness in excess of 250 m and extends to the faulted boundary with the Springdale Group. There, it is host to several chalcopyrite showings in the vicinity of narrow sheet intrusions belonging to Units Tm and Td of the Topsails intrusive suite.

The upper lenticle of Unit Cla contains fossiliferous interbeds of bioclastic limestone (Dean, 1970). These are located at several horizons within an approximately 250-m-thick succession of spectacular pillow lava and pillow breccia. Secondary red jasper beds are restricted to a very thin horizon of carbonate-rich basalt and altered crystal tuff located at the top of the upper lenticle. Mafic volcanic rocks comprising the upper lenticle of Unit Cla are conformably underlain and overlain by felsic volcanic rocks assigned to Unit Cfr.

Unit Cms

The youngest observed division of the Catchers Pond Group (Figure 2) is mainly made up of mafic volcanic flows, epiclastic sedimentary strata and overlying felsic pyroclastic rocks. Two internal subdivisions, referred to as subunits Cmsb and Cmsf, have been mapped near the southwest margin of the area surveyed for this report.

West of Silver Pond, Moore *et al.* (2002) assigned the equivalents of what are herein termed Unit Cms strata to the lower part of their Batters Brook sequence. In the area east of this pond, these authors showed the Cms portion of the Batters Brook sequence to be directly juxtaposed against strata typical of their older Indian Pond sequence, particularly in the area immediately southeast of the 'Hammerdown Basalt'.

The lower subdivision of Unit Cms is characterized by massive basaltic andesite, andesite breccia, pillow breccia and mafic tuff, all having abundant matrix-disseminated carbonate. Subunit Cmsb also includes tuffaceous wacke, sandstone turbidite, siliceous argillite and ribboned chert, although these lithofacies are commonly associated with individual mafic volcanic flows. The stratigraphic base of the Cmsb subdivision occurs above Unit Cfr along a sharply conformable boundary.

The upper subdivision of Unit Cms is highlighted by a dotted pattern in Figure 2. Subunit Cmsf is mostly composed of massive quartz-phyric crystal tuff, polylithic felsic breccia, and rhyolitic agglomerate. The stratigraphic base of the upper subdivision is repeated by a large fold that crosses Silver Pond (Figure 2).

In various locations along the trace of a regionally folded thrust, the rocks of Unit Cms are tectonically juxtaposed against a hanging-wall sequence represented by Unit Cbc, Unit Cmi and Unit Cfr (Figures 2 and 3). Within the footwall plate, both subdivisions of Unit Cms are crosscut by apophyses of biotite microgranite that emanated from the largest body of the Topsails (Unit Tm) intrusive rocks.

INTERPRETATION

Within the type area of the Catchers Pond Group, the oldest exposed Cbc unit, the overlying Cmi unit and the lower part of the succeeding Cfr unit are much more extensive in map view than the younger lithostratigraphic units. Moreover, their regional distribution shows that such discontinuously outcropping units recur in many localities between the northwestern-faulted contact with the Kings Point Complex and the southeastern-faulted contact with the Springdale Group (Figure 2). This suggests that Catchers Pond Group strata were already complexly disposed prior to the regional deformation that affected the Silurian terrestrial rocks.

In the writer's interpretation, the youngest strata in the Catchers Pond Group are found in the south of the map area, although they may also occur at depth beneath the Beetle Pond belt (BB' in Figure 3). If correct, this data is incompatible with the notion of a regionally northwest-facing lithostratigraphic succession. It is herein postulated that the youngest strata in Unit Cms are preserved in several localities immediately below the basal thrust of an overlying fold nappe (Figures 2 and 3). In the type area, such regional structures delimit and dispose the lower stratigraphic elements of the Catchers Pond Group. This is particularly the case in the region immediately southwest of the Lushs Bight Group.

CONCLUSIONS

In the Catchers Pond Group, the thickest accumulation of arc-related mafic volcanic rocks is found at the base of the group (Unit Cbc). In contrast, most of the highly explosive volcanism is recorded during the development of a thin marker horizon (Unit Cmi) that is dominated by intermediate volcanic rocks. The most extensive rhyolite flows, ignimbrite sheets and quartz–feldspar-porphyry intrusions were erupted and intruded during the early formation of a subaqueous basin filled, for the most part, by felsic pyroclastic and argillaceous strata (Unit Cfr).

Major lithofacies and thickness variations are interpreted to have occurred during the deposition of the Catchers Pond Group. This was the probable cause of Unit Cla being restricted to the eastern part of the group and Unit Cmi being well developed only in the western part of the group. The resultant facies belts were thus established during several discrete episodes of volcanism. The axis of the Catchers Pond Group depocentre is broadly coincident with the trace of the refolded synform located due south of Silver Pond (Figure 2; CC' in Figure 3).

The overprinting structures described in the explanation of symbols for Figures 2 and 3 can be broadly separated into a group that probably predated deposition of Silurian terrestrial strata and a group that postdated this geological event. The northeast-trending reverse faults or ductile shear zones that have their hanging-wall sequence displaced northwestward are postulated to have formed in the Early Silurian contemporaneously with the Gaboury *et al.* (1996) suite of HSZ3 structures that have been previously described near the former Hammerdown gold mine.

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