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PRELIMINARY 1:50 000 MAPPING OF LOWER PALEOZOIC PARAUTOCHTHONOUS SEDIMENTARY ROCKS OF THE CORNER BROOK AREA

I. Knight
Newfoundland Mapping Section

ABSTRACT

Low-grade metamorphosed Cambrian to Ordovician carbonate rocks form a southward-narrowing belt from the Humber River gorge to just north of Corner Brook Lake, in the area south of Corner Brook. The carbonates are bounded in the east by the Corner Brook Lake thrust belt and in the west by rocks of the Humber Arm Allochthon and Pinchgut Lake group. The carbonate rocks were overthrust westward by Pinchgut Lake group phyllites and limestones before being folded by a series of mainly upright, although eastward-verging, southward-trending and plunging folds. C–S fabrics, in phyllitic limestones of the Reluctant Head Formation at the base of the carbonate sequence, indicate earlier west-verging overthrusting before the main folding. A late crenulation cleavage deforms the main cleavage in the Reluctant Head Formation. A suite of west- to northwest-trending, dextral and sinistral strike slip faults cut the carbonate belt. The carbonate stratigraphy is similar to that noted in the most easterly thrust slices in the Pasadena map area.

A variety of marbles occurs in three zones in the carbonate belt. White, pink to light-grey varieties occur in a collage of stylolitic, massive to brecciated types. Pink varieties resemble Pink fiorito, Rosa aurora, Arabescato rosso, Red Antico light and Rosa borba. *A pink and red variety containing white veins also occurs.*

INTRODUCTION

Low-grade metamorphosed Cambrian to Ordovician carbonate rocks form a southward narrowing belt from the Humber River gorge to just north of Corner Brook Lake in the area south of Corner Brook (Figures 1 and 2). The carbonates, which are bounded in the east by the Corner Brook Lake thrust belt (Cawood and van Gool, 1992) and in the west by rocks of the Humber Arm Allochthon, occupy a dissected rolling plateau, approximately 300 m high, which rises precipitously from sea level above Humber Arm and Humber River gorge. The frontal trace of the Corner Brook Lake thrust belt is marked, in part, by a prominent, north-trending incised valley that drains Corner Brook Lake and by some perched, high valleys west of Marble Mountain ski resort. To the east, the wooded to barren, rocky, mountain slopes of Mount Musgrave and the mountains near Breeches and Livingston ponds rise to more than 500 m. They are underlain by polydeformed, greenschist- to amphibolite-grade metasedimentary rocks of the Breeches Pond and South Brook formations and, locally, Proterozoic basement rocks of the Corner Brook Lake complex (Cawood and van Gool, 1992, 1994). No striking topographic feature marks the western contact of the carbonate belt. Along this contact, metasedimentary rocks of the ?parautochthonous Pinchgut Lake group and the Humber Arm Allochthon, in particular the Irishtown formation, form a rolling wooded terrane of 300 to 400 m elevation.

Geological mapping of the carbonate belt was confined to a network of major and minor roads, and forest-access roads such as Lady Slipper Pond and Twelve Mile dam roads (Figure 1). The area, particularly adjacent to Lady Slipper Pond and Twelve Mile dam roads, was clear-cut following extensive damage of the forest by the spruce budworm in the 1980s. The carbonate belt is host to a number of potential marble prospects.

GEOLOGICAL SETTING AND PREVIOUS WORK

The lower Paleozoic carbonate, Humber Arm Allochthon and eastern metamorphic terranes of the Corner Brook map area (NTS 12A/13) preserve elements of the ancient eastern Laurentian miogeocline and are part of the Humber tectonostratigraphic zone of the Appalachian Orogen (Williams, 1978). The carbonate terrane and the structurally adjacent allochthon to the west, are placed in the outer structural domain typified by unmetamorphosed to lower-greenschist metamorphism and simple to complex deformation. Recent geological mapping in the Pasadena map area (NTS 12H/4) indicates that the carbonate sequence is deformed in a complex foreland fold-and-thrust belt (Knight, 1994).

The metamorphic terrane to the east is characterized by greenschist- to amphibolite-grade pelites, psammites, marbles and minor metavolcanic amphibolite of the South Brook

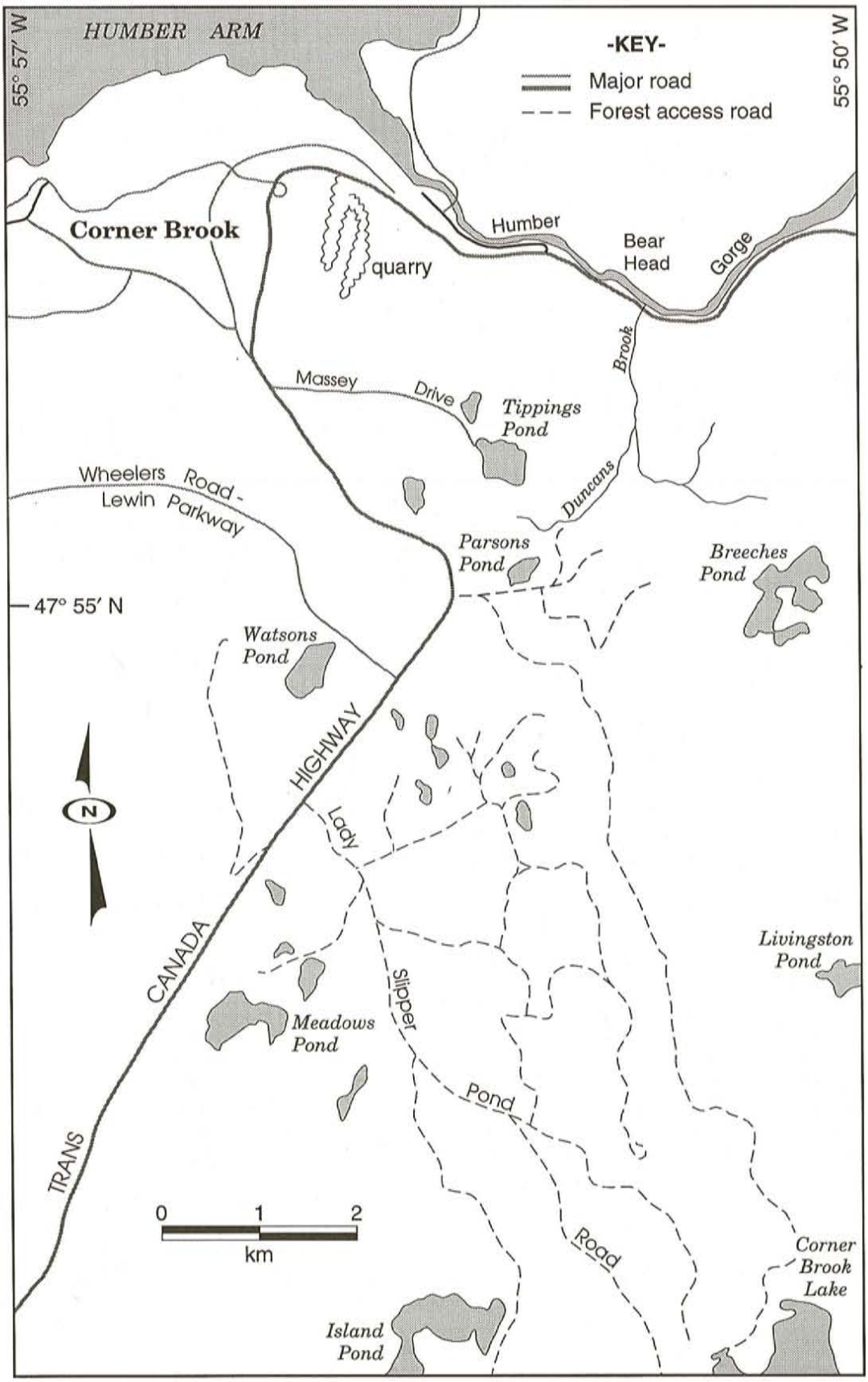


Figure 1. *Location map of the area south of Corner Brook mapped in 1994.*

Formation, Mount Musgrave Group and the Breeches Pond formation and by the Corner Brook Lake complex of granitoid gneiss, amphibolite, and minor quartzite and psammitic gneiss (Cawood and van Gool, 1992, 1994). This terrain is characterized by a frontal fold-and-thrust complex, the Corner Brook Lake thrust belt, which is in contact with the outer domain of the carbonate shelf rocks. The contact was previously mapped as a single fault named the Corner Brook Lake thrust (Williams and Cawood, 1989).

Although the carbonate sequence near Corner Brook has been studied by a number of workers (Schuchert and Dunbar, 1934; Walthier, 1949; McKillop, 1963; DeGrace, 1974) and shown to consist of dolostone and limestone and their metamorphosed equivalents, the stratigraphic subdivision of the sequence has largely escaped resolution. Only McKillop (1963), together with a complementary study of the Goose Arm area to the north by Lilly (1963), defined a stratigraphy. This included in ascending order the Reluctant Head, Hughes Brook and Corner Brook formations. In the Pasadena map area (NTS 12H/4) to the north, only the Reluctant Head Formation was retained by Knight (1994) and the overlying formation divisions of McKillop (*op. cit*) and Lilly (*op. cit*) abandoned in favour of recent stratigraphic subdivisions mapped throughout western Newfoundland (see Knight, 1992, 1994; Knight and Boyce, 1991).

STRATIGRAPHY

CAMBRIAN STRATA

Three rock units are assigned a Cambrian age based on correlation to similiar dated rocks in the Pasadena map area. They include a basal unit of ribbon limestone and phyllite, a thick middle unit of dolostone, divisible into two parts by the presence of chert in the upper part, and an upper unit of intercalated limestone and dolostone. Cambrian rocks occupy the eastern half of the map area.

Ribbon-Banded Limestone and Phyllite

This unit outcrops only in the core of Bear Head anticline and in a belt of vertical strata at the eastern end of the Humber River gorge close to the faulted contact with the Mount Musgrave terrane. It is not found south of a west-trending fault south of Tippings Pond. The strata is characteristically ribbon-banded, fine-grained grey limestone and dark-grey phyllite. Much of this bedding-like lithofabric is believed to be transposed bedding. Rootless closures of brownish-weathering, thin-bedded, argillaceous, limestone, dolomitic limestone and phyllite are present in the vertical zones of ribbon-banded limestone and phyllite. However, bioturbated and grainy limestone intercalated with phyllite is present in the east limb of the Bear Head anticline. Limestone near the contact with the overlying dolostone in the western limb of the anticline is grainy and has a strong planar tectonic fabric. The limestone, which is dolomitized as it approaches the contact, is clearly oolitic having some skeletal remains. Dolostone beds and boudins in the formation close to the same contact contain quartz sand grains. The unit is correlated with the Reluctant Head Formation of the Pasadena map area (Knight, 1992, 1994; Knight and Boyce, 1991).

Middle Dolostone

Overlying the basal unit, is a thick section of buff, grey- to yellow-weathering, off-white, light-grey to grey, microcrystalline to fine-grained dolostone. Chert occurs locally in the middle of the dolostone, marking the division of the unit into two. This unit is correlative with the Petit Jardin Formation and the lower part of the Berry Head formation in the Pasadena map area (see Knight, 1992, 1994; Knight and Boyce, 1991). The dolostones are thick bedded, massive and rarely reveal original sedimentary structure. Off-white to creamy dolostones are common in the upper part of the lower Berry Head formation.

Intraformational breccias occur in the lower part of the Berry Head formation. These breccias comprise red to pale reddish-grey dolostone clasts, and white to locally red carbonate veins occur in several places in the east.

Upper Intercalated Limestone and Dolostone

This unit comprises off-white, cream to grey, very fine-grained dolostone interbedded with white to grey limestone marbles, and is correlative with the upper member of the Berry Head formation in the Pasadena map area (Knight, 1992, 1994; Knight and Boyce, 1991). The white marbles are commonly thinly stratified and laminated. South of Tippings Pond and above the steep slope down into Corner Brook valley, the same stratigraphic interval consists of pink marbles. This unit also includes interbedded grey limestone and dololaminites. The grey limestones are commonly burrow mottled and cryptalgal.

Stratabound to locally crosscutting intraformational breccias are widespread in the same area of the upper Berry Head formation. These breccias comprise a polymictic suite of angular dolostone and less commonly limestone clasts up to a metre in size enclosed in a sand to mud-sized carbonate matrix; calcite fills the fractures and pores.

ORDOVICIAN STRATA

Lower to Middle Ordovician strata of the St. George and Table Head groups outcrop along the western side of the carbonate belt. Four formations make up the mainly Early Ordovician St. George Group similiar to elsewhere in western Newfoundland and the Pasadena map area (Knight and James, 1988; Knight, 1992, 1994). None of the formations of the St. George Group are particularly well exposed and fossils have not been recovered from any units to confirm their identity. In addition, the lithological character of some of the formations appears to vary along strike from north to south in the area.

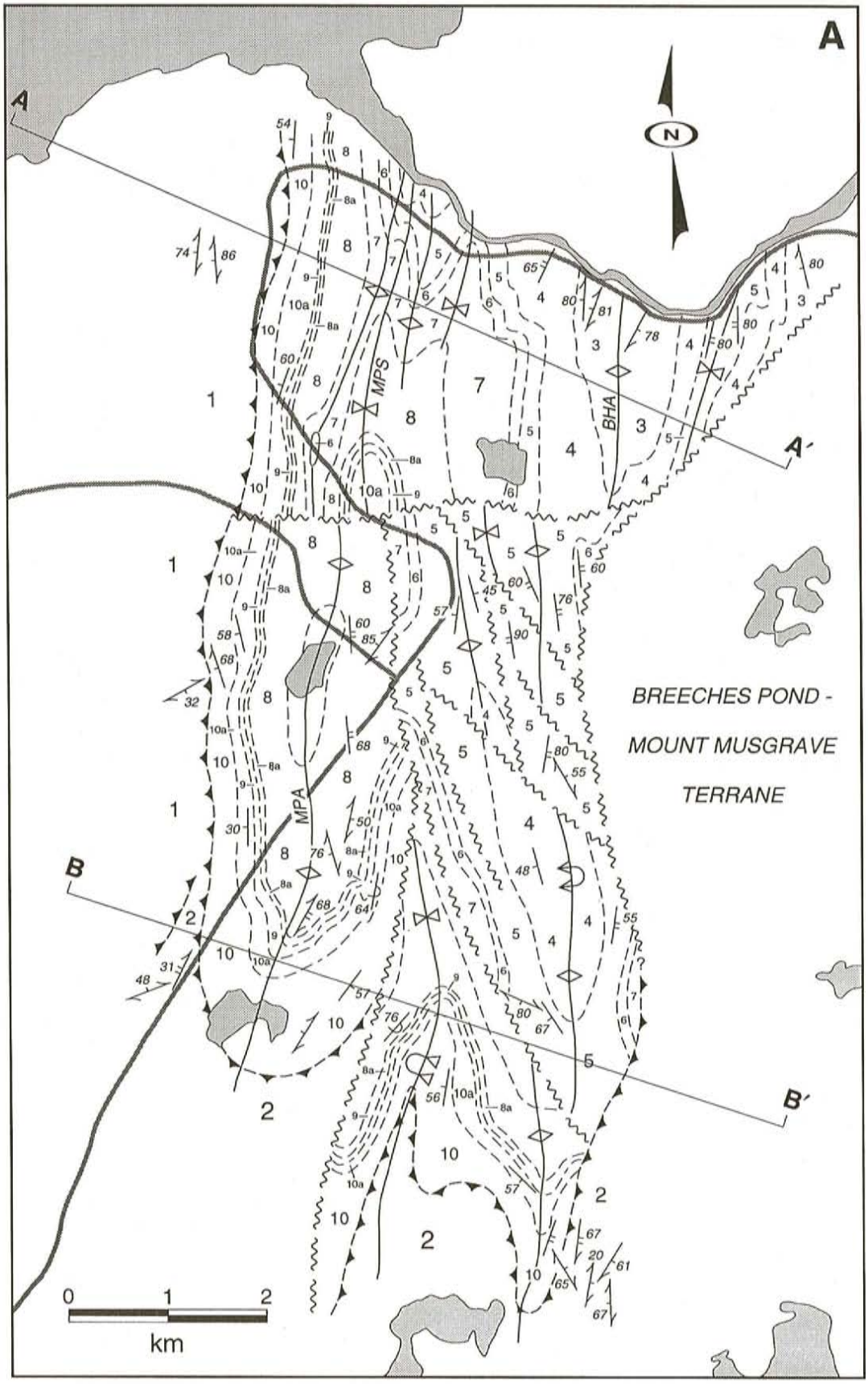
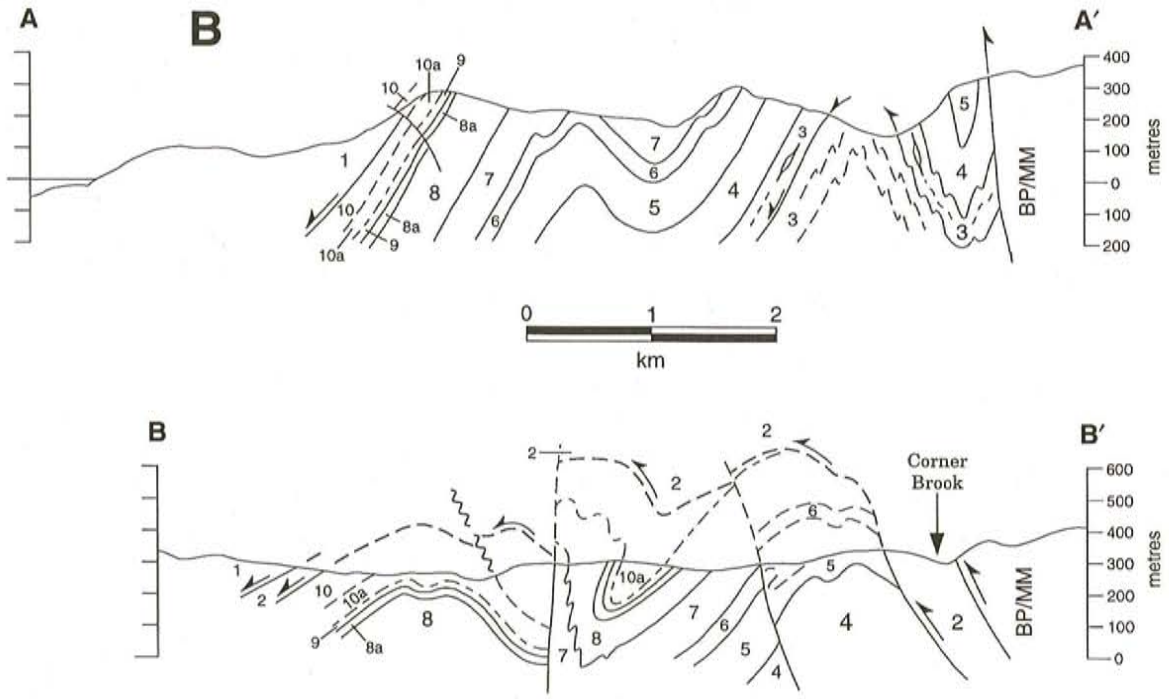


Figure 2. *(A) Preliminary geological map.*



LEGEND

ORDOVICIAN

TABLE HEAD GROUP

10 Table Point Formation; **10a,** Spring Inlet Member

ST. GEORGE GROUP

9 Aguathuna Formation

8 Catoche Formation; **8a,** Costa Bay Member

7 Boat Harbour Formation

6 Watts Bight Formation

CAMBRIAN

PORT AU PORT GROUP

5 Berry Head Formation

4 Petit Jardin Formation

3 Reluctant Head Formation

2 Pinchgut Lake Group

1 Humber Arm Allochthon

KEY

Anticline/syncline

Fault

Thrust Fault

Bedding/co-planar bedding-schistosity

Cleavage

Figure 2. *(A) Preliminary geological map and (B) structural cross section (A-A$_1$, B-B$_1$) of the Cambrian–Ordovician shelf terrane, south of Corner Brook. BP-MM–Breeches Pond–Mount Musgrave terrane. BHA–Bear Head Anticline, MPA–Meadow Pond Anticline, MPS–Mount Pleasant Syncline.*

Watts Bight Formation

Rocks from this formation are not well exposed in the area. The formation is characteristically thick bedded, bioturbated and locally thrombolitic, and is interbedded with dark-grey to grey limestone containing chert nodules, thin dololaminite and laminated dark-grey limestone. Close to the top of the formation, mounded limestones are associated with planar cross-stratified grainstone and dolostone.

Boat Harbour Formation

This formation is characteristically cyclical, consisting of various limestone facies interbedded with dololaminites. The limestone varies from off-white, light grey to dark grey and includes bioturbated, skeletal-rich, parted and thinly bedded types, stromatolitic and thrombolitic mounds, stylobedded grainstone, and dololaminite and laminated lime mudstone that display tepées and mud cracks. Gastropods,

trilobites, brachiopods and orthoconic cephalopods occur in the formation.

Catoche Formation

The Catoche Formation comprises a lower grey and an upper white limestone, the latter known as the Costa Bay member. The lower unit consists of dominantly blue-grey to grey, bioturbated, thrombolitic and grainy limestone having thin interbeds of laminated limestone and dololaminite. There appears to be at least two intervals of thrombolitic mounds seperated by a middle interval of shallowing-upward metre-scale sequences of bioturbated limestone and dololaminite. Gastropods, cephalopods and sponges are associated with the bioturbated and mounded limestones. Planar truncation surfaces in the limestones probably are submarine hardgrounds. Upward, the formation comprises intercalated black, white and grey stylolitic limestones with scattered mounds, including stromatolites, intercalated with dololaminite and argillaceous dolostone, rich in desiccation features.

A white to off-white, stylo-thin-bedded limestone having sericitic and chloritic partings and variable numbers of dolostone interbeds marks the very top of the formation. The Costa Bay member varies in thickness. It is only about 2 m thick near Corner Brook but increases to approximately 10 m, south of the area. Here, the limestones are locally pink.

Aguathuna Formation

The Aguathuna Formation consists of intercalated decametre-thick beds consisting of dolostone and limestone or exclusively dolostone. The limestones include bioturbated grey limestone and off-white microbial laminites and stylo-thin-bedded limestone. The dolostones are typically thin bedded, laminated, and locally argillaceous. The formation is 20 to 60 m thick in much of the area but may be absent in the southwest. This may be an artifact of the difficulty of distinquishing the formation from a similar lithofacies in the overlying Spring Inlet member of the Table Point Formation. Alternatively, it may indicate that the formation is eroded beneath the St. George Unconformity (see Knight, 1994; Knight *et al.*, 1991).

Table Point Formation

This Middle Ordovician sequence consists mostly of limestone and is divided into three parts. The lower part comprises interbedded limestone and dolostone of the Spring Inlet member, the middle part is a succession of well-bedded fossiliferous dark-grey limestone, and the upper part consists of lumpy to nodular limestone. A few scattered outcrops of thin-bedded limestone have been noted at the top of the formation. By definition, the latter would be placed in the Table Cove Formation (see Stenzel *et al.*, 1990) but cannot be separated at the scale of mapping employed here.

The Spring Inlet member is characterized by thick beds of parted, stylo-nodular, and bioturbated dark-grey, commonly fossiliferous limestone interbedded in metre-scale cycles with laminated limestone, dolostone and dololaminite beds. Stromatolite and locally *Renalcis*-like mounds occur in the limestone. Some erosion surfaces of rounded but undercutting depressions and broad pinnacles indicate the presence of karst surfaces between some cycles. The member is approximately 40 to 50 m thick.

The middle well-bedded limestone, which is about 65 m thick, comprises very thick beds of bioturbated, dolomitic and argillaceous, dark-grey limestone. The limestones are fossiliferous. Some sections consist of dolomitic, parted and nodular thin-bedded limestone, skeletal wackestone having laminated lime mudstone layers and crosslaminated very fine grainstone, and metre-thick beds of bioturbated, skeletal, dolomitic wackestone–packstone having skeletal grainstone lenses. Brachiopods, trilobites and ostracods form grainstone and coquina layers in the different facies. Large gastropods are common.

The upper part of the unit, which reaches at least 30 m in thickness, is a medium-bedded, commonly bituminous, grey to dark-grey limestone. It is distinctly rubbly in weathered outcrops, and lumpy, clotted to nodular, and stylolitic in fresh outcrops. The fabric is pervasive, and clearly syndepositional because the clasts are enclosed in a fine-grained limestone matrix. Fossils include large gastropods, cephalopods, sponges and large trilobite cross sections.

Only one outcrop of thinly stratified, fine-grained limestone was discovered in the Lady Slipper road area. The thin stratification is cut by sharp, gently inclined but planar truncation surfaces, and is deformed by small-scale slump folds. Pockets of breccia occur associated with the slump folds.

PARAUTOCHTHONOUS STRATA

Included in this unit are dark shales, phyllites having interbeds of thin-bedded, fine-grained limestones, rubbly brecciated limestones, and stylo-nodular dark-grey limestones; quartz–carbonate veins are common. The unit is locally known as the Pinchgut Lake group (Williams and Cawood, 1989) and is mapped extensively in the area west of the carbonate belt (Cawood and van Gool, 1994).

Locally, the facies includes rusty-weathering grey slate and phyllite containing laminae of white quartzite. These rocks possibly belong to the allochthonous Irishtown formation of the Humber Arm Supergroup. In other outcrops, the phyllite and fine-grained limestone are interbedded with green-grey sandstone suggesting a correlation with the parautochthonous Goose Tickle Group. However, because none of these outcrops have been systematically located by regional mapping of the unit, it is unclear if the different facies associations are part of the same rock unit or different units of approximately similar appearance that have been structurally interleaved. The mapping of Cawood and van Gool (1994) indicates that there is more than one stratigraphic unit involved.

STRUCTURAL GEOLOGY

MAIN CHARACTERISTICS

The carbonate belt in the area south of Corner Brook is deformed in a number of southward-plunging essentially north–south-trending folds. The folds include the Meadows Pond anticline and Mount Pleasant syncline of Cawood and van Gool (1994). The mainly upright folds have east-verging, inclined to locally overturned assymmetry as the belt is traced to the south. Cleavage associated with the main folds is generally steeply dipping to the west although the cleavage dips eastward locally. Cleavage is sporadically developed in limestone and is either absent or obscured by multiple fractures in dolostones.

An earlier schistosity is deformed by the main folds in the Reluctant Head Formation exposed in the walls of the Humber River gorge. The schistosity is parallel to bedding. Isoclinal rootless folds and sheath folds are folded about the main cleavage. Stretching lineations, C–S fabrics including augen-tail structure, rootless folds and small-scale to metre-scale duplex and horse structures occur in the banded rocks. Generally, these structures indicate mostly west vergence on the schistosity regardless of whether the fabric is preserved in steep vertical zones or in more gently dipping parts of the main fold structure. However, some small-scale duplexes show east-vergence in the easterly outcrops of the Reluctant Head Formation at Marble Mountain. These are essentially adjacent to the contact with the Corner Brook Lake frontal fault of the Breeches Pond–Mount Musgrave terrane.

Evidence of the early, west-verging, bedding-parallel shortening is rare in the carbonate sequence above the Reluctant Head Formation. However, small decametre-scale duplexes and horse structures occur in the Berry Head formation of the Humber River gorge section and in the St. George Group in overturned strata along Wheelers road, opposite Watsons Pond Industrial Park; in each case the vergence is westward.

The main cleavage in the Reluctant Head Formation is crenulated by a later, penetrative, or 0.5- to 1.0-cm-spaced crenulation cleavage striking 090 to 160° and dipping to the south at 21 to 48°, and locally 72°. Associated crenulation folds and a lineation on the main cleavage plunge at 10 to 15° to the south.

Carbonate Contacts with Enveloping Rock Units

The main folds deform the contact of the carbonate belt and the phyllites and limestones of the Pinchgut Lake group. This contact is generally poorly exposed around the southern-plunging closures of the main folds. However, a faulted contact is exposed and mapped at the eastern limb of an anticline at its most southerly closure of the belt near Island Pond. The limestone is strongly foliated as the contact is approached; the foliation and contact strikes 015 to 020°, and dips steeply at 65 to 75° to the east. A lineation on the foliation plunges 55° on a vector 010°. Similar strong foliation is noted in the Table Point Formation limestone immediately adjacent to the concealed contact with the phyllites on the west limb of the same anticline. This suggests that the limestone and phyllite contact is an early structural one folded about the main folds.

Stratigraphy of the St. George and Table Head groups is truncated at the southern end of the carbonate belt by the carbonate–Pinchgut Lake structural contact as it is traced eastward around the plunging nose of the fold. However, traced westward and then north to the Trans-Canada Highway, the Pinchgut Lake group phyllites are essentially structurally conformable with the underlying limestone of the Table Head Group. This places older probably Cambrian rocks above younger Ordovician carbonates. If the structural relationships described above are cogenetic, they define a pre-folding thrust ramp and flat as the contact is traced from east to west.

In the east, the folded thrust fault is projected northeastward to intersect with the Corner Brook Lake fault zone. Similarly, the western end of the thrust is truncated by the base of the Humber Arm Allochthon, which structurally overlies Table Head Group limestone from near the Trans-Canada Highway northward to Humber Arm. This allochthon–carbonate contact measured at several localities generally dips at 50 to 60° to the west, slightly shallower than the dip of the underlying footwall limestones of the Table Point Formation. Phyllites in the hanging wall carry a foliation that is cut by a cleavage; both structures have a parallel or steeper dip than the contact. The phyllites contain augen of dismembered laminated thin limestone beds and quartz veins; C–S fabrics all indicate down to the west vergence on the early cleavage. Locally, a crenulation cleavage trending 080° and dipping 38° to the south cuts the earlier foliation and cleavage.

Faults

High-angle faults group into two main trends: uncommon north–south faults and more numerous northwest- to southwest-trending faults. The main north-trending fault, the Lady Slipper Pond fault, is easily defined in the Lady Slipper Pond area, where it dips probably steeply westward; however, tracing the fault northward is difficult.

A number of northwest-trending faults transect the carbonate belt and are defined by locally intense shearing and fracturing in limestones and dolostones respectively, and by good topographic lineaments. A plethora of high-angle faults occurs in the roadcuts along the Trans-Canada Highway. These faults, which trend between 230 and 305°, dip both north and south, between 65 and 90°. Slickensides plunge obliquely between 20 and 56°, and indicate dominantly dextral, with some sinistral, displacement. Displacement across most of these faults is probably not more than a few metres.

Low- (30°) to high- (75°) angle thrust faults trend northward and dip to the east. They are later than the main

folding because they locally offset the carbonate–allochthon contact, but are cut by the wrench faults described above.

ECONOMIC GEOLOGY

Base metals have not been found in the area. However, the carbonate belt is blessed by an abundance and variety of carbonate rock that are suitable for dimension stone. It is host to an operating limestone quarry (in the Catoche Formation) that supplies material to the cement plant, at Corner Brook.

Marble suitable for dimension stone occurs in three zones (Figure 3). Zone 1 occurs in the southern closure of the carbonate belt, west of the Lady Slipper access road. This zone contains rocks of the upper part of the Catoche Formation and of the Spring Inlet member of the Table Point Formation.

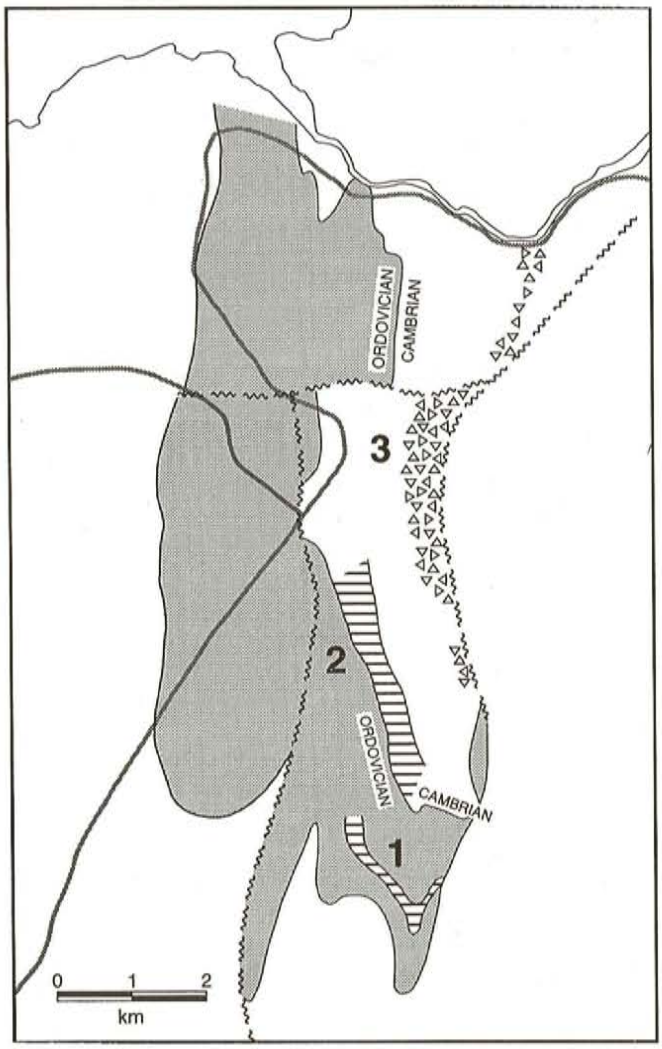


Figure 3. *Location of the three main marble zones in the Cambrian–Ordovician shelf terrane, south of Corner Brook. Cambrian–Ordovician boundary shown.*

The primary focus of the zone is white to pink, fine-grained marbles of the Costa Bay member, Catoche Formation. These form a deposit up to 10 m thick that can be traced over approximately 2 km. The beds strike north-northwest and dip at 12 to 24° to the west. Pink varieties occur in the south of the belt and whiter varieties occur to the north. The rock types in the unit include beds up to a metre or more thick of stylo-thin-bedded and laminated limestone marble having buff sericitic and green chloritic stylolitic partings. An irregular, very fine red vein also occurs in some of the marbles. Pink, white to slightly grey mottled to lumpy fabric occurs in beds of microbial mounds. The type of marble texture varies depending on the angle at which the rock is cut. Bedding-parallel cuts provide marbles that resemble *Rosa borba, Rosa aurora* and *Pink fiorito* (comparison with marble tiles displayed in local St. John's building-supplies stores). Some of the less stylolitic varieties are typically laced by green veins. White varieties are not so well exposed, but are fine-grained, white to off-white, stylolitic types associated with beds of dolostone.

Marble beneath the Costa Bay member is a pale-grey variety having dark stylolites; the marble is fine to medium grained. White marble having dark-grey, irregular partings and stylolites provides a striking rock when cut parallel to bedding; the marble is fine grained. It is associated with other off-white to dark-grey marbles having a variety of mottled and laminated fabrics. These marbles are interbedded with dolostone beds and in turn overlie dark-grey limestone marbles formed from thrombolitic mounds.

Above the Costa Bay member, a variety of off-white, light blue-grey and dark-grey marbles occur including a local bed of conglomerate.

Zone 2 occurs east of zone 1 and forms the west-facing slope of a 3-km long northeast-striking ridge. Beds strike parallel to the ridge and dip steeply at 52 to 80° to the west. The marble in this zone is predominately a very fine-grained white limestone to calcic dolomite type. Beds of massive marble are associated with beds of thinly stratified, mottled and stromatolitic carbonate.

Zone 3 consists of a variety of red, pink and off-white, fine-grained, veined and brecciated marbles. They form a kilometre-wide tract that extends south from the Humber River gorge, approximately 5 km along the eastern margin of the carbonate belt. Fine-grained, bedded marbles that are stratified to stromatolitic, occur as individual beds or in sequences several metres thick. Red irregular stylolites possibly related to incipient brecciation occur in some pink marble beds. Marble varieties resemble *Pink fiorito* and *Red antico* light.

However, the zone is characterized by widespread brecciated and veined marble. Also present in the zone are thick, stratabound and stratiform, polymictic breccias that are tilted with the regional dip. The breccias and veined marbles are of several kinds. The first consists of angular buff-grey grading to red or dark-pink clasts of dolomite and limestone set in a fine-grained pinkish matrix. Clasts are rarely larger than a few centimetres. Red to orange veins cross

the matrix and outline the clasts. Short, narrow, white mosaic calcite veins cut both clasts and matrix. When these marbles are sawed close to the bedding they resemble *Arabescato rosso.* Cut at right angles to bedding the marble is best described as a *Rosso venato.* The white veins are short, dominantly parallel to one direction and cut by later longer veins crossing the cut surface at oblique angles.

Deep-red varieties of the veined marble occur in the north and central part of the zone. The most accessible outcrop is that in a roadcut in Humber River gorge. Another outcrop occurs just east of Parsons Pond in the centre of the area. The dolostone clasts are red and enclosed in veins of blocky mosaic calcite that are white or display colour variation, particularly red staining and banding.

Breccias consisting of large to small, rounded to angular buff-grey dolostone clasts cemented by white sparry calcite, are also common in the same zone. The breccias, which look like many of the artificially produced terrazo stones, are locally enriched by red colouration. These breccias contrast with the stratabound, stratiform breccias that consist of polymict fragments set in a dark-red matrix. These breccias are well exposed east of the Tippings Pond area. They reach several metres in thickness and are traceable for up to a kilometre along strike. The red colouration appears to be stronger close to paleo-cave fills of red calcareous siltstone.

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