THE SOUTHERN PORTION OF THE FLEUR DE LYS BELT ON THE BAIE VERTE PENINSULA (12H/15E, 12H/10E, 12H9/W, 12H/7N)

by

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INTRODUCTION

Geologic mapping of the Fleur de Lys belt on the Baie Verte Peninsula at a scale of 1:50,000 was completed during the 1979 field season. The area surveyed included portions of the Jackson's Arm (12H/15E), Hampden (12H/10E), King's Point (12H/9W), and Sheffield Lake (12H/10N) map sheets. This part of the Baie Verte Peninsula is accessible by the Trans Canada Highway to the south, Baie Verte Highway to the east, Hampden road to the west, Bowater's logging roads in the areas of Wild Cove Pond and Black Lake, and by boat along the shores of White Bay. The west-central portion of the area was surveyed from three fly camps.

The area was previously mapped at a scale of 1:250,000 by Neale and Nash (1963). More detailed studies along the margins of the area have been carried out by Betz (1948) near Hampden, de Wit (1972) and Kidd (1974) to the north and northeast, and by Canadian Johns Mansville (Farquhar, 1959) and Brinex (Czamanske, 1956) to the southeast. The present study includes compilation and assessment of these investigations as well as mapping of intervening areas. All new informal stratigraphic names used in this report will be formalized in a forthcoming memoir on the geology of the Baie Verte Peninsula.

The rocks of the area compose the southern portion of the Fleur de Lys belt on the Baie Verte Peninsula. The Fleur de Lys belt forms the eastern margin to the Appalachian Humber Zone (Williams, 1978) and consists of polydeformed metasedimentary and metaigneous rocks intruded by postkinematic granitoid bodies. The belt extends from the Baie Verte Peninsula to the Grey Islands, more than 100 km to the north, and at least as far south as Grand Lake.

The Fleur de Lys belt within the present map area consists of the following three major geological elements; 1) the East Pond metamorphic suite (Hibbard, 1979), an intensly and inhomogeneously deformed unit of metasediments, banded gneisses and local eclogitic amphibolite pods, 2) the Fleur de Lys Supergroup, a thick sequence of polydeformed metasedimentary and metaigneous rocks, and 3) the Wild Cove Pond Igneous Complex, a composite granitic to dioritic pluton that intrudes both the East Pond metamorphic suite and Fleur de Lys Supergroup. These elements are bounded to the east by a discontinuous chain of ultramafic bodies that are remnants of a dismembered ophiolite termed the Advocate Complex (Williams, *et al.* 1977). The complex has been previously described (Hibbard, 1978) and is only briefly mentioned within this report. Isolated on Granby Island, to the west of the belt, graywacke and slate of the Granby Island formation may represent a less deformed and metamorphosed equivalent of parts of the Fleur de Lys Supergroup.

EAST POND METAMORPHIC SUITE (UNIT 1)

The East Pond metamorphic suite (Hibbard, 1979) consists of fine grained psammitic and semipelitic schists, amphibolite pods, and banded granodioritic gneisses that are poorly exposed in the north central portion of the map area. Migmatite and metaconglomerate that occur within the complex along strike to the north (Hibbard, 1979) do not appear to extend

LEGEND

SILURIAN TO DEVONIAN

WILD COVE POND IGNEOUS COMPLEX

7 granite, granodiorite, and diorite with minor pegmatitic and aplitic dikes.
7a - ultramafic xenoliths

EOCAMBRIAN TO ORDOVICIAN (?)

ADVOCATE COMPLEX

6 ultramafic fragments of an ophiolite

GRANBY ISLAND FORMATION

5 dominantly gray-black slate, argillite, and graywacke, minor boulder conglomerate

FLEUR DE LYS SUPERGROUP (2-4)

4 unseparated psammitic, semipelitic and graphitic schist and greenschist, includes rocks of Birchy Complex, Rattling Brook Group, and Old House Cove Group

WHITE BAY GROUP

3 psammitic, semipelitic, and graphitic schist with amphibolite and marble interlayers
3a - *Oody Mountain amphibolite* with screens of Grenville (?) granitic gneiss.

OLD HOUSE COVE GROUP

2 psammitic and semipelitic schist with abundant amphibolite sills and dikes.

EAST POND METAMORPHIC SUITE

1 quartz-rich fine grained psammites and banded paragneisses; includes amphibolite pods that are locally eclogitic.


Pigeon Island
Hauling Point
White Point
Wild Cove
Old House Cove
Western Arm
WHITE BAY
Westport
Purbeck's Cove
Purbeck's Pond
Granby Island
Pumbly Cove
Little Pumbly Cove
Kidney Pond
Wild Cove Pond
Otter Point
Twelve Mile Point
Little Chouse Brook
Black Lake
Hampden
CABOT FAULT
Rocky Brook
Upper Indian Pond
BAIE VERTE LINEAMENT
Highway
Baie Verte
Barren Pond
SANDY LAKE
Birchy Lake
T.C.H.
-N-
km 5
0
5 km.

into the map area. Outcrops of psammitic schist and gneiss are intimately comingled throuhout the present area, hence the gneisses may represent intensly deformed psammites. In eastern outcrop areas, exposures of coarse grained feldspathic psammite identical to those of the Old House Cove Group (Unit 2) are interspersed among typical fine grained, thinly layered East Pond psammite outcrops, and thus, are here included in the suite. This area may represent a transition zone between the two units, though very poor exposure precludes the interpretation of this transition as either tectonic (infolding or faulting) or depositional. To the west, the suite is in tectonic contact with the Old House Cove group along a wide high-strain zone delineated by feldspar porphyroblastic pelitic schist. A similar high-strain zone occurs within the suite near its eastern margin.

The age of the East Pond metamorphic suite is uncertain, though the unit has been interpreted as Grenvillian basement (de Wit, 1972) and more recently thought to range in age from Proterozoic to Lower Paleozoic (Hibbard, 1979).

FLEUR DE LYS SUPERGROUP (UNITS 2,3,4)

The Fleur de Lys Supergroup (Church, 1969) is a thick sequence of polydeformed metasedimentary and metaigneous rocks that is separated into three divisions in the area. The stratigraphic sequence of these rocks is uncertain, though contacts between units are all locally conformable. Previous correlations of the Fleur de Lys rocks with less deformed rocks of the Humber Zone (de Wit, 1972) as well as regional tectonic constraints (Bursnall and de Wit, 1975; Williams et al., 1977; Dallmeyer, 1977) indicate an Eocambrian to Lower Ordovician age for the supergroup. It may be partially correlative with the East Pond metamorphic suite (Hibbard, 1979).

Old House Cove Group (Unit 2)

Rocks previously assigned to the Seal Cove group (de Wit, 1972; Hibbard, 1979) are herein referred to as the Old House Cove group, as the term Seal Cove has been reserved for a stratigraphic unit elsewhere in Newfoundland. Psammites, semipelites, and amphibolites of the unit are well exposed at the new type section in Old House Cove, Western Arm. They form the lowest structural, if not stratigraphic, unit in the Fleur de Lys Supergroup.

The Old House Cove group outcrops in two belts; the main belt occupies the middle of the map area, whereas a thinner belt outcrops along the coast of White Bay, between Wild Cove Point and Westport. Typical rocks of the main outcrop belt have been described by Hibbard (1979) and the reader is referred to this report. The coastal section of the group bears an overall resemblance to the main outcrop belt, though it is generally more thinly layered, more graphitic, and has a greater proportion of mafic schist over the massive black amphibolite that is characteristic of the unit to the east.

De Wit (1972) defined a inlier of reconstituted Grenville basement within the coast belt near Hauling Point. These rocks are identical in field appearance to the surrounding Old House Cove group and hence, are not separated from them here.

The main outcrop belt of the Old House Cove group is in conformable, transitional contact with the White Bay Group (unit 3) in Western Arm. Near this contact, thin bands of garnetiferous quartz-muscovite semipelite are interlayered with typical Old House Cove psammite; the garnetiferous schist is continous along strike for nearly 20 km to the south. The contact between the Old House Cove coastal belt and the

White Bay Group is less clear. In the area between Westport and Purbeck's Cove, psammitic and semipelitic schist of the Old House Cove group subtly grade southward along strike through an intensely deformed and faulted zone into semipelite, graphitic schist, and quartz rich psammites of the White Bay Group; thus, this contact appears to be a faulted, laterally gradational contact.

White Bay Group (Unit 3)

The White Bay Group, first described by Betz (1948) in the Hampden area, is a varied assemblage of semipelite, graphitic schist, psammite, garnetiferous schist, amphibolite, marble, metaconglomerate, and quartzite. De Wit (1972) has defined seven formations in the Western Arm area, most of which cannot be reliably traced further south than Purbeck's Cove, though two of his units are recognizable as far south as Little Chouse Brook.

In Western Arm, carbonate schist, thinly layered quartzite, and marble form the structural base of the unit and are conformably overlain to the west by approximately 300 m of amphibolite. This asssociation extends as far south as Purbeck's Pond, south of which it appears to pinch out. At Western Arm, a thin unit of graphitic schist structurally overlies the amphibolite. This unit is structurally overlain by a thick sequence of infolded garnetiferous quartz-muscovite semipelite and magnetite bearing psammite that form an extensive belt from Pigeon Island, south to Little Chouse Brook. At Purbeck's Pond, where the graphitic schist unit is absent, the garnetiferous schist is interlayered with the amphibolite-marble association; south of here, the semipelite-psammite unit forms the eastern margin of the White Bay Group. South of Little Chouse Brook, quartz-muscovite semipelite, lacking garnet, extends along strike to the contact with the Wild Cove Pond Igneous Complex. The semipelite-psammite unit is in conformable contact with, and structurally overlain by, another amphibolite unit in Wild Cove; this mafic unit also extends only as far south as Purbeck's Pond before apparently pinching out. At Wild Cove, the amphibolite contains abundant flattened mafic clasts, strongly resembling a fragmental volcanic rock. This unit is faulted against the remainder of the White Bay Group to the west.

The western part of the White Bay Group, at White Point and from Purbeck's Cove south to Big Chouse Brook, is a heterogeneous assemblage of semipelite, graphitic schist, thinly layered quartz psammite, marble, carbonate schist, mafic schist, metaconglomerate, quartzite, and minor garnetiferous semipelite. Marble is the most conspicuous and variable rock type in this part of the group; it ranges in color from steel blue, to white and pink, and occurs as massive featureless layers,thinly laminated layers, carbonate breccias, zones of carbonate-muscovite schist, and as large (up to 15m) blocks within semipelitic and graphitic schist. On the coast between Little Pumbly Cove and Otter Point, layers of steel blue, white, and pink marble occur in close association with garnetiferous amphibolite and mafic schist layers. Quartz-rich psammite and quartz pebble metaconglomerate that locally exhibit graded bedding, are commonly interlayered with the marble. At the mouth of Little Chouse Brook within a section of east facing, overturned strata, a thick section of quartzite overlies a massive layer of marble; the quartzite pinches out abruptly along strike in both directions.

South of Big Chouse Brook, the White Bay Group is composed dominantly of fine grained biotite-quartz semipelite and graphitic schist with minor marble and quartz pebble metaconglomerate.

The *Oody Mountain amphibolite* (Unit 3a) forms the western boundary of the White Bay Group, against the Cabot

Fault. This thick amphibolite unit is conformably interlayered with metasediments of the group and, in many places, appears to display a primary diabasic texture. Along Rocky Brook and in the woods to the south, the amphibolite encloses large screens of foliated granitic gneiss; the foliation predates the deformation of the Oody Mountain amphibolite. The gneiss is very similar to Grenville gneiss of the Long Range Complex on the west side of White Bay. Northwards, along strike a single exposure of coarse metaconglomerate interlayered with the Oody Mountain amphibolite at the Beaches, contains cobbles of predeformed granite gneiss and quartzite. These relationships indicate that this zone likely marks an unonconformity between the Fleur de Lys supergroup and Grenville(?) basement; depending upon the original nature of the amphibolite, it may be either a nonconformity or an unconformity masked by intrusions of diabase.

UNSEPARATED FLEUR DE LYS ROCKS (UNIT 4)

Intensely deformed quartz-biotite semipelite, graphitic schist, garnetiferous semipelite, and amphibolite outcrop between the Baie Verte Lineament and the Wild Cove Pond Complex. The combined affects of the paucity of outcrop, strong deformation, and tectonism caused by the intrusion of the Wild Cove Pond Complex do not allow for the separation of these rocks at this time. Mafic schist and amphibolite are most obvious in the area east of the East Pond Complex and on Black Lake and Upper Indian Pond. Along the Baie Verte Highway, intensely deformed graphitic schist and quartz-biotite semipelite contain pods of actinolite schist up to 3 m in diameter. North of Kidney Pond, Kidd (1974) has reported a small, prekinematic granodiorite body.

Rocks in this zone are most likely correlative with the Rattling Brook Group and Birchy Complex that occur immediately north along strike. These units have been considered equivalent to the White Bay Group (de Wit, 1972).

STRATIGRAPHIC CONSIDERATIONS OF THE FLEUR DE LYS SUPERGROUP

The interpretation of an unconformity between the White Bay Group and Grenville basement near Hampden is not in accordance with earlier notions of Fleur de Lys stratigraphy. The structure of the Fleur de Lys belt has long been considered a simple anticlinorium, with oldest rocks in the centre of the area, succeeded outwards, towards the margin of the belt, by younger strata (*e.g.* Neale & Nash, 1963). De Wit (1972) considered rocks here included in the East Pond Complex as Grenville basement and considered the rocks of the present Old House Cove group to directly overlie basement. In turn, he considered these rocks to be overlain by the White Bay and Rattling Brook Groups. The present investigation indicates that to the southwest, the White Bay Group rests on basement without intervention of the thick, Old House Cove group.

These observations can be accomodated by at least two interpretations:

1) the Old House Cove and White Bay Groups are at least partial lateral equivalents representing different depositional facies resting on Grenville basement.

2) in the area of Hampden, the Old House Cove group was either eroded or never deposited before deposition of the White Bay Group.

In the present investigation, the first interpretation is favoured, as the one outcrop of metaconglomerate interlayered with the Oody Mountain amphibolite is very similar in aspect and clast content to metaconglomerate in the East Pond metamorphic suite. The latter unit surrounds a small body of migmatite which may be Grenville basement (de Wit, 1972; Hibbard, 1979). These metaconglomerates may be correlative and form a discontinuous

marker horizon near the basement-cover contact. The contact of the White Bay and Old House Cove Groups near Westport also lends further support to this idea, as they appear to be laterally transitional.

GRANBY ISLAND FORMATION (UNIT 5)

The Granby Island formation is confined to Granby Island, White Bay. It is comprised of predominantly interlayered black to gray slates, argillites, and graywackes. The graywackes are commonly medium bedded, graded, and locally, are carbonate rich. On the southwest corner of the island, a coarse conglomeratic argillite with boulders greater than 1 m in diameter occurs at the strand line; all included clasts are indigenous to the formation.

The unit is substantially less deformed and metamorphosed than Fleur de Lys rocks to the east. Its age is uncertain, though the rocks are reminiscent of parts of the White Bay Group and may represent the protolith to parts of the group.

WILD COVE POND IGNEOUS COMPLEX (UNIT 7)

A large, composite granitic to dioritic pluton, the Wild Cove Pond Igneous Complex (Kidd, 1974), underlies approximately one half of the map area, extending south from Wild Cove Pond to Birchy Lake. Similar rocks may occur in the Kitty's Brook area, south of Sandy Lake (R. Taylor, pers. comm., 1979). The complex intrudes all of the metamorphic rocks in the area as well as ultramafic rocks of the Advocate Complex.

Rock types within the complex include biotite ± quartz ± hornblende diorite, hornblende ± quartz diorite, minor biotite-hornblende gabbro, biotite ± hornblende granodiorite, biotite granite, and biotite-muscovite granite. The highly variable distribution of these phases precludes their separation at the present scale, though biotite granite, the most common phase in the pluton, occupies a large area in the center of the pluton, west of Upper Indian Pond.

Dioritic rocks comprise the oldest phases of the complex, as they are either intruded by or included within all other phases. The diorites are common in the Wild Cove Pond and Black Lake areas, as well as in the area west of Barren Pond. The hornblende bearing phases are generally gray-green, equigranular fine to medium grained, and locally feldspar porphyritic. Minor feldspar porphyritic hornlende-biotite gabbro in the area immediately north of Birchy Lake is probably related to the diorites.

Biotite and biotite-hornblende granodiorite are commonly associated with the dioritic rocks. At most localities, irregular patches of medium to coarse grained granodiorite envelope the diorites, though west of Wild Cove Pond and west of Barren Pond, contacts between these rocks are gradational.

Medium to coarse grained, equigranular to feldspar porphyritic biotite granite is the most common rock type in the pluton. Along the north shore of Birchy Lake, large (up to 10 cm) megacrysts of potassium feldspar occur within the granite. Locally, the granite is in gradational contact with the granodiorite, though generally it intrudes all phases of the pluton except the two mica granite.

Fine to medium grained equigranular biotite-muscovite granite occurs as small irregularly distributed stocks throughout the complex; locally, it is garnetiferous. The best exposures of this granite occur immediately west of Upper Indian Pond and just north of Birchy Lake. Fine grained leucocratic dikes and aplite dikes that occur in the vicinity of these stocks are most likely related to the two mica granite. Muscovite bearing pegmatites that intrude all other phases of the pluton may also be another manifestation of the two mica granite.

The contact between the pluton and surrounding metamorphic rocks is very irregular and, in many places, transitional. In the areas of Black Lake, Upper Indian Pond and along the west edge of the pluton, large rafts of country rock are incorporated into the pluton, forming large scale agmatites; migmatitic hybrid gneisses are common in these areas. At the north end of Wild Cove Pond, a narrow zone of contact migmatite gneisses marks the edge of the pluton. Only at Rocky Brook and at the northeast corner of the granitic satellite at Kidney Pond, are the contacts with the country rock relatively sharp. Intermediate dikes that crosscut Fleur de Lys rocks along the Baie Verte highway and near Big Chouse Brook are believed to be associated with the complex.

Granitic rocks are seen in contact with ultramafic rocks of the Advocate Complex only east of Upper Indian Pond. The contact between feldspar porphyritic felsite and the ultramafic rocks is ambigiuous, as it is sheared and altered, but flecks of serpentine throughout the felsite strongly indicate an intrusive relationship here.

The complex encloses many map scale sized rafts of the country rock; their size indicates that they are most likely roof pendants in the pluton. Large xenoliths of ultramafic rocks and garnetiferous metagabbro occur immediately north of Birchy Lake. In hand specimen they appear to be totally recrystallized, and thus are not considered to be genetically related to the complex. Their proximity to, and similarity with ultramafic rocks along the Baie Verte Lineament implies they may be remnants of the Advocate Complex.

A K/Ar date on biotite from the granite at Wild Cove Pond has yielded an age of 358 m.y. (Neale and Nash, 1963). The complex postdates tectonism of the Fleur de Lys and East Pond rocks, which apparently ceased by the Middle Silurian (Dallmeyer 1977). Hence, the Wild Cove Pond Complex is considered to be Upper Silurian or Lower Devonian in age.

STRUCTURE AND METAMORPHISM

The structural and metamorphic histories of the East Pond metamorphic suite and Fleur de Lys Supergroup are very similar to those described by Bursnall (1979) and Hibbard (1979) for the same units on the northern part of the Baie Verte Peninsula. The reader is referred to these reports for general information.

The deformation and metamorphism of Fleur de Lys rocks in the area south of Big Chouse Brook is slightly different than that of the main Fleur de Lys outcrop belt. Here, recrystallization of the rocks is finer grained than elsewhere in the terrain, and the late deformation (D_L) and accompanying porphyroblast growth so prevalent elsewhere in the Fleur de Lys has had little affect. The change in structural-metamorphic character appears to be subtle and transitional.

The Wild Cove Pond Complex crosscuts and thus, post-dates most Fleur de Lys structures. At two localities along the west side of the pluton, fine grained granitic dikes have been affected by a late crenulation cleavage evident in the Fleur de Lys rocks. This late cleavage in the country rocks is local, and can not be directly correlated with other structures in the supergroup, hence the cleavage may be related to emplacement of the pluton.

All rock types within the complex are locally foliated. The foliation ranges from flow alignment of minerals to tectonic fabrics with flattened quartz and feldspar; many fabrics appear to be intermediate in character between these types. In the area west of Barren Pond, the granodiorite is gneissose, with wispy banding defined by biotite and hornblende. All of these structures postdate polydeformation and metamorphism of the country rocks and

are considered to be related to the emplacement of the complex.

In the field, no thermal aureole was observed in the country rocks around the complex, though Kidd (1974) has defined an andalusite-cordierite aureole around the granite west of Kidney Pond, based on petrographic work. Coarse kyanite, presumably related to thermal metamorphism occurs in metasedimentary xenoliths near the south end of the complex.

ECONOMIC GEOLOGY

Mineralization in the area appears to be meager, minor galena occurs in small shear zones in the White Bay Group near Otter Point, and minor disseminated bornite was found in a marble boulder, near outcrop, at Purbeck's Cove. Hand samples of the two mica granite within the Wild Cove Pond Complex have yielded scintillometer readings 2 to 3 times greater than background.

Marble along the White Bay coast was at one time considered a prospect for facing stone, though generally it is highly fractured. Massive varieties do occur locally, and may be worthy of future investigation.

Rocks in Tennessee that are similar in aspect and tectonic setting to the Old House Cove group contain substantial massive sulfide deposits (Ducktown; Addy and Ypma, 1977); such a prospect is not to be discounted for the present field area.

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