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Geology of the Orrs Island 7 1/2' Quadrangle and Adjacent Area

Hussey, Arthur M.

TRIP A

Geology of the Orrs Island 7 1/2' Quadrangle and Adjacent Area

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INTRODUCTION

The Orrs Island 7 1/2' quadrangle, comprising the SW 1/4 of the Bath 15' quadrangle, is underlain by metasediments and metavolcanics intruded by syntectonic binary granites and pegmatites and infrequent post-tectonic basalt and diabase dikes. Figure 1 is a preliminary geologic map of the quadrangle representing field mapping during the summers of 1963, 1964, and 1965. Figure 2, a generalized geologic columnar section for the area summarizes the lithologic character of the stratigraphic units. Fuller descriptions of some of these units will be presented under discussions of individual field trip stops.

These rocks represent high grade equivalents of the Casco Bay Group typically exposed in the Cape Elizabeth-Scarboro-South Portland area (See Trip F, this Conference). Pelites in the Orrs Island quadrangle indicate metamorphism to the staurolite and sillimanite grades. The sillimanite isograd is shown on Figure 1. Quartz veins in very aluminous pelites contain masses of clear pink andalusite which is partially replaced by sillimanite in a zone roughly one-half to one mile wide on the staurolite side of the isograd. Andalusite generally does not persist on the sillimanite side of the isograde. The isograd is drawn on the basis of appearance of the sillimanite in the schists and not on its appearance in quartz veins.

As a result of mapping in the quadrangle it has been necessary to recognize a new formation embracing the rocks exposed on Sebascodegan Island. For convenience of discussion, this sequence of rocks is referred to as the "Sebascodegan" Formation in this guidebook, and is composed of the lithologies described in the Columnar Section. Formal establishment of this as a formation must appear elsewhere. This formation is at least in part equivalent to the Cushing Volcanics of the Casco Bay-South Portland area, but it includes several lithologies not represented in the Cushing. That portion of the "Sebascodegan" Formation most closely related to the Cushing is the sequence of volcanics designated "sev" in the vicinity of Lookout Point, Harpswell Neck.

Among the more conspicuous units of the "Sebascodegan" Formation are the numerous amphibolites, both massive, and thin, well-bedded. These will be discussed in greater detail in the field trip stop discussions.

The other units recognized in the quadrangle can be correlated with the formations of the Casco Bay Group--the Cape Elizabeth Formation, Spring Point Greenstone, Scarboro Formation, Spurwink Limestone and Jewell Formation--as originally defined by F. J. Katz (1917) and mapped by the writer in the Portland quadrangle, and by Bodine in the Casco Bay quadrangle (see Trip F, this Conference). The Diamond Island, a thin unit consisting of black siliceous graphitic phyllite, is not present in the Orrs Island quadrangle.

The major folds in the quadrangle are the Harpswell Sound syncline on the west and the Hen Cove anticline on the east. Drag folds with axial plane schistosity are common, especially in the Cape Elizabeth Formation, and in general bear out the major structures. Locally a second set of crude small scale folds involving both bedding and schistosity is developed. Plunges of the primary drags are rather variable indicating frequent reversals of the major plunge direction.

Lineations are well-developed in all units of the quadrangle, but especially so in the Cape Elizabeth Formation. In this unit three lineations can commonly be seen. On the bedding surfaces of the competent beds a lineation formed by the intersection of a fracture cleavage and bedding, parallel to the plunge direction of primary fold axes, is frequently present and gives these beds a rather woody appearance. The second and third lineations are observed in the micaceous beds and are formed by the close crenulation of schistosity. The principal crenulation has axes plunging consistently to the northeast about 25 to 30 . The lesser crenulation plunges essentially down dip of the general schistosity.

Along the western shore of Harpswell Neck, local relations suggest the presence of a major fault: 1) south of Jordan Point, the sea-cliff is held up by very rusty schist and granulite of the "Sebascodegan" Formation dipping very gently eastward and striking parallel to the shore. At the waters edge is an exposure of aluminous schist much like the "ces" unit of the Cape Elizabeth Formation, but with a strike nearly at right angles to the shoreline; 2) at different points along the shore, thin breccias and minor faults are present; 3) the "serg" unit is offset about 3/4 mile between Scrag Island and the mainland. These three observations argue

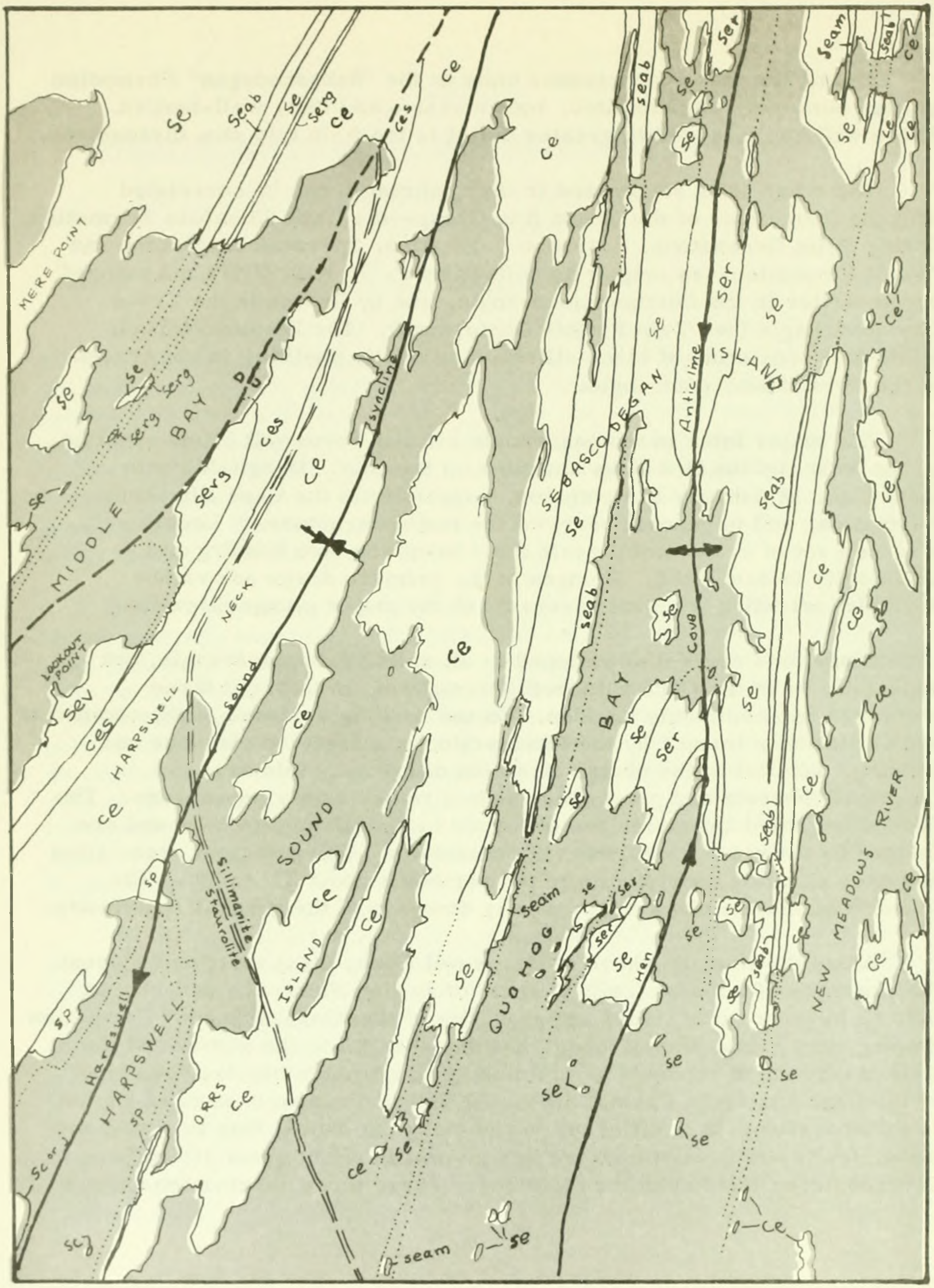


Figure 1. Preliminary geologic map of the Orrs Island 7 1/2' Quadrangle. Explanation of symbols on opposite page.

EXPLANATION OF SYMBOLS

j -- Jewell Formation

sc -- Scarboro Formation

sp -- Spring Point Greenstone

ce -- Cape Elizabeth Formation
- ces -- staurolitic rusty weathering member

se -- "Sebascodegan" Formation *
- ser -- rusty schist member
- serg -- rusty garnet-rich biotite-quartz schist.
- seam -- massive amphibolite
- seab -- bedded amphibolite
- sev -- felsic volcanics (equivalent of the Cushing Fm.)

*Unofficial name, used here informally.

Geologic contact

Geologic contact underwater

Metamorphic isograd

Approximately located fault

Trace of anticlinal axis

Trace of synclinal axis

Scale 1/62500

1 1/2 0 1 2 3 4 Miles

1000 500 0 1000 2000 3000 4000 5000 6000 7000 Yards

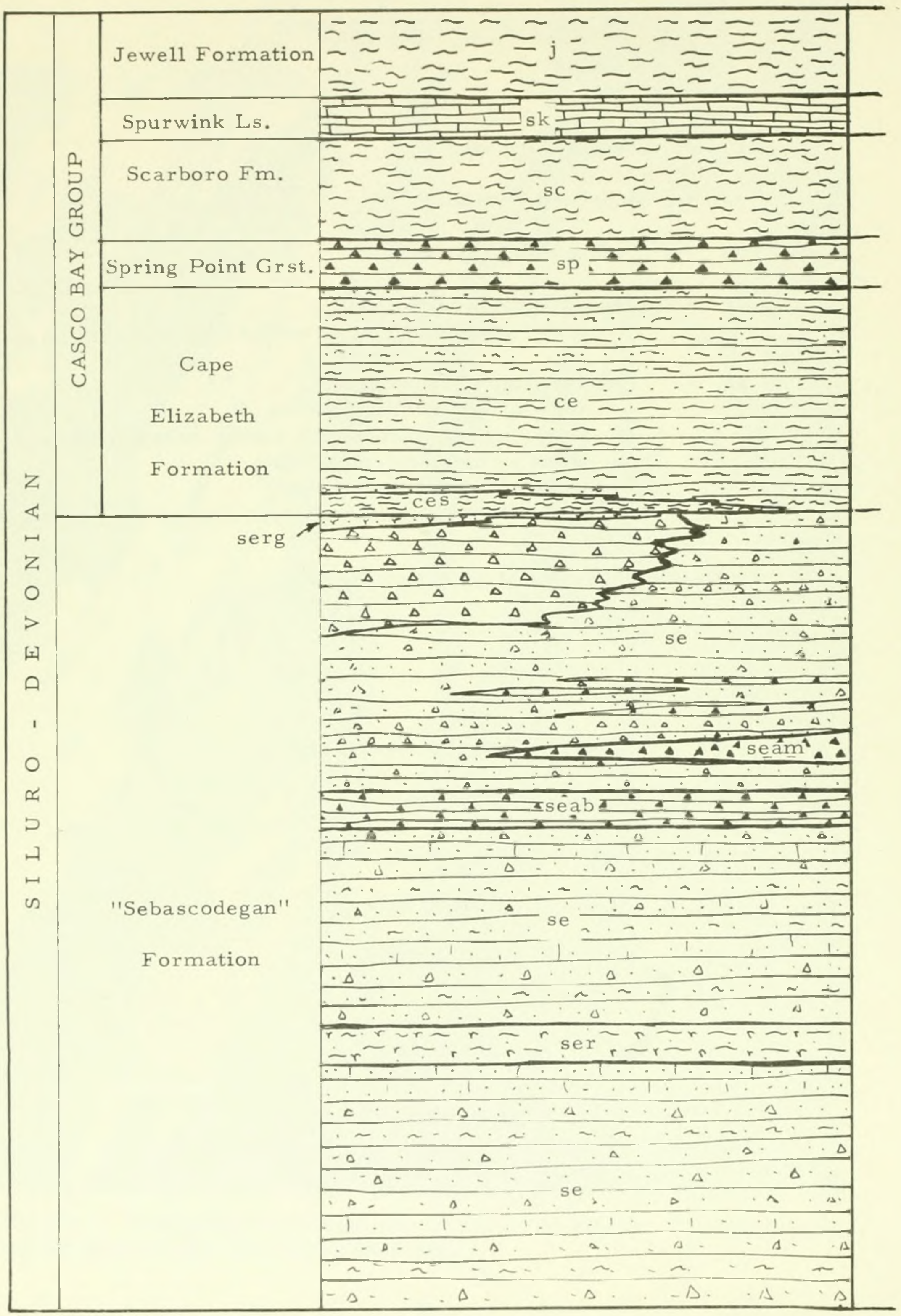
1000 0 3000 6000 9000 12000 15000 18000 Feet

1 .5 0 1 2 3 4 5 Kilometers

Contour interval 20 feet

Datum is mean sea level

Preliminary Columnar Section, Orrs Island 7 1/2' Quadrangle



General lithologic character

	Rusty-weathering biotite-muscovite garnet schist with minor thin interbeds of micaceous quartzite and amphibolite.
	Thin-bedded gray limestone with biotite schist/phyllite interbeds.
	Same as the Jewell Formation
	Thin bedded amphibolite ± garnet, and quartzo-feldspathic granulites.
	ce: Thin-bedded biotite and biotite-muscovite quartzite, quartz-muscovite-biotite schist, and muscovite-biotite-garnet-quartz-staurolite or sillimanite schist, with sparse quartz-plagioclase-garnet-hornblende granulite pods and lenses. Beds of amphibolite up to 6 feet thick rendered discontinuous by pinching and swelling are present locally. ces: Poorly bedded rusty-weathering staurolitic two mica schist.
	se: quartz-feldspar-biotite granulite, quartz-feldspar-biotite-hornblende granulite, with minor calc-silicate granulite, quartz-plagioclase-biotite-sillimanite granulite, and biotite quartzite. serg: very rusty-weathering sulfidic garnet quartzite to garnet-biotite schist. sev: thin crudely bedded plagioclase-quartz-biotite ± garnet gneiss; plagioclase-quartz-muscovite schist. Metamorphic equivalents of felsic tuffs and agglomerates. seam: massiv coarse-grained hornblende plagioclase amphibolite. seab: thin to medium-bedded amphibolite with thin interbeds of biotite schist, calc-silicate granulite, and thin seams of diopsidic marble; includes a unit up to 6 feet thick varying from pure calcite marble to diopside-hornblende-marble. ser: rusty-weathering quartz- muscovite-biotite schist and quartz-feldspathic granulite

strongly for a fault extending through Middle Bay and just striking the shore of Harpswell Neck south of Jordan Point. This is essentially on a line with a fault mapped by Bodine (see Trip F) in the Casco Bay quadrangle and by the writer in the Portland quadrangle. It is proposed that the fault in the Orrs Island quadrangle is a continuation of the one in the Portland and Casco Bay quadrangles. The attitude and age of the fault are not known, but the southeast side is the upthrown side.

In the Cape Elizabeth Formation in the western part of the quadrangle minor vertical sinistral shears are very common and are the latest of all structures noted. Bedding is dragged around consistently in a left-handed fashion, and in some places parted by minor slippage. These shear zones strike essentially east-west. Although individual offsets either by bending or faulting are not more than a few feet (most are less than one foot), these zones are frequent enough to cause significant deflection of general strike. At one point near Ewin Narrows (separates Harpswell Neck from the upper part of Sebascodegan Island) where a single bed can be followed about 400 feet, the local strike and general trend vary about 20 . This is significant when attempting to predict the outcrop zone of a given unit along strike. These shears are apparently later than diabase and basalt dike emplacement. On Orrs Island one small diabase dike has been slightly deformed by one of them.

Pegmatites are very abundant on Mere Point Neck; along the crestal zone of the Hen Cove anticline (an interesting case of structural control of pegmatization); and along the western edge of the quadrangle. The pegmatites are concordant lenses in these zones, becoming cross-cutting stringers away from these centers, and finally cross-cutting dikes with even, straight, matched walls farthest from these pegmatization centers. Some of the pegmatites grade into binary granite. The mineralogy of all pegmatites examined is simple and non-exotic, consisting of quartz and orthoclase, sometimes in graphic intergrowths, and biotite and muscovite micas, with occasional black tourmaline.

Correlation and Age

Reconnaissance mapping by the writer in other parts of the Bath quadrangle and in the Wiscasset and Gardiner quadrangles has indicated that the Cape Elizabeth Formation is equivalent to the interbedded quartzites and pelites at Coopers Mills (see Trip B, this Conference). This correlation is made starting with the Cape Elizabeth exposures on the east limb of Hen Cove anticline, and carrying them through extremely migmatized pelites

in the Bath-Woolich-Wiscasset-Alna area to non-migmatized or slightly migmatized pelites and quartzites exposed in the road cut along Route 17 just southwest of Coopers Mills. By similar reconnaissance mapping the "Sebascodegan" Formation has been carried through into the Wiscasset and Gardiner quadrangles, and lies on either side of the Coopers Mills rocks (see Trip B).

In the Freeport and Brunswick area the "Sebascodegan" Formation is underlain by a thin unit consisting of very rusty weathering granulite and schist traceable to the rusty rocks exposed along U. S. Route 201 at Iron Hill in Gardiner. Beneath these rusties lies a thick sequence of quartz-biotite-feldspar and lime-silicate granulites equivalent to the Berwick Formation (Hussey, 1962) and Vassalboro Formation (Osberg, in press). These granulites are excellently exposed in Interstate 95 roadcuts between Brunswick and Freeport. Bodine (Trip F) refers to these rocks as the Pejepscot Formation following Fisher (1937), but the writer does not fully concur with this useage. Fisher included in the Pejepscot Formation rocks which are equivalent to part of the "Sebascodegan" Formation, but his mapping did not extend to the area of Sebascodegan Island. If the term "Pejepscot" is to be retained in the regional stratigraphic nomenclature, the writer would prefer to see it raised to the status of a Group. The Pejepscot Group would include the Berwick Formation (in this area), the rusty granulites and schists of Iron Hill, and the "Sebascodegan" Formation discussed here. Overtop the Pejepscot Group is the Casco Bay Group.

Katz (1917) originally referred to the Casco Bay Groups being of Carboniferous age. He considered the Group to be equivalent to the Eliot Formation of southwestern Maine and adjacent New Hampshire. The Eliot Formation was correlated with the Worcester phyllite in Massachusetts which was regarded as being of Carboniferous age on the basis of alleged fossils. Billings (1956) has critically reviewed these correlations pointing out errors in interpretation, and has suggested that a Silurian age is a better determination for the Berwick and Eliot Formations (the Eliot Formation lies immediately below the Berwick).

Present investigations show that the Casco Bay Group lies above the Berwick Formation, and is therefore younger, not older, than that Formation. The most meaningful information on the age of these rocks comes from the Vassalboro-Waterbille area. In that region, fossils of Llandovery age occur in the Mayflower Hill Formation, and of Wenlockian age in the Waterville Formation. Our mapping shows that the Waterville Formation is correlable with the Eliot Formation. Osberg (in press)

assigns a Siluro-Devonian age to the Vassalboro Formation above the Waterville. This is taken as the age of the Berwick Formation. The "Sebascodegan" Formation and Casco Bay Group are younger still by superposition and may be Siluro-Devonian or straight Devonian in age.

The Cape Elizabeth Formation and possibly other formations of the Casco Bay Group are equivalent to the Gonic, Rindgemere, and Towow Formations (Littleton equivalents) of southern York County and the Newfield-Kezar Falls area (See Trip H, this Conference). In these areas, the "Sebascodegan" Formation is absent.

References cited

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Fisher, L. W. (1941) Structure and metamorphism of Lewiston, Maine, region: Geol. Soc. Am. Bull, Vol. 52, pp. 107-160.

Hussey, Arthur M. II (1962) The Geology of Southern York County, Maine: Maine Geol. Surv., Sp. Geol. Studies Series, No. 4, 67 pp.

Katz, F. J. (1917) Stratigraphy in southeastern New Hampshire and southwestern Maine: U. S. Geol. Surv., Prof. Paper 108, pp. 165-177.

Osberg, P. (in press) Geology of the Waterville Area: Maine Geological Survey.

Perkins, E. H. and Smith, E. S. C. (1925) Contributions to the geology of Maine, No. 1: A geological section from the Kennebec River to Penobscot Bay: Am. J. Sci., 5th Ser., Vol. 9, pp. 204-228.

Quadrangle Maps Needed

Orrs Island 7 1/2' quadrangle
Bailey Island 7 1/2' quadrangle
Small Point 7 1/2' quadrangle
South Harpswell 7 1/2' quadrangle

Assembly Point

In front of Cleaveland Hall, Bowdoin Campus

Time

Trip will leave by bus at 8:00 A. M. sharp!

Road Log

Mileage

0.0	Bowdoin Campus at West Campus Gate. Turn right onto Bath Road.
0.3	Pass Bowdoin Pines.
2.1	Entrance to Brunswick Naval Air Station, right.
2.2	Right turn onto Route 24.
4.5	Exposures of amphibolite and marble along the highway for about 1/2 mile. We will return to these at stop #4.
5.9	Cross the Gurnet
6.6	Road to Cundys Harbor left.
10.5	Bear slight left onto tar road off Route 24.
12.0	Stop #1. "Sebascodegan" Formation. Amphibolites and Associated Granulites.

Park opposite house with name "Young" on mailbox. Walk eastward down lane to shore. Examine the rocks along the shore, southward around the point and into the cove on the west side of the point, and as far down Long Point shore

as time permits. See detailed geologic map of this area (Figure 2).

The rocks of this area lie on the western flank of the Hen Cove anticline centered through the Bethel Point - Yarmouth Island area. Rock types include massive, fine to coarse-grained hornblende amphibolites, some bedded hornblende amphibolites with biotite schist and calc-silicate granulite interbeds, quartz-plagioclase-biotite-(hornblende)-(garnet) granulites, quartz-feldspar-diopside-hornblende granulites, and rusty quartzo-feldspathic granulites and schists. Thin beds or groups of beds of light-gray plagioclase cummingtonite amphibolite are relatively common in the quartzo-feldspathic granulites. The rock units to be seen will not be described in detail here. However, the following notes refer to specific areas along the walk and are located on the detailed map of this area.

Note 1: Rocks at the end of the woods lane, along the shore, are quartzo-feldspathic granulites of medium gray color with 1/2 to 2" long lens-shaped pods of lighter granulite probably representing fragments of felsic volcanics.

Note 2: Thick massive amphibolite with coarse poikiloblastic texture. Mineralogy rather simple--essentially hornblende and plagioclase (An_{30-35}) with accessory apatite and opaques. Probably andesitic flows or dioritic sills before metamorphism.

Note 3: Sequence here consists of distinctly bedded quartzo-feldspathic granulites with minor light gray fibrous amphibolites and biotite quartzite and schist. The amphibolites are composed of plagioclase (about An_{30}) and cummingtonite (optically positive, highly twinned, light brown color, n_B about 1.651, inclined extinction), with minor amounts of biotite and opaques. The quartzo-feldspathic granulites probably represent immaturely weathered sediments derived from volcanic terrains, and the cummingtonite amphibolites, beds of magnesium-rich volcanic tuff.

Note 4: Associated quartzo-feldspathic granulites and calc-silicate granulites, very thin and well bedded.

Note 5: Massive, fine-grained, weakly laminated hornblende-biolite amphibolite.

Note 6: At the western contact of the rusty granulite and schist with amphibolite and calc-silicate granulite "drag" folds all have sinistral pattern, but varying plunges, giving opposing interpretations of major structure. The drag folds in the Cape Elizabeth Formation on Gun Point to the west consistently indicate a major anticline to the east. If the contact between the Cape Elizabeth and "Sebascodegan" Formations is conformable (as has been assumed so far), and there is no complication due to faulting, the sequence at this stop must top to the west; consequently the minor folds seen here plunging northward must not reflect the traditional drag mechanism of formation. Furthermore, the distribution of rock types precludes tight, major isoclinal folding within the sequence examined here.

Return to the buses via the dirt road.

Turn around and return to Route 24.

14.4 Sharp left turn onto Route 24. From here to the Bailey Island Bridge, all outcrops are of the Cape Elizabeth Formation.

15.2 Causeway to Orrs Island.

18.3 Cross granite crib bridge to Bailey Island. Outcrops on the west side of the bridge at the Orrs Island end are of the Spring Point Greenstone whereas those on the east are of the Cape Elizabeth Formation. Here the Cape Elizabeth Formation contains occasional boudined dark green beds of amphibolite.

19.4 Bailey Island Post Office on the right.

19.5 Right turn onto tar road.

19.6 Stop #2. Spring Point - Cape Elizabeth Contact.

Park in Skillings Boat Yard and walk to the shore beside the Boat Yard office.

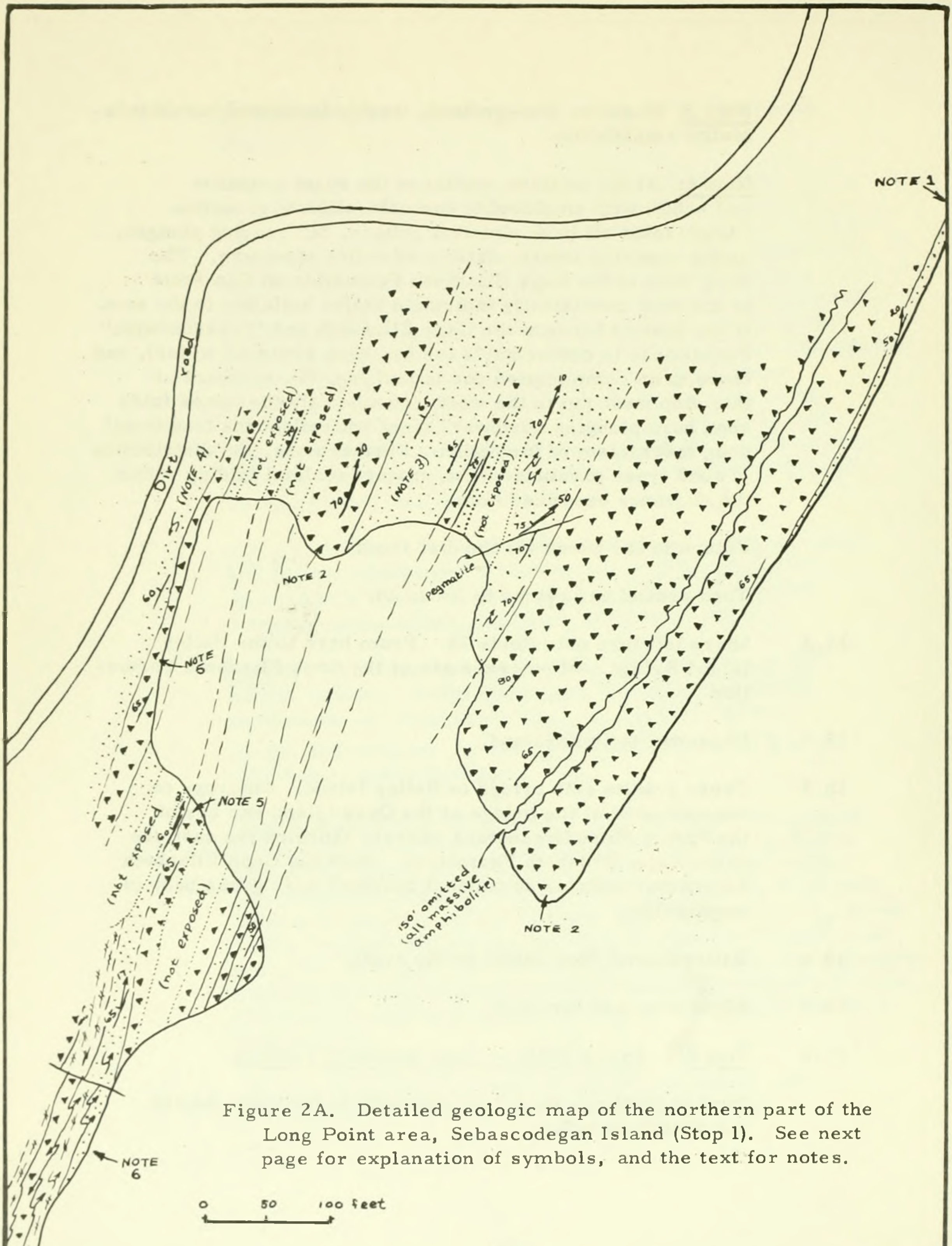


Figure 2A. Detailed geologic map of the northern part of the Long Point area, Sebascodegan Island (Stop 1). See next page for explanation of symbols, and the text for notes.

Explanation of Symbols

amphibolite, both coarse and fine grained

quartzo-feldspathic and limesilicate granulite

rusty-weathering qtz-spar-bi granulite and musc-qtz schist.

amphibolite and hornblendic quartzo-feldspathic granulite.

rusty-weathering amphibolite

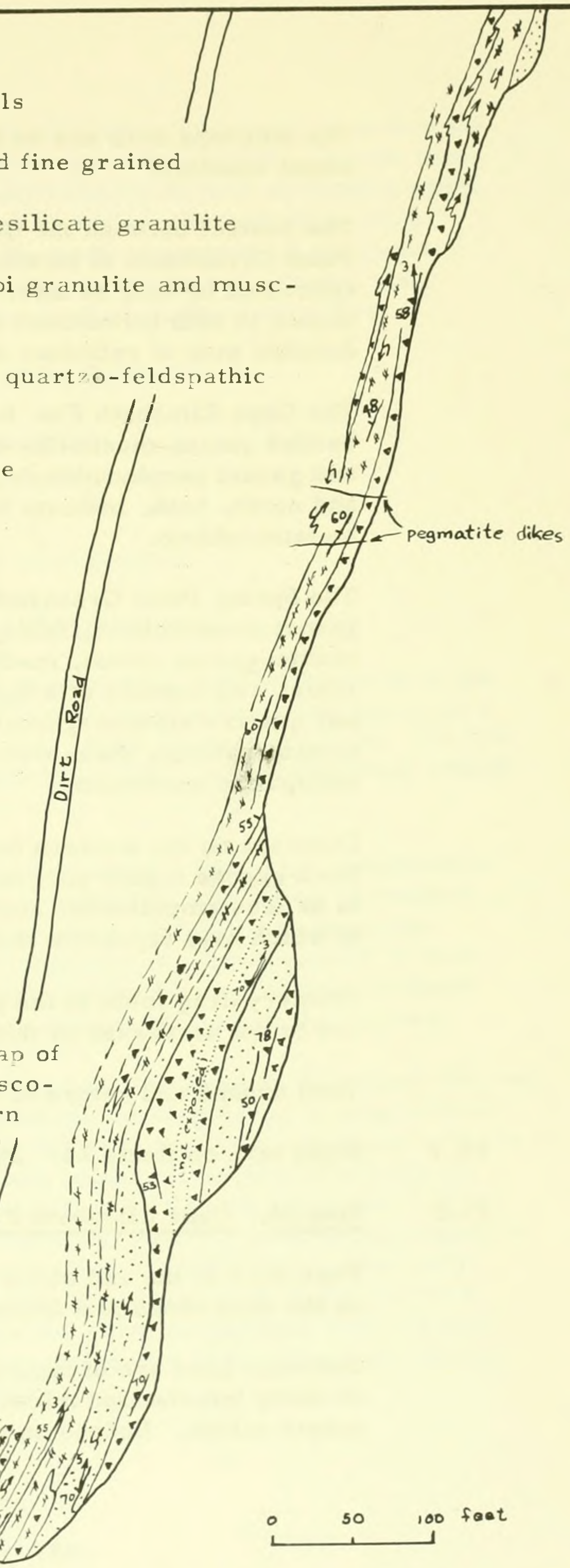


Figure 2B. Detailed geologic map of southern part of Long Point, Sebascodegan Island. (Joins on to southern end of Figure 2A.)

The outcrops here are on the eastern limb of the Harpswell Sound syncline.

The contact between the Cape Elizabeth Fm. and the Spring Point Greenstone is located beside the Boat Yard office, concealed by only an interval less than two feet wide. Bedding planes in both formations are conformable. Figure 3 is a detailed map of relations at this point.

The Cape Elizabeth Fm. here consists of thin, rather weakly bedded quartz-muscovite-biotite schist with prominent chlorite and garnet porphyroblasts. More aluminous beds to the south and north, both, indicate the staurolite grade of regional metamorphism.

The Spring Point Greenstone consists of a series of thin garnet amphibolites, feldspathic biotite-muscovite quartzite, biotite-garnet schist, medium greenish-gray chloritic schist with needles of a light green amphibole (actinolite?), and quartz-feldspar-garnet-biotite granulite. Before metamorphism, these were probably basic volcanic tuffs and feldspathic sandstones.

Outcrops on the western limb of the structure on Harpswell Neck expose higher portions of the formation which appear to be less amphibolitic and more feldspathic, some portions of which may represent metamorphosed felsic tuffs.

Primary drag folds in the general area all indicate that tops are to the northwest on this side of the structure.

Turn around and return to Route 24.

19.7 Right turn on Route 24. Proceed to the end of the highway.

21.0 Stop #3. Cape Elizabeth Formation.

Park cars at the end of the highway. Examine the outcrops on the east shore just beyond the gift shop and snack bar.

Outcrops here are of typical Cape Elizabeth Fm., consisting of thinly interbedded micaceous quartzite, and two-mica quartz schist. Ledges on the other side of the cobble beach

expose the same lithology plus some interunits of somewhat rusty weathering staurolitic two-mica schist. Quartz veins in the latter carry sparing amounts of pink andalusite which has been partially altered to sillimanite and white mica. Andalusite and sillimanite, both, are absent from quartz veins in the non-staurolitic quartzites and schists; also, sillimanite does not occur in the schists themselves.

Turn around and return along Route 24.

23.6 Bailey Island crib bridge again.

30.8
to
31.3 Outcrops of well-bedded amphibolite.

34.6 Stop #4. "Sebascodegan" Formation.

Park in parking area on west side of road at the crest of the hill. Walk back (south) to outcrop of marble and associated amphibolite on the east side of the road. CAUTION: WATCH OUT FOR FAST MOVING TRAFFIC. SOME PEOPLE THINK THIS IS A DRAG STRIP!

Good exposure of marble bed about 5 feet thick composed of pure calcite. Marble is interbedded with thinly laminated (bedded?) amphibolite and some calc-silicate granulite. At top of hill beside parking area is a quarry about 15 feet wide and 700-800 feet long where the marble was obtained for agricultural purposes around the turn of the century.

After examining these exposures proceed on foot about 800 feet north along Route 24, past the parking area, to long roadcut of bedded amphibolite on the west side of the highway. These are dark green hornblende amphibolites with interbeds of phlogopitic biotite schist and calc-silicate granulite. Some beds contain cummingtonite and possibly anthophyllite-gedrite. The plagioclase in these bedded amphibolites is markedly more calcic (An_{50-70}) than the plagioclase of the massive amphibolites. This plus the close association with marble and calc-silicates is suggestive of a sedimentary parent for the bedded amphibolites.

Continue on Route 24 northward.

36.6 Left onto Bath Road (old U.S. 1)

37.2 Outcrop of rusty-weathering Cape Elizabeth in railroad cut on the right.

38.9 Left onto Route 123.

39.0 Stop #5. Lunch.

Park near the entrance to Cleaveland Hall and Gymnasium parking lots. Lunch will be under the pines.

Continue on Route 123.

46.0 Outcrops of typical Cape Elizabeth Formation.

47.4 Stop #6. Cape Elizabeth Formation. Rusty staurolite schist member.

Park beside Bailey's Grocery Store. Walk about 500 feet westward down dirt road to Navy fuel pipeline. Observe outcrops south along pipeline clearing for about 200 or 300 feet.

Exposures of the somewhat rusty weathering staurolitic unit at the base of the Cape Elizabeth Formation--two-mica garnet-staurolite schist and schistose quartzite. Numerous quartz veins cutting the schist carry clear pink andalusite somewhat altered to sillimanite and white mica. As at stop #3, andalusite and sillimanite occur only in the quartz veins, and not in the schist. Furthermore, andalusite and sillimanite are not present in the quartz veins of the normal quartzose Cape Elizabeth exposed just east of the pipeline, clearly indicating that the quartz veins are of very localized origin.

This aluminous member of the Cape Elizabeth is recognized only on this limb of the Harpswell Sound syncline.

Continue on Route 123.

48.0 Well-lineated Cape Elizabeth on right.

48.9 Left onto dirt road, and bear right 300 feet east.

49.2 Bear right.

49.5 Left turn to shore area.

49.6 Stop #7. Spring Point Greenstone.

This stop is on the western limb of the Harpswell Sound syncline. Here, some of the same units of the Spring Point Greenstone as exposed at stop #2 are seen again. The Cape Elizabeth Fm. is exposed 100 feet west across a narrow inlet.

Return to Route 123.

50.5 Left turn onto Route 123.

53.6 Stop #8. Spurwink Limestone and Jewell Formation.

Park in Estes Beach and Lobster House parking area. Walk north to the exposures of the Spurwink Limestone on the western shore of the Neck, then walk south to exposures of the Jewell Formation at end of causeway on east side of highway.

The outcrop of thin-bedded gray limestone with biotite schist and dark hornblendic amphibolite on the west shore north of the parking lot are correlated with the Spurwink "ribbon" limestone of the Casco Bay Group named by Katz (1917) and mapped by Bodine (see Trip F, this Conference) in the Casco Bay quadrangle and this writer in the Portland quadrangle.

On the east shore of the Neck just south of the parking lot, two similar units of "ribbon" limestone are exposed close to roadside and may represent part of the same unit as seen to the north. These limestones are overlain to the west by garnet-rich rusty and non-rusty schists assigned to the Jewell Formation. Similar schists comprise the Scarboro Formation on the other side and stratigraphically below the Spurwink Limestone. Drag folds in some inter-bedded amphibolites indicate tops to the southeast. This locality is close to the center of the Harpswell Sound syncline.

The metamorphic grade here may be the garnet zone (no staurolite noted here).

Turn around. Return on Route 123.

58.4 Pass Bailey's Store. Be ready for left turn.

58.6 Left onto Lookout Point Road. Go to the end of the road.

59.3 Stop #9. "Sebascodegan" Formation. Felsic volcanics and associated rocks.

The outcrops to be examined are located along the tip of Lookout Point and on the two small islands beside the Point. Figure 4 is a detailed map of this locality.

The rocks exposed here include quartz-plagioclase (An_{15-20})-biotite granulite and gneiss, quartz-plagioclase-muscovite-biotite (sparing) schist, dark gray rusty-weathering garnet-rich biotite quartzite, and somewhat rusty muscovite-biotite schist. The first two lithologies quite clearly represent felsic meta-volcanics, and in the quartz-plagioclase-biotite granulite and gneiss are numerous elongated blocks or lenses of light and dark granulites suggestive of agglomeratic character.

Note the fine drag fold in the garnet-rich quartzite on the island closer to Lookout Point, indicating a minor syncline to the southeast. A similar dark gray garnetiferous quartzite is exposed south of the fishing wharf on the east side of the cove, and probably marks the other limb of the syncline.

In the granulites on Lookout Point, note the laminated boudins, well-developed in the rocks east of the rusty schist.

The units here are correlated with the Cushing metavolcanics as mapped by Bodine (see Trip F, this Conference).

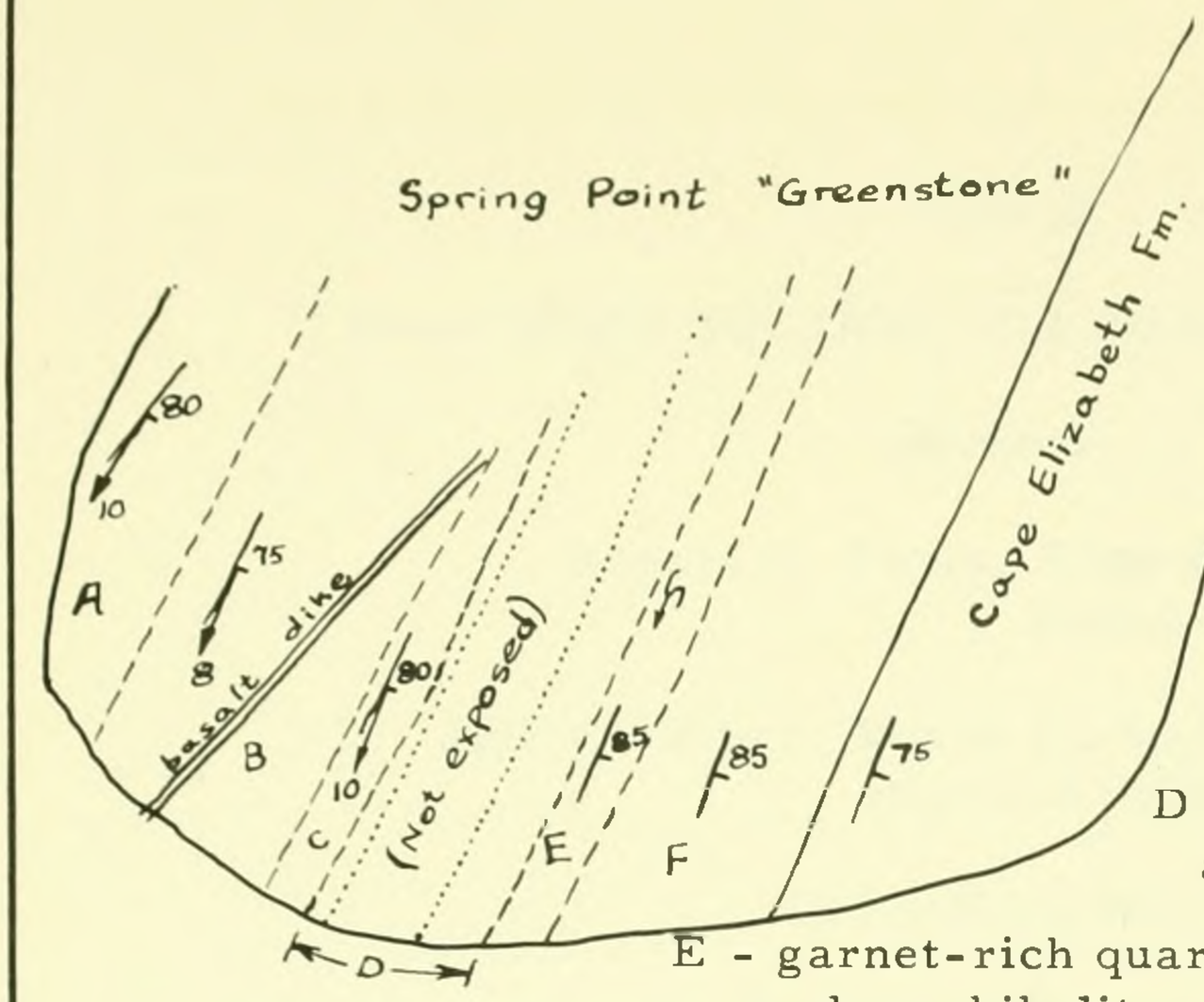
Turn around and return to Route 123.

50.9 Left turn onto Route 123.

68.1 Left onto College Road.

68.3 Right onto Campus Drive through east gate.

68.5 Front of Cleaveland Hall. END OF TRIP.



SPRING POINT GREENSTONE

A - mostly feldspathic quartzite and granulite

B - feldspathic quartzite and granulite with increasing garnetiferous amphibolite to east.

C - thin-bedded amphibolite ± chlorite, biotite, garnet.

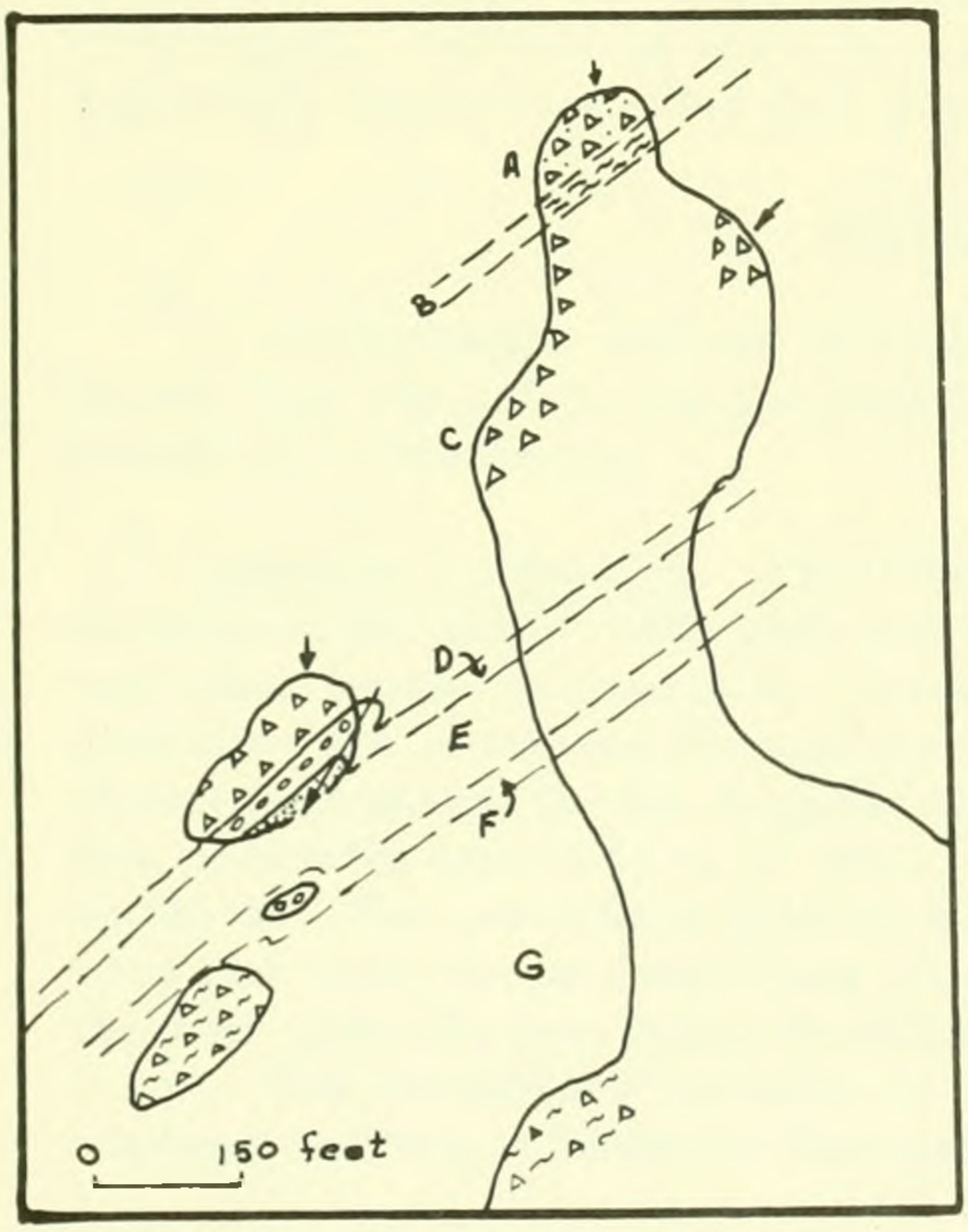
D - medium greenish gray chlorite-actinolite schist.

E - garnet-rich quartz-plagioclase-biotite granulite and amphibolite.

F - thin-bedded amphibolite with biotite and garnet.

CAPE ELIZABETH FORMATION - thin-bedded two mica schist and micaceous quartzite with garnet and chlorite porphyroblasts.

Figure 3. Detailed geologic map for Stop 2, Bailey Island, Maine



↘ Areas where rock appears quite agglomeratic.

G Feebly bedded qtz-plag-musc schist.

F Garnet-rich biotite quartzite.

E Qtz-bi-gar-musc granulite.

D Garnet-rich biotite quartzite.

C Weakly-bedded qtz-plag-bi gneiss

B Rusty qtz-musc-bi-graph schist.

A Blastoporphyritic plag-qtz-bi gneiss

Figure 4. Detailed geologic map of the Lookout Point area, Harpswell Neck, Maine (Stop 9).