

Molluscan Paleontology of Fiddlers Bluff, Washington

by

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Undergraduate Research

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ABSTRACT

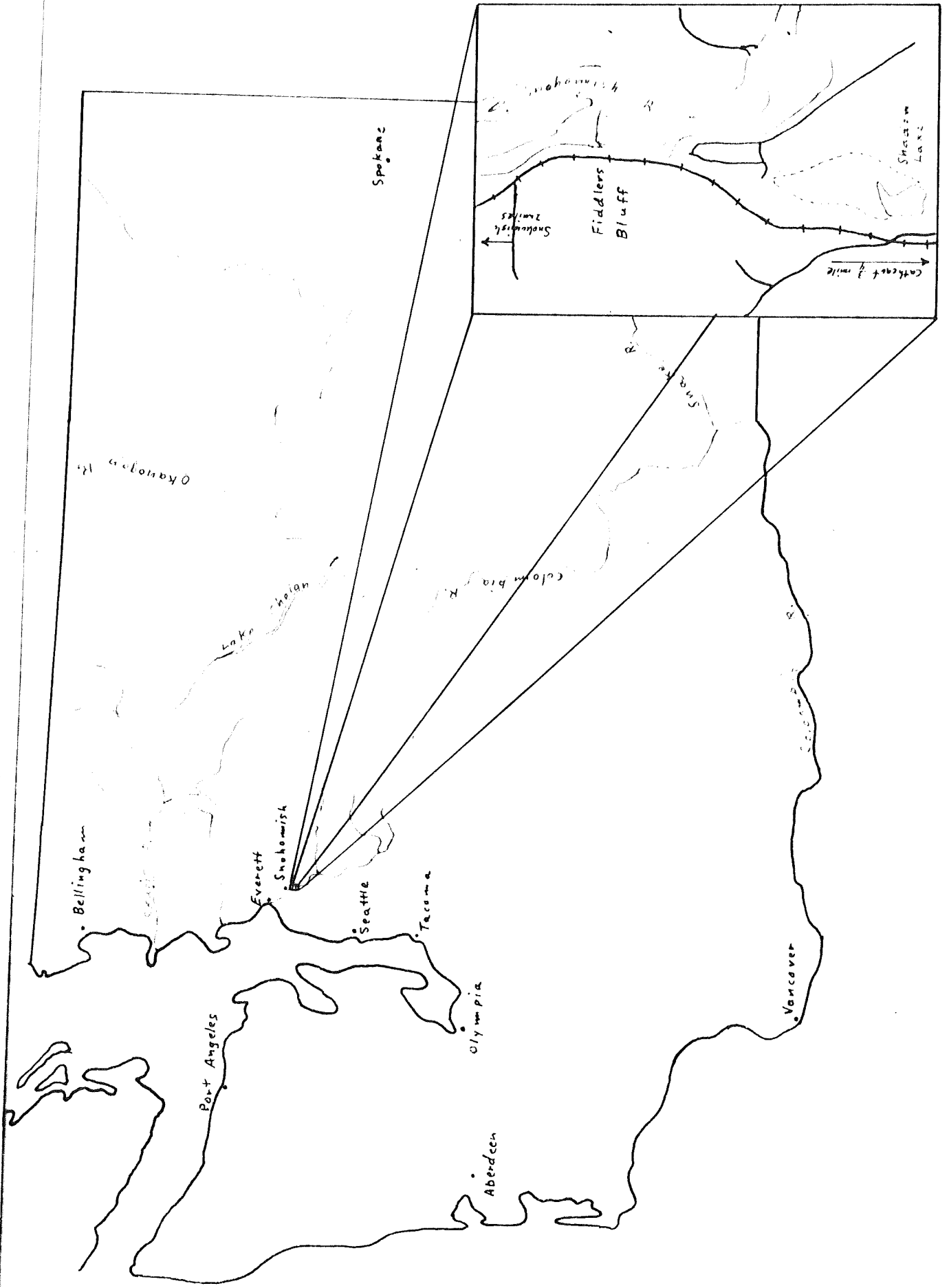
Fiddlers Bluff, which is approximately 2.5 miles south of Snohomish and 1 mile north of Cathcart Washington on the west side of the Snohomish river, is a middle to upper Oligocene marine section with a stratigraphic thickness of approximately 420 feet. The sediments are gray jointed silty sandstones with occasional grit to pebble conglomerate layers, weathering to a brown spheroidal unit. The fossil assemblage which is mainly well preserved pelecypods have specimens that occur in both the Lincoln and Blakeley formations.

INTRODUCTION

This paper is the result of a special paleontological field problem under Dr. V. S. Mallory of the Department of Geology at the University of Washington. The area, an Oligocene exposure known as Fiddlers Bluff, is approximately one mile in extent along the west side of the Snohomish river three miles south of the city of Snohomish Washington.

The purpose of the project was to give the writer experience in molluscan paleontology along with field work. This entailed collecting fossils, allocating them horizontally, and classifying them. The stratigraphic section was measured but without a top or bottom. Further stratigraphic work may turn up a base. A correlation was also made with other Oligocene outcrops in and around Seattle, most of which belong to the Blakeley formation. The field work was done on weekends throughout winter quarter 1957 when weather permitted. Fossil specimens were identified the same quarter.

The writer is indebted to Dr. V. S. Mallory for making the project possible and in addition for aid in the field work, checking identified specimens, and helpful criticisms in preparing the manuscript. The writer also appreciates the help of two fellow students, Mr. Richard C. Allison for occasional field assistance, and Mr. Richard E. Thoms for help in measuring the stratigraphic section.



Index Map

HISTORY OF PREVIOUS WORK

Previous work in the area was done by Charles E. Weaver, former paleontologist at the University of Washington. At this time he called these sediments the Clallam formation probably because of similarity of some fossil specimens to those of the Olympic peninsula. He subsequently changed this as designated on several geologic maps he published on Washington. There is a brief summary of the area in "The Tertiary Stratigraphy of Western Washington and Northeastern Oregon" by Charles E. Weaver.

NATURE OF THE OUTCROP

At the time Weaver worked in this area, prior to 1912, the railroad was probably 20 or 30 feet downslope from the present grade. The old tressel is still standing in places, and the old grade although overgrown is visible. Exposures, along this old grade, have slumped badly and vegetative cover is considerable. Most of the work was therefore done along the present railroad cut, where outcrops are better. During the progress of field work for this report new slides have taken place improving some of the outcrops. A talus of weathered material with a few small trees and grass cover the lower portion of most of the outcrops. During the wet part of the year there are several water trickles that drop over the outcrop. Brush is stacked against the outcrop in the southern one third of the area making it difficult to get at the exposures.

Due to the massive jointed character of the sediment, good attitudes



Railroad fill across semicircular depression



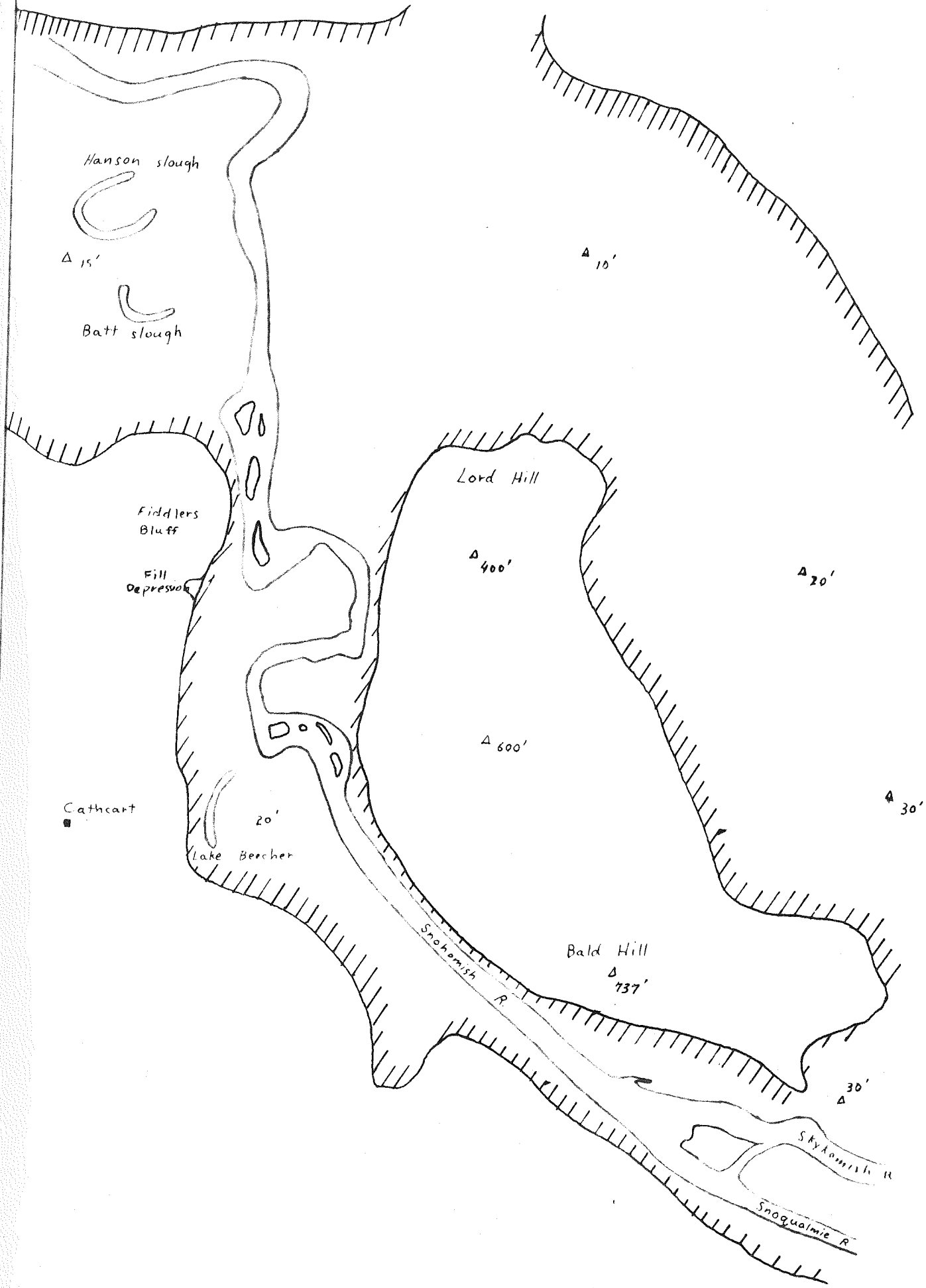
Dead trees and talus slope covering outcrop

cannot be taken in many places, although slides have helped considerably by exposing fresher rock. The stratigraphy is complicated by weathering features. Brown to buff spheroids up to 5 feet in the longest dimension are very common. They are associated with either sand or siltstone and quite often have irregular joints filled with an earthy material. It appears that they result from the weathering of gray indurated massive jointed silty sandstone. In places weathering produces an apparent fissility that is parallel to the ground surface rather than the bedding.

The fossils, which are mainly pelecypods, are in general, very well preserved. Most of the well preserved specimens come from a gray massive jointed siltstone. Very little preparation is needed since they break out of the matrix along joint planes. Specimens from the weathered spheroids are iron stained and as a rule not as well preserved.

PHYSIOGRAPHIC STATEMENT

The Snohomish river valley in this area is approximately one mile wide with a grade of $\frac{1}{2}$ foot per mile (refer to map on next page). The river meanders across the full width of the valley in which there are numerous small islands and sand bars. Many abandoned meander loops are preserved either as marshes, such as the Hanson Slough one mile south of Snohomish, or as small lakes such as Lake Beacher east of Cathcart. There is a similar valley on the east side of Bald Hill and Lord Hill which was cut either by the Snohomish or the Skykomish rivers. The Skykomish joins the Snoqualmie river, forming the Snohomish river, just south of Bald Hill. The Skykomish river may have joined the Snoqualmie river farther downstream in which case the valley east of



Bald Hill would have been cut by the Skykomish river. The other possibility is that the Snoqualmie river may have flowed in the other valley. The area inbetween was left as an isolated area varying from 400 to 737 feet in a valley of 5 to 10 feet above sea level. Just north of Fiddlers Bluff the river crosses the valley which is $2\frac{1}{2}$ miles wide and flows in a westernly direction. From this discussion it appears that the stage of development of the Snohomish river is late mature.

There is a small semicircular depression with a rolling slope 50 feet above the valley floor, which is crossed by the railroad, just south of Fiddlers Bluff. Throughout the rest of the report this feature will be referred to as the fill depression. It is possible that this feature may have been cut by the river during meandering although it appears too small in relation to other established meanders on the map. The underlying geological structure is synclinal. Patches of bedrock have been found which indicate that it is not a stream fill.

On the west side of the river the topography is gentle and rolling in places dissected by gulleys. It is typical of glacially smoothed hills. At the railroad cuts there is very little glacial debris and in places is lacking. On the east side of the river the bluff is more abrupt, although exposures are fewer due to the lack of highway or railroad cuts. This area also appears to have heavier glacial cover.

Locality Map from U.S.G.S. topographic maps of the Snohomish and
Maltby quadrangles enlarged 4 times. scale 1 in. equals 400 feet.

8

W.A. 243

W.A. 247

W.A. 246

W.A. 243

W.A. 242

W.A. 241

W.A. 240

W.A. 244

W.A. 245

W.A. 249

W.A. 250

W.A. 238

Fiddlers Bluff

20

5

200

100

10

W.A. 237

W.A. 236

10

20

Locality Map

LOCALITY DESCRIPTIONS

W.A. 236

Outcrop on the west side of the Northern Pacific Railroad cut approximately 3 miles south of Snohomish and 1 mile north of Cathcart, Snohomish County Washington, on the west side of the Snohomish river. Center portion SW¹, Sec. 31, T.28 N., R.6 E. Approximately 175 feet south of a railroad fill 300 feet long across a semicircular depression off the river bluff, and 110 feet south of locality W.A. 237. Outcrop slumped and grown over in places. Gray to green indurated poorly sorted and rounded medium grain sandstone dipping 8°N. containing a bed of Nytilus snohomishensis and Solen sp. approximately 6 feet above a grit to pebble conglomerate 4 feet thick. A considerable amount of carbonaceous material associated with the fossil layer.

W.A. 237

(For general location see W. A. 236). Approximately 110 feet north of locality W.A. 236, and 65 feet south of a railroad fill 300 feet long across a semicircular depression. Outcrop partly covered by slump and vegetation. A weathered buff coarse to medium grained poorly sorted and rounded sandstone highly jointed and iron stained, approximately 5 feet above a pebble conglomerate 15 feet thick striking N33°E and dipping 32°NW. Fossils in rather poor condition, iron stained and lacking shell material.

W.A. 238

Outcrop on the east side of the Northern Pacific Railroad cut approximately 2.5 miles south of Snohomish and 1.5 miles north of Cathcart, Snohomish county Washington, on the west side of the

Snohomish river, SE $\frac{1}{4}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 31, T.28N., R.6E. Approximately 377 feet south of locality W.A. 239, and approximately 225 feet north of the south end of the outcrop, and midway from either end of a rectangular shaped island near the west side of the Snohomish river. In a weathered buff to brown poorly sorted, jointed spheroidal coarse grained siltstone. Spheroids 2 to 3 feet long and 6 to 8 inches wide. The unit strikes N45°E and dips 23°NW. Locality known as Fiddlers Bluff.

W.A. 239

Outcrop on the east side of the Northern Pacific Railroad cut 2.5 miles south of Snohomish and 1.5 miles north of Cathcart, Snohomish County Washington, on the west side of the Snohomish river. E $\frac{1}{8}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 31, T.28N., T.6E. Approximately 29 feet south of the northern tip of a rectangular shaped island near the west side of the Snohomish river, 493 feet south of the northern end of the outcrop, 212 feet south of locality W.A. 246. A gray indurated massive jointed siltstone with irregular shaped concretions and a white flakey skum in some joints that has apparently slide off the outcrop intact and maybe replaced in the section. Fossils are well preserved. Locality known as Fiddlers Bluff.

W.A. 240

(For general location and rock description see locality W.A. 239)
Locality 20 feet north of locality W.A. 239 in the same slump block.

W.A. 241

(For general location and rock description see locality W.A. 239)
Locality 12 feet north of locality W.A. 240 in the same slump block.

W.A. 242

(For general location and rock description see locality W.A. 239)

Locality 17 feet north of locality W. A. 241 in the same slump block.

W.A. 243

(For general location and rock description see locality W.A. 239)

Float collected from slump block.

W.A. 244

(For general location see W.A. 239). Outcrop on the west side of the railroad track, approximately 49 feet south of the northern tip of a rectangular shaped island near the west side of the Snohomish river, 493 feet south of the northern end of the outcrop, and 232 feet south of locality W.A. 246. A gray indurated massive jointed siltstone with round concretions and a concretionary type of weathering, approximately 1 to 2 feet below a more fissile brown iron stained weathered layer grading into soil. Fossils mainly well preserved pelecypods. Some concretions contain fossils. Locality known as Fiddlers Bluff.

W.A. 245

(For general location and rock description see locality W.A. 244).

Locality approximately 20 feet south of locality W.A. 244 in the same siltstone unit.

W.A. 246

Outcrop on the west side of the Northern Pacific Railroad cut 2.5 miles south of Snohomish and 1.5 miles north of Cathcart, Snohomish County Washington, on the west side of the Snohomish river. NE $\frac{1}{4}$, NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 31, T.28N., R.6E. Approximately 261 feet south of the north end of the outcrop, 232 feet north of locality W.A. 244, and 183 feet

north of the northern end of a rectangular shaped island near the west side of the Snohomish river. A massive indurated gray to green poorly sorted and rounded, micaceous fine grain sandstone. Numerous fossil fragments and carbonaceous material, contains iron stained joints and weathers to a brown to buff spheroidal unit. Outcrop intermittent due to slump and vegetative cover. Dominant fossils are Lucina acutilineata. Macrocallista pittsburgensis commonly occurs in concretions. Locality known as Fiddlers Bluff.

W.A. 247

(For general location and rock description see locality W. A. 246). Locality approximately 180 feet south of the northern end of the outcrop, 81 feet north of locality W.A. 246, and 264 feet north of the northern end of a rectangular shaped island near the west side of the Snohomish river. Macrocallista pittsburgensis commonly occurs in concretions 2 to 3 feet above an indurated siltstone band 2 feet thick striking N52°E and dipping 37' NW. Locality known as Fiddlers Bluff.

W.A. 248

(For general location see locality W.A. 246). Locality directly across the track from locality W.A. 247, approximately 180 feet from the north end of the outcrop. A weathered buff to brown medium to fine grain sandstone with fairly well rounded poorly sorted iron stained quartz grains. Rather large oval spheroids 4 to 5 feet in the longest dimension, weathering into smaller spheroids (spheroidal weathering). Some carbonaceous twigs are associated with the fossils. Fresh rock is a gray to green sandstone. Locality known as Fiddlers Bluff.

W.A. 249

(For general location see locality W. A. 239). Collecting locality approximately 240 feet south of locality W.A. 239 on the east side of the railroad track. Lithology consists of a weathered brown to buff spheroidal and fissile sandstone. The fossils are quite well preserved.

W.A. 250

(For general location and rock description see locality W.A. 249). Collecting locality 14 feet south of locality W.A. 249 and 3 feet lower in the section.



Mytilus snohomishensis locality

W.A. 236

SYSTEMATIC PALEONTOLOGY

Abbreviations

Stewart, 1930	Acad. of Nat'l. Sci. of Phil. Spec. Pub. No. 3, 1930
Tegland, 1933	Univ. of Calif. Pub. Bull. Dept. Geol. Sci. Vol. 23, 1933
Schenck, 1936	Geol. Soc. of America Spec. Papers No. 4, 1936
Weaver, 1942	Univ. of Wash. Pub. Geol. Vol. 5, 1942
Durham, 1944	Univ. of Calif. Pub. Bull. Dept. Geol. Sci., 1944
Museum	Univ. of Wash. Paleontological Museum of Dept. of Geology

Family LIMOPSIDAE

Genus LimopsisLimopsis carmanahensis? Clark, 1925

Comment: Plate 13, figs. 12 and 14, in Weaver 1942, are similar in outline. The specimens, however lack shell material. Museum specimen 13020 seems incorrectly identified.

Specimen no: W.A. 237 13729

Geologic occurrence: Blakeley formation, Alki Point
locality A 50.

Type locality: Three miles west of Caramanah Point,
Vancouver Island, Canada.

Family LUCINIDAE

Genus LucinaLucina acutilineata Conrad, 1894Lucina acutilineata Conrad, Weaver 1942, p. 143, pl. 34, figs. 8, 11, 16.

Comment: Most specimens are well preserved, and appear conspecific with the reference cited, and Museum specimens nos. 13055, and 13349. In some specimens the beaks are more curved towards the anterior.

Specimen nos: W.A. 240 13744, and W.A. 246 13784

Geologic occurrence: Blakeley formation, Alki Point A 50.

Astoria formation, ten miles northwest of Pysht
locality no. W 491

Lincoln formation; Porter Bluffs W 53, and the

Type Lincoln formation near Galvin Wash. W 54.

Type locality: City of Astoria Ore. middle Miocene

Lucina hannibali (Clark), 1925Phacoides (Lucinoma) hannibali Clark, Tegland 1933, p. 115, pl. 8, figs.

5 to 13.

Lucina hannibali (Clark), Weaver 1942, p. 144, pl. 34, figs. 9, 10,

12, and 18.

Comment: General outline more asymmetric than Lucina acutilineata. Beaks point more strongly towards the anterior.

Specimen nos: W.A. 239 13738, and W.A. 240 13745

Geologic occurrence: Blakeley formation; Restoration Point UW 13, and Alki Point A 50.

Lucina sp.

Specimen nos: W.A. 237 13730, W.A. 243 13763, W.A. 245 13775, and W.A. 249 13793

?Lucina sp.

Specimen nos: W.A. 240 13746, and W.A. 249 13792

Family MYTILACEA

Genus Mytilus

Mytilus snohomishensis Weaver, 1912

Mytilus snohomishensis Weaver, Weaver 1942, p. 102, pl. 25, fig. 12; pl. 26, fig. 6.

Comment: Several specimens matched the plaster cast of the holotype no. 49 P. in the museum perfectly except my specimens are slightly smaller.

Specimen nos: W.A. 236 13723, W.A. 237 13731, and W.A. 250 13796. Specimens 13723, and 13731 must be topotypical from Weavers locality U. W. 228.

Geologic occurrence: Blakeley formation, north side of Restoration Point UW 13. Fiddlers Bluff UW 228.

Type locality: Fiddlers Bluff, 3 miles south of Snohomish Washington.

Family NUCULIDAE

Genus Acila

Acila (Truncacila) shumardi (Dall), 1909

Nucula (Acila) shumardi Dall, Teglund 1933, Pl. 5, fig. 10.

Acila (Truncacila) shumardi (Dall), Schenck 1936, p. 64, pl. 4, figs.

5, 6, 7, and 9; pl. 6, figs. 1 to 11; Weaver 1942, p. 25,
pl. 7, figs. 5, 6, 7, and 11; pl. 8, figs. 2, and 5.

Comment: Little shell material and exterior ornamentation
remain, but otherwise cited references and
museum specimens from Fiddlers Bluff seem very
close.

Specimen no: W.A. 245 13774

Geologic occurrence: Astoria formation, at Slip Point
Washington, W 490

Blakeley formation, Georgetown (behind old Brewery)
Seattle Wash. W 51.

Type Lincoln formation near Galvin Wash. W 54. .

Type locality: Pittsburg Bluffs, Columbia Co. Ore UW 476.

Acila (Truncacila) shumardi (Dall) ?

Comment: Posterior end is compressed although the
anterior end and ornamentation match quite well
with museum specimens from Fiddlers Bluff. W.A.
228.

Specimen no: W.A. 240 13743.

Genus NuculanaNuculana washingtonensis (Weaver), 1916

Leda washingtonensis Weaver, Tegland 1933, p. 108, pl. 5, fig. 19.

Nuculana washingtonensis (Weaver), Weaver 1942, P. 38, pl. 8, figs. 18, 20, and 26.

Comment: Specimens nos. 13752, and 13768 appear to be conspecific with museum specimens from Fiddlers Bluff, UW 228.

Specimen nos: W.A. 240 13747, and W.A. 241 13752.

Geologic occurrence: Blakeley formation, Behind the old brewery in Georgetown, Seattle Wash. W 51.

Type Lincoln formation W 54, and the Porter member W 53.

Eocene (Cowlitz) Duwamish Wash. A 56.

Type locality: Type Lincoln near Galvin Wash.

Nuculana washingtonensis ?

Specimen no: W.A. 244 13768

Nuculana sp.

Specimen no: W.A. 249 13795, and W.A. 250 13797

Genus YoldiaYoldia sammamishensis Weaver ?

Comment: (Weaver 1942, p. 48, pl. 9, fig. 3.). Beak more accentuated in the posterior dorsal portion, and growth lines not as even or regularly spaced as in cited reference. No

specimens in the museum available for
comparison.

Specimen nos: W.A. 236 13726, and W.A. 237 13733.

Family SAXICAVIDAE

Genus Panopea

Panopea snohomishensis Clark, 1925

Panopea snohomishensis Clark, Weaver 1942, p. 261, pl. 59, fig. 3, 19.

Specimen no: W.A. 239 13740 This specimen must be
topotypical from Weavers locality UW 12.

Geologic occurrence: Locality known as Fiddlers Bluff
one mile north of Cathcart Wash.

?Panopea snohomishensis Weaver

Specimen no: W. A. 242 13755

Family SOLENIDAE

Genus Solen

Solen sp.

Comment: Specimens only fragments, therefore a specific
identification is impossible.

Specimen nos: W.A. 236 13724, and W.A. 246 13786

?Solen sp.

Specimen no. W.A. 245 13779

Family SOLENOMYACIDAE

Genus Solemya

Solemya (Acharax) dalli Clark, 1925

Solemya (Acharax) dalli Clark, Tegland 1933, p. 103, pl. 4, figs. 1 to 10; Weaver 1942 p. 20, pl. 4, figs. 6, 7, and 8; pl. 5, figs. 4 to 8.

Comment: Compared with museum specimens from the same locality WA 12, and found to be conspecific.

Specimen nos: W.A. 240 13748, and W.A. 244 13771

Geologic occurrence: Blakeley formation; Restoration Point UW 13, and Twin Rivers Clallam county Wash. UW 220.

Type locality: $1\frac{1}{2}$ miles east of Twin Rivers Wash. Blakeley formation.

Solemya (Acharax) dalli? Clark

Specimen no. W.A. 249 13794

Solemya sp.

Specimen no: W.A. 248 13790

Genus Tagelus

?Tagelus sp.

Specimen no: W.A. 236 13725

Family TELLINIDAE

Genus Macoma

Macoma twinensis Clark, 1925

Macoma twinensis Clark, Tegland 1933, p. 120. pl. 8, figs. 14 to 17:

Weaver 1942, p. 210, pl. 49, figs. 6, 7; pl. 55, fig. 1.

Comment: Specimen quite similar to material found at the type locality, 2 miles west of Twin Rivers WA 220 04101.

Specimen no: W.A. 244 1376A

Geologic occurrence: Blakeley formation; Alki Point
A 50, Twin Rivers W.A. 220

Type locality: Two miles west of Twin Rivers in Sea
Cliff, Blakeley formation W.A. 220

Macoma twinensis Clark ?

Specimen no: W.A. 249 13791

Family TEREDIDAE

Genus Teredo

Teredo sp.

Comment: Several identified specimens in the museum
were consulted and this specimen appears to belong
to the same genus.

Specimen no: W.A. 244 13780

Family THRACIIDAE

Genus Thracia

Thracia condoni Dall, 1909

Thracia condoni Dall, Tegland 1933, pl. 8, fig. 5: Weaver 1942,
p. 119, pl. 25, fig. 10; pl. 29, fig. 15: Durham 1944,
p. 141, pl. 13, fig. 6.

Comment: Several specimens, nos. 13749, 13754, and
13781 match cited references and specimens in
the museum from Fiddlers Bluff UW 12 very well.

Specimen nos: W.A. 239, 13741, W.A. 240 13749, W.A. 241
13754, and W.A. 243 13759.

Geologic occurrence: Smiths quarry (Oligocene), Eugene
Oregon.

Type locality: Smiths quarry Eugene Oregon

?Thracia condoni Dall

Specimen nos: W.A. 238 13737, W.A. 243 13760, and W.A. 244
13766.

Family VENERIDAE

Genus Macrocallista

Macrocallista pittsburgensis (Dall), 1900

Macrocallista pittsburgensis (Dall), Tegland 1933, p. 118, pl. 8, fig. 4;
Weaver 1942, p. 175, pl. 32, fig. 7; pl. 41, figs. 4, 7,
10, and 14.

Comment: Several specimens are identical with the cited
references and museum specimens from Fiddlers
Bluff (UW 12).

Specimen nos: W.A. 239 13739, W.A. 245 13776, W.A. 246
13785, and 13789 W.A. 247.

Geologic occurrence: Type Lincoln A 54, and A 55, and the
Porter member A 53.

Type locality: Pittsburg Bluffs, Columbia County Oregon.

Genus Fitar

? Fitar Galli (Weaver)

Specimen no: W.A. 244 13765.

Geologic occurrence: Type Lincoln formation A 54, and A 55,
and the Porter member A 53.

Type locality: Galvin Station Wash. Type Lincoln formation
A 55.

Pitar (Katherinella) arnoldi (Weaver), 1916

Pitar (Katherinella) arnoldi (Weaver), Weaver 1942, p. 185, pl. 44, figs.
1 to 8, and 12; pl. 104, fig. 10.

Comment: Specimen no. 13753 is conspecific with the
description of the hypotype in the cited
reference. It is also very similar to specimens
in the museum from Fiddlers Bluff UW 12.

Specimen nos: W.A. 237 13732, W.A. 241 13753, W.A. 242
13756, W.A. 244 13769. and W.A. 245 13777.

Geologic occurrence: Blakeley formation; Alki Point A 50,
Twin Rivers Wash. W.A. 220
Lincoln formation; Porter member A 53.

Type locality: 11,000 feet southeast of Slip Point
Clallam County Washington.

Class Pelecypoda ~~Gastropoda?~~

Family NASSARIIDAE

Genus Molopophorus

Molopophorus gabbi Dall, 1909

Molopophorus gabbi Dall, Weaver 1942, p. 466, pl. 90, figs. 4, and 6:
Durham 1944, p. 170, pl. 18, fig. 5.

Comment: Specimens not too well preserved and some
compressed but are very similar to cited
references. No specimens in the museum

available for comparison.

Specimen nos: W.A. 237 13735, and W. A. 240 13750.

Geologic occurrence: Pittsburg Bluffs Ore., middle
Oligocene UW 500.

Type locality: Nehalem River at Pittsburg Columbia
County Oregon.

Molonophorus sterhensoni Dickerson ?

Comment: Specimen not too well preserved but the lower
whorl resembles Weaver 1942, pl. 90, fig. 1.
fairly well. No specimens in the museum
available for comparison.

Specimen no. W.A. 237 13736

Geologic occurrence: Gries Ranch Beds Lewis county Wash.
UW 237, middle Oligocene.

Quimper sandstone Jefferson County Wash. near
Discovery Bay A 1802.

Type locality: South bank of the Cowlitz River, Gries Ranch
Lewis County Wash.

Family FASCIOLARIIDAE

Genus Fusinus

Fusinus (Priscofusinus) chehalisensis (Weaver) ?

Comment: Specimens consists of the two lower whorls without
the siphon. Very little shell material remains..
Match Weaver 1942, pl. 92, fig. 9, and museum
specimen no. 13109 from the Lincoln formation
fairly well.

Specimen nos: W.A. 237 13734, and W.A. 242 13757

Geologic occurrence: Type Lincoln formation A 54, and A 55,
and the Porter member A 53.

Blakeley formation; Restoration Point UW 13.

Type locality: One mile north of Galvin Lewis County
Washington, Lincoln formation.

Class Scaphoda

Genus Dentalium

Dentalium sp.

Specimen nos: W.A. 244 13772, W.A. 243 13761, and W.A.

245 13782

CHECK LIST

SPECIMENS	W.A. 236	W.A. 237	W.A. 238	W.A. 239	W.A. 240	W.A. 241	W.A. 242	W.A. 243	W.A. 244	W.A. 245	W.A. 246	W.A. 247	W.A. 248	W.A. 249	W.A. 250
Pelecypods															
<u>Acila (Truncacila) shumardi</u>											C				
<u>Acila (Truncacila) shumardi?</u>					F										
<u>Limopsis carmanahensis?</u>		F													
<u>Lucina acutilineata</u> X					C							A			
<u>Lucina hannibali</u>				C	C										
<u>Lucina</u> sp.		R						R		F				F	
? <u>Lucina</u> sp.					F									F	
<u>Macoma twinensis</u>									R						
<u>Macoma twinensis?</u>															C
<u>Macrocallista pittsburgensis</u>				C							C	A	A		
<u>Mytilus snohomishensis</u>	A	F													F
<u>Nuculana washingtonensis</u>					C	C									
<u>Nuculana washingtonensis?</u>									F						
<u>Nuculana</u> sp.														F	F
<u>Panope snohomishensis</u>				F											
? <u>Panope snohomishensis</u>							F								
<u>Pitar (Katherinella) arnoldi</u>		F				C	C		C	C					
? <u>Pitar dalli</u>									R						
<u>Solen</u> sp.	F											F			
? <u>Solen</u> sp.										F					

SPECIMENS	W.A. 236	W.A. 237	W.A. 238	W.A. 239	W.A. 240	W.A. 241	W.A. 242	W.A. 243	W.A. 244	W.A. 245	W.A. 246	W.A. 247	W.A. 248	W.A. 249	W.A. 250
<u>Solemya (Acharax) dalli</u>					C				C						
<u>Solemya (Acharax) dalli?</u>														R	
<u>Solemya</u> sp.													R		
? <u>Tagelus</u> sp.	R														
<u>Teredo</u> sp.									R						
<u>Thracia condoni</u>				C	C	C		C							
? <u>Thracia condoni</u>			C					C	C						
Gastropods															
<u>Fusinus (Priscofusus) chehalisensis?</u>		R					R								
<u>Molopophorus gabbi</u>		F			R										
<u>Molopophorus stephensoni?</u>		R													
Scaphopods															
<u>Dentalium</u> sp.							F	F		F					

A Abundant

C Common

F Few

R Rare

DESCRIPTION OF ROCK UNITS

Unit I

The bottom unit is a gray to green massively jointed poorly sorted sandstone with lenticular layers of grit that weathers gray. Some joints have a white calcareous filling that is often associated with fossil occurrences. Small concretions are occasionally found. Approximately 15 feet from the top of the unit is a layer of Mytilus snohomishensis. An occasional Solen sp. was found 1 to 2 feet below the Mytilus snohomishensis layer. There is considerable amounts of carbonaceous material associated with the fossils and a piece of carbonized wood was found.

Unit II

The sediments here consist of a weathered buff to brown iron stained grit which grades up dip to a poorly sorted sandstone. It thickens from 15 feet in the south outcrop to 20 feet in the north outcrop across the fill depression. This lithology is unfossiliferous.

Unit III

Unit III consists of an intensely jointed iron stained sand and siltstone. Five feet above the base is a fossil locality. Approximately 10 feet above this the outcrop disappears as a result of the fill depression. Cuts produced by a small creek expose sediments within this fill depression. Weathering characteristics are somewhat different on the north where fissility is better developed than in the south outcrop. The northern outcrops are unfossiliferous. The correlation across this fill depression is based on unit II which is very similar lithologically on both north and south sides. The presence of unit III is based on stratigraphic position.

Unit IV

This unit consists primarily of weathered brown to buff siltstone with sandstone spheroids and occasional fissile bands. These bands and spheroids appear to be the weathering product of the massive jointed sandy siltstone. In places the fresher spheroids are almost concretionary and are composed of fine grain sandstones. No base was found due to the lack of exposures. About 20 feet from the top there is a local very hard and indurated gray jointed slightly micaceous fine grain sandstone, with spheroidal weathering that is approximately 25 feet thick. There are 3 fossil occurrences within the unit. Two of these near the top, have very well preserved fossils. A locality near the base has fewer and less well preserved fossils.

Unit V

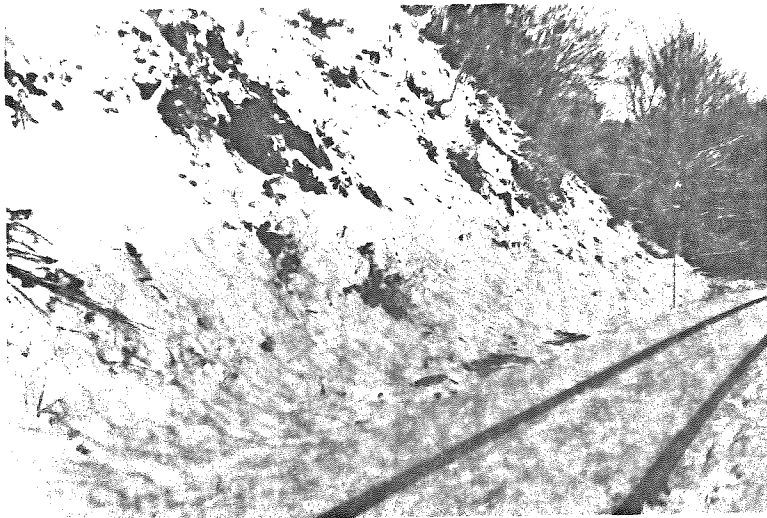
This unit is primarily a gray massive jointed siltstone that is quite sandy near the base. The contact at the top of this unit is covered by talus and brush. There are numerous concretions. 15 feet from the base are several concretions 1 to 2 feet in diameter. Throughout the unit there are many smaller concretions $\frac{1}{2}$ to 4 inches in diameter, occasionally containing shell fragments. There are also some crooked tube like objects varying from $\frac{1}{4}$ to 2 inches in diameter that are probably concretions. In some joints there is a white calcareous filling associated with fossil occurrences similar to that seen in unit I. Fossils, which are mainly pelecypods, are very well preserved. Gastropods are occasionally found. A piece of indurated wood was found which was riddled with borings of the pelecypod, Teredo.

Unit VI

Unit VI is a gray to green slightly micaceous angular medium to fine grain sandstone. Occasional flat spheroids approximately 4 to 5 feet in length and a foot in width are found. The bottom is covered by talus and the top is missing due to soil cover. This is the last exposure. North of this is the Snohomish Valley. Near the top of the unit is an indurated siltstone band approximately 2 feet thick with a fossil locality 2 to 3 feet above. Fossils occurring in this unit are very well preserved, with an abundance of Lucina acutilineata. Macrocallista pittsburgensis characteristically occurs in concretions. Carbonaceous material, possibly seaweed or wood chips occur as fossils. Directly east across the railroad track the outcrop is a weathered buff to brown spheroidal sandstone with iron stained quartz grains, and irregular joints filled with an earthy material. This indicates very strongly that this sediment along with that of unit IV is probably the same originally and that subsequent weathering has masked this identity.



The Snohomish River



Snow covered outcrop

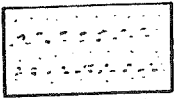


Snow covered outcrop

COLUMNAR SECTION



Brown grit to pebble cong.



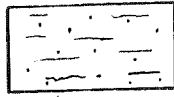
Brown sandy silt



Brown spheroidal sandy siltstone



Massive gray to green sandstone



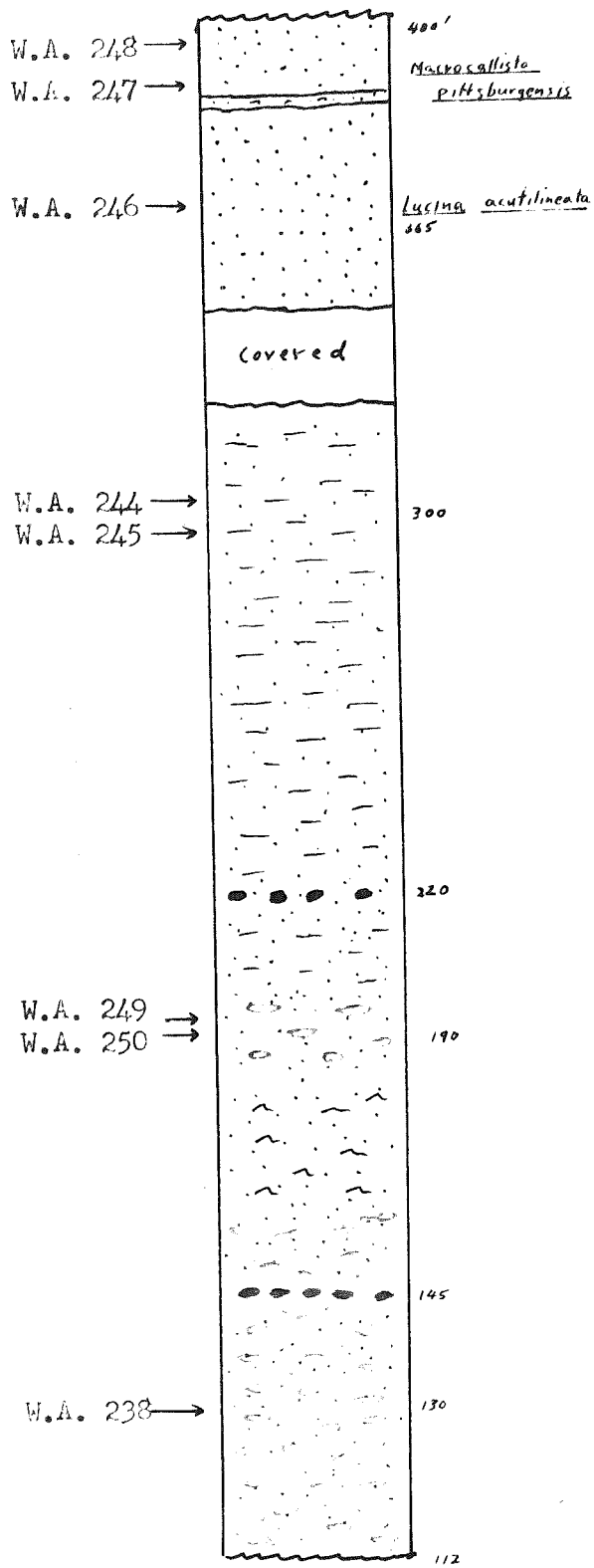
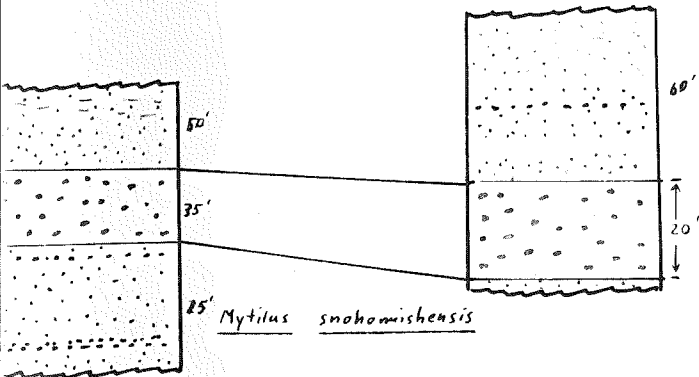
Massive gray jointed siltstone



Gray concretions



Black to gray indurated siltstone



Scale 1 inch equal 40 feet

STRUCTURE

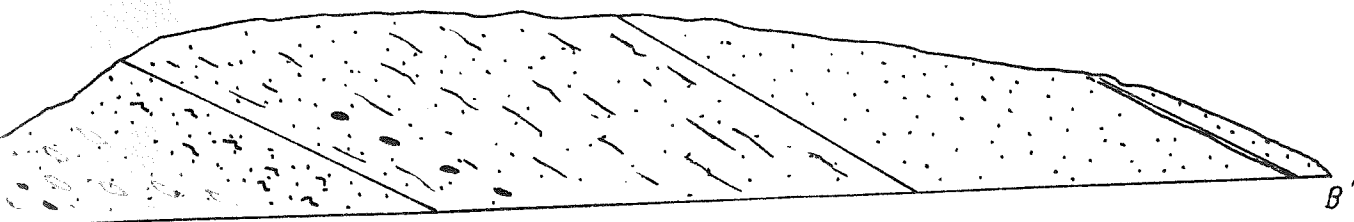
There is an anticlinal flexure in unit I. The north limb strikes N 57°E, and dips 29°NW. The southern limb dips less steeply, approximately 5° to 8° south. At this location a good strike and dip was not possible due to the massive character of the sediment.

Unit II, a grit to pebble conglomerate, and unit III, a buff to brown sandy siltstone, is present on both north and south sides of the fill depression. On the south side they strike N 33°E, and dip 32°NW. On the north side they are dipping in a northerly direction. Inbetween there is a syncline (see cross section on next page).

Units IV, V, and VI, all dip in a northwesternly direction, and steepen farther north. Unit IV strikes N 42°E, and dips 16°NW. Unit V strikes N 53°E, and dips 27°NW. Unit VI strikes N52°E, and dips 37°NW.

For locations of cross sections on next page see Locality Map on page 8.

STRUCTURE CROSS SECTIONS



Scale 1 inch approx. 100.

ECOLOGY

Lucina acutilineata, and Molopophorus gabbi, and the genera Thracia, Panope, Solemya, and Macrocallista, are all noted from water of tropical or subtropical temperatures. According to J.I. Smith, there are fewer tropical faunas that carry on into the Oligocene than in Eocene time. Tropical conditions at this time must have extended at least as far north as Puget Sound.* Many modern types make their first appearance in the Oligocene, such as the genera Panope, Lucina, Macrocallista, and Molopophorus, some of which are common in present southern California waters.

Most pelecypods are bottom dwelling shallow water marine inhabitants. The majority are either sluggish crawlers (vagil benthos), burrowers, or attached to the bottom (sessile benthos). The genera Panope, Solemya, and Solen, are mud burrowers, and the genus Teredo is a wood burrower. The presence of the genus Mytilus indicates a near shore environment, generally ranging from high tide to a few fathoms. The sediment associated with the Mytilus snohomishensis locality, grades from a poorly sorted grit to pebble conglomerate into a medium grain sandstone, which is quite typical of a beach deposit. On present day rocky beaches on Puget Sound where wave action is intense, mussels are very common. Dentalium, a burrowing scaphod, is characteristic of a marine environment ranging from low tide to considerable depths. The sediment associated with them are gray siltstones. Dentaliums in this section are quite rare and probably do not represent a deep marine environment.

Smith, J. P., Climatic Relations of The Tertiary and Quaternary Faunas of The California Region: Calif. Acad. Sci. Series 4, Vol. 9, No. 4. 1919

The conclusion, based on the discussion above, is that these sediments were deposited in tropical to subtropical waters at a depth ranging from littoral possibly to epineuritic (0 to 120 feet).

CORRELATION AND AGE

Many fossils within the assemblage range from middle to upper Oligocene, and occur in both the Lincoln and Blakeley formations. They are Acila (Truncacila) shumardi, Lucina acutilineata, Mytilus snohomishensis, Nuculana washingtonensis, Pitar (Katherinella) arnoldi, and Fusinus (Priscofusus) chehalisensis. Lucina acutilineata continues on to recent. Macoma twinensis, Solemya (Acharax) dalli, and Lucina hannibali, occur only in the Blakeley formation. Macrocallista pittsburgensis occurs in the Lincoln formation and the Duwamish outcrop, but has not been reported from the Blakeley formation. Thracia condoni and Molopophorus gabbi occurs in the middle Oligocene in Oregon. Based on the fossil assemblage, the age of this locality, Fiddlers Bluff, is middle to upper Oligocene. There is not too good a correlation between middle Oligocene fauna occurring at the lower portion of the section and upper Oligocene fauna near the top in some cases. Molopophorus gabbi occurs in both the lower and upper parts of the section. Macrocallista pittsburgensis occurs only at the top of the section. The fauna restricted in occurrence, to the Blakeley formation occur in the upper one third of the section. This indicates that Molopophorus gabbi and Macrocallista pittsburgensis which is considered middle Oligocene in age extends into the upper Oligocene.

CORRELATION OF LITHOLOGIES

The Alki Point outcrop which is part of the Blakeley formation is composed of alternating black and gray sandy shales that are very poorly indurated and weather easily. This is overlaid by a light buff siltstone member that is quite well indurated. There is a set of joints perpendicular to the bedding.

The Georgetown outcrop behind the old brewery and along side the Northern Pacific Railroad tracks is part of the Blakeley formation. It is composed of massive light and dark colored siltstones highly jointed making it difficult to distinguish bedding planes. In places there are irregular joints that are filled with an earthy material. There are also numerous small concretions. The gray to black siltstone is well indurated and has a concretionary type of weathering.

The Duwamish outcrop on Empire Way consists of alternate beds of brown, gray to black, and greenish sandy shales. This locality is questionably Eocene in age and might be part of the Cowlitz formation.

Of these three outcrops the only one that is similar to the lithology of Fiddlers Bluff is the Georgetown outcrop. The indurated gray to black jointed siltstone is very similar. At both localities these siltstones weather to brown silty sandstone with irregular joints filled with an earthy material, although the Georgetown outcrop lacks the large spheroids characteristic of Fiddlers Bluff.

SUMMARY

The age of the Fiddlers Bluff outcrop, based on the fossil assemblage, is middle to upper Eocene. These sediments were

deposited in waters of tropical or subtropical temperatures at a depth ranging from littoral to epineuritic (0 to 120 feet). The Mytilus snohomishensis locality was probably deposited on a rocky beach where wave action was intense.

The conclusions of this report are in general agreement with the previous work done by Charles E. Weaver.* Weaver, however, called these sediments middle Oligocene. Since there are numerous fossils that are restricted in occurrence to the Blakeley formation, which are also present at Fiddlers Bluff I feel that this area in part must be upper Oligocene.

Weaver found the hills on the east side of the Snohomish river composed of andesitic lavas. A quick search of the area failed to turn up any lava, however, further stratigraphic study may locate them. Some basalt float was found on the west side of the Snohomish river near the railroad tracks. It is possible that it is foreign to the area since there is a railroad fill nearby.

Weaver reported 400 feet of marine sediments. The section measured in this report is approximately 420 feet not including a small interval that was covered.

Weaver, Charles E., Tertiary Stratigraphy of Western Washington and North-western Oregon: Univ. of Wash. Pub. Geol. Vol. 4, p. 156, 1937

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