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AN ABSTRACT OF THE THESIS OF Larry R. Gaston for the
Master of Science in Geology presented November 16, 1973.

Title: Biostratigraphy of the type Yamhill Formation,
Polk County, Oregon

APPROVED BY THE MEMBERS OF THE THESIS COMMITTEE:

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Richard E. Thoms, Chairman

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One hundred and seventy-four species and varieties of fossil Foraminifera are recorded from thirty-eight localities in the Siletz River Volcanics, Yamhill and Nestucca Formations exposed along Mill and Gooseneck Creeks, in the Northern Coast Range of Oregon. *Marginulina holmesi* is described as new. The Foraminifera indicate that this sequence was deposited during late Ulatisian and Narizian time, in marine waters at bathyal or lower neritic depths, with cool surface temperatures. The

Yamhill Formation can be correlated with the Moody Shale member of the Toledo Formation and the Coaledo Formation of Oregon; the McIntosh and Aldwell Formations of Washington; and the upper part of the Canoas siltstone member of the Kreyenhagen Formation and the Alhambra Formation of California.

It is proposed to modify, in part, the type section of the Yamhill Formation. Approximately 2.2 miles of section, south of the Yamhill River Fault, are excluded from the original type area. Biostratigraphic studies of foraminiferal faunae from adjacent sides of the Yamhill River Fault suggest only minor vertical displacement.

BIOSTRATIGRAPHY OF THE TYPE YAMHILL FORMATION
POLK COUNTY, OREGON

by

LARRY R. GASTON

A thesis submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE
in
GEOLOGY

Portland State University
1974

TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH:

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November 16, 1973

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INTRODUCTION

Tertiary rocks are exposed on the eastern slope of the northern Coast Range of Oregon within the Yamhill River Basin. In Yamhill and Polk Counties, southwest of the town of Sheridan, Eocene sediments, comprising the type Yamhill Formation and a portion of the superjacent Nestucca Formation are well exposed along Mill Creek, a northward flowing tributary of the Yamhill River. Volcanic rocks of the Siletz River Volcanics underlie the Yamhill Formation and form highlands along the southern margin of the Yamhill Valley (Figure 1).

The sedimentary section along Mill Creek is generally rich in microfossils and very well exposed. During the Summer and Fall of 1972, the interval previously designated as the type section of the Yamhill Formation by Baldwin, Brown, Gair and Pease (1955) was mapped in detail. Using tape and Brunton compass, three major sections (Upper, Middle and Lower) were measured. A supplementary section was also measured along Goose-neck Creek, a tributary of Mill Creek. This supplementary section was combined with the Lower Mill Creek section.

7

Figure 1. Location Map.

Volcanic sediments exposed in the uppermost part of the Siletz River Volcanics are represented in the Upper Mill Creek Section.

During the field investigation, 110 preliminary foraminiferal samples were collected from the Yamhill Formation, three samples from the underlying Siletz River Volcanics and two samples from the overlying Nestucca Formation. Representative foraminiferal samples were selected to form a basis for biostratigraphic study.

This study was undertaken in an attempt to more clearly establish the age and depositional environment of the type Yamhill Formation. Primarily, Foraminifera from the type Yamhill Formation were collected and evaluated. To a lesser extent, the biostratigraphic relationship between the type Yamhill Formation, the subjacent Siletz River Volcanics, and the superjacent Nestucca Formation, were investigated. During this study an attempt was made to clarify some of the stratigraphic and structural problems inherent in the area. Correlations made between the type Yamhill Formation and other units are confined to the West Coast.

This paper is the culmination of my graduate studies at Portland State University. Special thanks are due to Professor Richard E. Thoms, whose advice

and knowledge contributed greatly in both the field work and writing phases of this paper. Other members of the Earth Sciences Department, whose help and support is gratefully acknowledged, include Dr. R. O. Van Atta and Dr. P. E. Hammond. I want to thank Professor V. S. Mallory, whose encouragement made my graduate studies a reality. In addition, I owe thanks to Charlene Close and Chris Nastrom, who quickly and thoroughly picked several samples when time was critical. Finally, I want to thank my wife, Edna, whose patience and encouragement made this study possible. Without her help in all aspects of its preparation, the paper would never have been completed.

GEOLOGY

Introduction

The sequence of rocks comprising the type Yamhill Formation and the lower part of the overlying Nestucca Formation are exposed in the southern part of the east-west trending Yamhill Valley downwarp. The underlying Siletz River Volcanics form highland areas at the outer margins of the downwarp. The Yamhill River fault, the dominant structural feature, trends approximately parallel to the Yamhill River Valley. Folds and subordinant faults associated with the major lineation dissect the area, adding complexity to the upper parts of the section.

The thickest continuous section of type Yamhill strata is exposed along Mill Creek in a syncline in the southern part of the Yamhill Valley. To the north the section is partly repeated on the north limb of an anticline, which trends approximately parallel to both the syncline and the Yamhill River fault farther to the north. Only minor faulting affects the section from the southernmost exposure of the type Yamhill to a point approximately two miles south of the Yamhill River fault. From this point to the Yamhill River fault

the section is badly disrupted because of faulting associated with the major lineation.

Siletz River Volcanics

The oldest rocks exposed along Mill Creek are the volcanic sandstones, breccias, and basalt flows of the Siletz River Volcanics. A crudely bedded sequence of greenish-gray volcanic breccias overlain by a brownish-buff colored volcanic sandstone outcrops under a bridge over Mill Creek about six-tenths of a mile south of the southern border of the Sheridan Quadrangle. Two of the breccias, one of which is in contact with the brownish-buff colored sandstone, are separated by a fault. The coarser breccia, on the southern side of the fault, grades rapidly into more typical basaltic flows which comprise most of the sequence that is almost continuously exposed south of the bridge. The total thickness of the volcanic sequence along Mill Creek is unknown and beyond the scope of this investigation. Several authors (Snively and Baldwin 1948, Baldwin 1947, Baldwin 1955) have determined the thickness in related areas to the south and west. Estimates of thickness range from about 500' in the southwest corner of the Sheridan Quadrangle to more than 10,000' in the Mary's Peak area.

Baldwin (1964) mapped the fault in the upper part of the Siletz River Volcanics along Mill Creek as a major structural feature. Although it was impossible to establish the displacement from local mapping, the presence of a highly brecciated zone associated with the fault adds support to his interpretation.

Three foraminiferal samples were collected from the finer grained breccia and volcanic sandstone. Only a few poorly preserved specimens were found in the fine-grained, buff-colored sandstone and are listed in the checklist under locality PSUA0199.

In 1955, at the time of the original mapping of the area, the contact between the Siletz River Volcanics and the overlying Yamhill Formation was exposed (Baldwin, *et al.*, 1955). Subsequently, extensive slumping of the overlying terrace materials has obscured the contact. The first outcrop of type Yamhill north of the contact is exposed approximately 140 stratigraphic feet above the volcanics.

Yamhill Formation

As a result of detailed investigation, it is proposed to modify, in part, the description of the type section of the Yamhill Formation. Revisions are

required because of the influence of structure in the northern part of the original type area and the difficulty of lithologically distinguishing between the Yamhill Formation and the superjacent Nestucca Formation.

As defined by Baldwin, *et al.* (1955), the type Yamhill Formation and superjacent Nestucca Formation are separated by the Yamhill River fault, which is the predominant northeast-southwest trending structural feature in the area. Subordinant *en echelon* faults add to the complexity of the rocks adjacent to the major structure. Along Mill Creek, in the northern part of the type area, the section is disrupted from the major fault to a point approximately 2.2 miles upstream. At this point a northeast-southwest trending fault intersects the section. Exact aerial delineation of the fault is impossible because of the extreme disruption of the incompetent mudstones and siltstones which comprise this interval. An *en echelon* relationship with the Yamhill River fault is partially supported, however, by local topographic expression. Displacements associated with the faulting are as yet unmeasured, but as evidenced by the size and

complexity of the resulting interval, they are probably large. Baldwin *et al.* (1955) speculated that the rocks north of the Yamhill River fault have been downthrown at least 1000 ft. As part of the present investigation, biostratigraphic studies of foraminiferal faunae from adjacent sides of the fault indicate only minor vertical displacement. However, because of the extreme disruption of the rocks near the fault, it is suggested that horizontal displacements may be great.

In the original description, the type Yamhill Formation was separated lithologically from the superjacent Nestucca Formation by Baldwin, *et al.* (1955) as follows:

The sedimentary rocks of the Nestucca Formation are more tuffaceous than those of the Yamhill Formation and contain less finely disseminated mica and less plant material. In places white spherical diatoms (?) are present in the Nestucca Formation. The occurrence of these white diatoms (?) has been observed by the writers only in beds of the Nestucca Formation; their presence aids in distinguishing the beds in this formation from similar lithologic units in the underlying Yamhill Formation.

Subsequent detailed investigation of the upper portion of the Yamhill Formation along Mill Creek, including the disrupted interval, and superjacent Nestucca Formation did not indicate significant interformational lithologic variation.

It was impossible, during field mapping, to separate the Yamhill and Nestucca Formations lithologically. In addition, white spherical diatoms and radiolaria were observed at several Yamhill localities, and are therefore not a good basis for distinguishing Yamhill from Nestucca.

The exclusion of the uppermost part of the previously defined type Yamhill Formation is necessary to make the unit more natural and useful. Justification for the redefinition is founded on the grounds of mappability. The inability to define, lithologically, the upper boundary of the type Yamhill Formation, and to establish the stratigraphic position of the disrupted portion excludes its usefulness as part of a rock-stratigraphic unit.

Biostratigraphic studies in the disrupted interval indicate a general repetition with rocks further to the south. Although it was impossible to establish the stratigraphic position of isolated foraminiferal samples, it was discovered that there existed a general relationship between the sequence of isolated foraminiferal faunae and a sequence of zonules established to the south.

Figure 2 TYPE YAMHILL FORMATION:
Correlation of Sections

Lower Member

The lower member of the Yamhill Formation consists of approximately 690 ft. of dark gray fossiliferous mudstones and siltstones with occasional thin beds of lime-cemented sandstone. Weathered surfaces have a reddish-brown blocky appearance.

The lower member is exposed only in the upper Mill Creek Section (Figure 2) on the southern limb of the syncline. The initial 220 ft., along Mill Creek, north of its contact with the underlying Siletz River Volcanics, is covered by alluvium. The remainder of the section, about 550 ft., is well exposed in the steep banks along the creek. Minor slumping and faulting occur throughout the member.

Near the contact with the overlying middle sandstone member, the siltstones become increasingly sandy. The contact, which is somewhat gradational, was placed just below a one foot thick bed of lime-cemented sandstone (see Figure 2). Although the contact is gradational, with respect to grain size, the rocks immediately above the concretionary layer are greenish in color, in contrast to the dark gray below.

Middle Sandstone Member

The middle sandstone member of the Yamhill Formation conformably overlies the lower member. The middle sandstone member consists of 615 ft. of massively bedded, fine to coarse-grained gray-green, greenish, and brown to buff colored sandstones. Minor concretionary layers and nodules are common throughout the member. The greenish color of the sandstone is caused by the presence of partly chloritized basaltic debris, probably derived from the underlying Siletz River Volcanics.

Variations in lithology are caused primarily by changes in grain size. The lower 100 ft. of the member is composed of fine-grained sandstone. Directly overlying the fine-grained interval, a conspicuous coarse-grained green sandstone layer approximately 8 ft. in thickness is exposed. The remainder of the member consists of generally fine-grained massively bedded sandstone, which tends to become finer-grained near the contact with the upper member. The contact with the upper member is gradational, but again the change in color, from green to gray, aids in making the distinction.

The middle sandstone member is exposed only in the upper Mill Creek section. Although a sufficient interval is exposed at the northern limb of the syncline (in the middle Mill Creek section), the middle sandstone is absent. No structural evidence to explain the absence exists. The explanation is provided by the geometry of the member. The sandstone member, over 600 ft. thick on the southern limb of the syncline, pinches out to the north in a map distance of about one mile. This interpretation is consistent with the probable configuration of the depositional basin. The thickest part of the "wedge" is nearest the volcanic highland to the south and the terminal end toward the deeper part of the basin to the north. On the north limb of the syncline, mudstones and siltstones, more indicative of deeper water, occupy the same stratigraphic position as the sandstone to the south.

Foraminifera are abundant locally, but several intervals were noted as barren.

Upper Member

The middle sandstone member is conformably overlain by a series of massively to thinly bedded dark-gray fossiliferous siltstones, mudstones and shales, which

comprise the upper member of the Yamhill Formation. This member is exposed in all three measured sections in the type area.

Approximately 160 ft. above the contact with the middle sandstone member a fossiliferous sequence of massively bedded well-indurated brownish sandstone, 35 ft. in thickness, is exposed. This conspicuous marker, which outcrops on both limbs of the syncline, marks a convenient base for both lithologic and biostratigraphic correlation. The thickness of the sandstone decreases from 35 ft. on the southern limb of the syncline to 12 ft. on the northern limb. This thinning northward, as in the case of the middle sandstone member, lends support to the idea of a depositional basin which becomes deeper northward, toward the axis of the Yamhill Valley.

PALEONTOLOGY

The Foraminifera

A total of 174 species of fossil foraminifera, representing 20 families and 65 genera, were identified from material collected from 38 localities. With the exception of the sediments associated with the Siletz River Volcanics, foraminifera are generally abundant throughout the interval. The arenaceous foraminifera, represented by 17 species, assigned to 13 genera from 7 families, are characterized by species of *Bathysiphon*, *Gaudryina*, *Cyclammina*, *Karrerella*, *Spiroplectammina*, *Haplophragmoides*, *Verneuilina*, and *Tritaxilina*.

Calcareous imperforate foraminifera, rare throughout the interval, are represented by five species from two genera of the family Miliolidae. The calcareous perforate foraminifera are dominant throughout most of the section both in numbers of species and individuals. They are most abundantly represented by the following families and genera: Lagenidae by *Robulus*, *Dentalina*, *Nodosaria*, *Marginulina* and *Lagena*; Nonionidae by *Nonion*; Heterohellicidae by *Plectofrondicularia*, *Amphimorphina* and *Nodogenerina*; Buliminidae by *Bulimina*, *Bolivina*, *Uvigerina*, *Virgulina*, and *Bifarina*;

Rotaliidae by *Valvulineria*, *Gyroldina* and *Eponides*; Cassidulinidae by *Cassidulina* and *Alabamina*; Chilostomellidae by *Allomorphina* and *Chilostomella*; and Anomalinidae by *Cibicides*, *Cibicidoides* and *Planulina*. Although the Lagenidae are by far the most diverse, the Buliminidae and Anomalinidae are commonly represented by greater numbers.

Planktonic foraminifera, present throughout the section, are represented by 13 species assigned to 6 genera from 3 families. The genera *Globogerina* and *Globorotalia* usually dominate the planktonic fauna but *Pseudohastegerrina* or *Globorotaloides* may be important locally. Usually the planktonic fauna is masked by abundant benthonics, but occasionally they are sufficiently abundant to be significant.

Foraminifera from the sediments of the Siletz River Volcanics, Yamhill Formation and Nestucca Formation are listed in alphabetical order in Figure 4.

Other Fossils

Fossil mollusks and crustaceans are common near the base of the middle sandstone member of the Yamhill Formation. Megafossil collections were not made as part of the present study. H. E. Vokes collected

and identified a fauna from this locality (Baldwin, et al., 1955). *Acila* (*Truncacila*) *decisa* (Conrad), *Nuculana* cf. *N. gabbi* (Gabb), *N. cf. N. cowlitzensis* (Weaver and Palmer), *Thracia* cf. *T. dilleri* Dall, and *Turritella uvasana stewarti* Merriam, were included in the fauna identified by Vokes. Vokes concluded " . . . that the fauna was of late Eocene age, probably early late Eocene." Schenck collected a fauna from the same locality and listed *Pitar conradi?* and *Venericardia hornii* cf. *calafia* Stewart (Schenck, 1936, p. 61). A species of *Ostrea* was noted by the author during the field work.

Ostracods occur consistently through the more clastic parts of the section and sporadically in finer-grained sediments. With the exception of one sample at the top of the middle sandstone member, they form an insignificant part of the total microfauna. No attempt has been made to identify the fauna which includes at least five species. The fauna is listed under Ostracoda in Figure 4.

Radiolaria occur in significant numbers in several parts of the section. They are listed with their relative abundance in the checklist.

[illegible]

LEGEND				Section		UPPER MILL CREEK												MID.		LOWER MILL GOOSENECK CR												"GRAB"										
Abundant	A	Few	F	Formation	TSR	YAMHILL FORMATION														TN																						
Common	C	Rare	R			PSU Collection Localities	A1999	A2000	A2001	A2002	A2003	A2004	A2005	A2006	A2007	A2008	A2009	A2010	A2011	A2012	A2013	A2014	A2015	A2016	A2017	A2018	A2019	A2020	A2021	A2022	A2023	A2024	A2025	A2026	A2027	A2028	A2029	A2030	A2031	A2032	A2033	A2034
Questionable Identification ?																																										
SPECIES																																										
<i>Cassidulina crassipunctata</i> (?) Cushman & Hobson																																										
<i>C. globosa</i> Hantken																																										
<i>Ceratobulimina alascensis</i> Cushman & Harris																																										
<i>Chilogumbelina martini</i> (Pijpers)																																										
<i>Chilosomella hadleyi</i> Keljzer																																										
<i>C. ovoidea</i> Reuss																																										
<i>Chilostomelloides cyclostoma</i> (Rzehak)																																										
<i>Cibicides cocoensis</i> (Cushman)																																										
<i>C. hodgei</i> Cushman & Schenck																																										
<i>C. laurissae</i> Mallory																																										
<i>C. lobatus</i> (d'Orbigny)																																										
<i>C. monasteri</i> Beck																																										
<i>C. natlandi olequaensis</i> Beck																																										
<i>C. pachyderma</i> (Rzehak)																																										
<i>Cibicides ocalingensis</i> (Cushman & G. D. Hanna)																																										
<i>C. venezuelanus</i> (Nuttall)																																										
<i>Cyclamina clarki</i> (G. D. Hanna)																																										
<i>C. pacifica</i> Beck																																										
<i>C. edmanioa</i> Berry																																										
<i>Dentalina approximata</i> Reuss																																										
<i>D. colei</i> Cushman & Dusenbury																																										
<i>D. communis</i> (d'Orbigny)																																										
<i>D. cf. D. communis</i> (d'Orbigny)																																										
<i>D. consobrina</i> d'Orbigny																																										
<i>D. cooperensis</i> Cushman																																										
<i>D. dusenburyi</i> Beck																																										

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Paleoecology

The principles of adaptive convergence and uniformitarianism are essential if "form and function" comparisons between fossil foraminifera and recent homeomorphs are to be of value. Recent papers published by Bandy (1956, 1960, 1961) and Bandy and Aral (1960) firmly establish this concept. These works and data on fossil communities (Natland, 1933, Norton, 1930) form the basis for environmental interpretation (i.e., depth, temperature, substrate condition) used in this paper.

Siletz River Volcanics

The meager fauna present at a single locality in the clastic sediments associated with the Siletz River Volcanics suggests an upper bathyal¹ depositional environment. *Gyroidina* and *Alabamina*, common to bathyal environments, are associated with *Vaginulinopsis* and other Lagenids which obtain an optimum at sea shelf depths.

¹Bathymetric terms used in this paper are defined as follows:

<u>Neritic</u> (continental shelf)	<u>Bathyal</u> (continental slope)	<u>Abyssal</u>
upper 0-60'	upper 600-1500'	
middle 60-300'	middle 1500-3000'	> 6000'
lower 300-600'	lower 3000-6000'	

Yamhill Formation

Six distinct faunules², and the six zonules³ which they characterize, are discernible in the type Yamhill Formation. A major downslope movement of clastic sediments is represented in both the upper and middle Mill Creek sections by a massive sandstone bed. The sandstone bed provides an excellent marker for physical correlation between sections and affords a good opportunity for their ecologic comparison. In this interval, marine deposition fluctuated between lower neritic and bathyal environments.

Faunules indicative of lower neritic bathymetric conditions, with the exception of the isolated "grab" sample (PSUA2033), are not present in rocks exposed north of the upper Mill Creek section. Rocks exposed in the lower Mill-Gooseneck Creek section were deposited in an upper to middle bathyal environment.

²C. L. and M. A. Fenton (1928, pp. 20-22), defined a faunule as ". . . an assemblage of fossil animals, associated in one or a few contiguous strata, and dominated by the representatives of one community, either an association or layer society."

³The term "zonule" was introduced by the Fentons (1928) and defined as ". . . the strata or stratum which contains a faunule, its thickness and area limited by the vertical and horizontal range of the faunule."

Bathymetric fluctuations and the environmental relationships between sections are reviewed in detail in the following discussion of individual biostratigraphic units in a sequence from oldest to youngest. The sequence of zonules is included in Figure 4.

Bulimina-Cyclammina Zonule. The lowermost Yamhill Formation is characterized by a faunule whose modern morphotype has an environmental optimum at depths corresponding to those of middle to lower bathyal. Arenaceous forms are represented by both the large and small *Cyclammina*, *Verneuilina*, and a robust *Bathysiphon*. Deep water calcareous forms are dominant and include costate *Bulimina*, papillate *Uvigerina*, *Valvulineria*, *Plectofrondicularia*, and *Allomorphina*. *Cassidulina*, indicative of both deep and cold conditions, is present in significant abundance. Planktonic foraminifera are rare and indicate a restricted connection with open sea currents.

The abundance of simple arenaceous forms, represented by *Cyclammina samanica* and *Verneuilina* sp., are indicative of poorly aerated waters of the type found in modern basins separated from the open ocean by a sill (Bandy, 1960, p. 8). This interpretation is supported by the rarity of planktonics.

The relative absence of Lagenids, accompanied by the abundance of deep water forms, especially the costate Buliminids (i.e., *Bulimina corrugata*) and papillate *Uvigerina*, indicates at least a middle bathyal environment.

Allomorphina Zonule. Contained within the mudstones and siltstones of the lower member, this faunule is indicative of a shallower water environment than its immediate predecessor. Deposition took place at depths comparable to the upper or middle continental slope. Important arenaceous forms include *Gaudryina*, the larger *Cyclamina* and *Haplophragmoides*.

Calcareous perforate forms represented by *Cibicides*, *Allomorphina*, *Amphimorphina*, *Nonion* and *Alabamina* are dominant. These forms are indicative of lower neritic to lower bathyal depths. The costate *Bulimina* and papillate *Uvigerina*, common in middle bathyal and deeper environments, are still present in significant numbers. However, the presence of these deep water forms is offset by the appearance of typically shallow water forms. These include various Lagenids, the large *Eponides*, and small, smooth *Bolivina*.

The combination of middle-lower bathyal forms and lower neritic-upper bathyal forms suggests at least middle and probably an upper bathyal depositional environment.

Planktonics continue to be rare and attest to the restriction of open sea currents.

Robulus-Gaudryina Zonule. A continuing trend toward shallower conditions is indicated by the faunule present in rocks of the uppermost part of the lower member and the majority of the middle sandstone member of the Yamhill Formation. Lower neritic to upper bathyal conditions persisted throughout this interval. Important arenaceous forms include the larger *Cyclammina* and *Gaudryina*. Floods of eurybathic *Gaudryina* attest to the increase in coarser sedimentary conditions which persisted during this time.

Costate Buliminids, *Uvigerina* and *Valvulineria*, important constituents of subjacent faunules, are absent or rare. The absence of these typically deeper water forms, in conjunction with a major influx of forms with bathymetric optima in outer shelf environments, attests to the unique character of this faunule. The Lagenids, relatively rare in subjacent faunules, reach a diversity and abundance unmatched throughout the remainder of the

interval. Considered individually, Lagenid forms are somewhat eurybathic, ranging from upper neritic to lower bathyal. A diverse fauna, however, is indicative of a lower shelf environment. Other important calcareous perforate forms compatible with an upper bathyal - lower neritic optimum include *Cibicides* and *Nonion*. More stenobathic sea shelf forms include rare *Elphidium* and the large *Eponides*, which is locally significant.

A decrease in the abundance of *Cassidulina*, represented by considerable numbers throughout the remainder of the Yamhill Formation, and the increase in Lagenid forms may indicate a local warming associated with the shallower environment.

Calcareous imperforate forms, represented by *Quinqueloculina* and *Spiroloculina* and Ostracods are locally significant. Although eurybathic, occurrence of significant numbers is an indication of shallower environments.

Planktonic foraminifera, rare in subjacent faunules, reach an abundance which signifies a broad connection with open ocean currents.

The occurrence of the pelecypod *Ostrea* in the middle sandstone member is a further indication of shallow water conditions.

Baggina-Karreriella Zonule. A return to somewhat deeper conditions is indicated by the faunule present in the uppermost part of the middle sandstone member and the siltstones of the lower parts of the superjacent upper member of the Yamhill Formation. Deposition occurred at depths corresponding to the upper and middle continental slope. The faunule is unique in containing several arenaceous forms. Important arenaceous forms restricted to the faunule include *Tritaxilina*, *Dorothia*, *Karreriella media-aguaensis*, and *Spiroplectammina directa*. Other forms locally important include *Rhabdammina* and *Gaudryina* and the large *Cyclammina*. None of these forms, with the exception of the large *Cyclammina*, are stenobathic, but do indicate the presence of a silty substrate.

Calcareous perforate forms are represented by a reoccurrence of deeper water forms. Costate Buliminids and *Valvulineria*, conspicuously absent in the subjacent faunule, reappear in significant numbers. Other deep water forms include *Alabamina*, the small *Eponides*, the robust *Baggina* and the costate *Uvigerina*. The costate *Uvigerina*, in contrast with the papillate forms of earlier faunules, have a bathymetric optimum which extends into the upper bathyal zone. Abundant *Robulus*, *Nodosaria*, *Dentalina* and *Vaginulinopsis*, in conjunction with deeper water forms are indicative of upper bathyal conditions.

The *Baggina-Karreriella* zonule can be traced laterally into rocks exposed to the north in the middle Mill Creek and lower Mill-Gooseneck Creek sections. Physical correlation between the upper and middle Mill Creek sections is accomplished by a sandstone bed, common to both, which contains faunal elements of shallow water affinity, suggestive of downslope contamination. Arenaceous and calcareous constituents of the faunule are present in rocks of both sections. However, the increased abundance of deep water forms, notably the costate Buliminid, in the middle Mill Creek section, is indicative of a northward trend toward a slightly deeper environment. This interpretation is in accord with a northward, downslope movement of clastic material. The most significant shallow water form common to the sandstone is the large *Eponides*, a form having an optimum in shelf environments (Bandy, 1960, p. 11). In addition, planktonic foraminifera, rare in the remainder of the zonule, are conspicuous in the sandy interval.

Farther to the north in rocks exposed in the lower Mill-Gooseneck Creek section, the delineation of the *Baggina-Karreriella* Zonule is more difficult. The faunule is present only in the lowermost sample (PSUA2023).

A very good faunal correlation exists between sample PSUA2023 and sample PSUA2022. Rocks immediately overlying sample PSUA2023 contain a distinct faunule, lacking the conspicuous arenaceous forms of the *Baggina-Karrerietta* faunule, and containing faunal elements indicative of deeper water conditions.

Bulimina-Bathysiphon Zonule. A faunule suggestive of middle bathyal conditions is exposed in the lower Mill-Gooseneck Creek section. The absence of the *Bulimina-Bathysiphon* zonule in the upper Mill Creek section farther to the south is consistent with the proposed configuration of the depositional basin. The abundance of robust *Bathysiphon* and the costate *Bulimina*, together with the general rarity of the Lagenids, is indicative of at least middle bathyal depths.

Planktonics occur sporadically, indicating some connection with open ocean currents.

Valvulineria-Gyroidina Zonule. The uppermost faunule of the Yamhill Formation exposed in the upper Mill and lower Mill-Gooseneck Creek sections, is suggestive of a slight shallowing with respect to the underlying faunules. The occurrence of *Valvulineria* and *Gyroidina* of the rounded edge types, *Bolivina*,

Nonionella, *Nonion*, the smooth Buliminids, and both the heavily costate and papillate Uvigerinids, suggests an upper to middle bathyal depositional environment.

Planktonics are very abundant locally and suggest good connections with open ocean currents.

Summary

The lowermost part of the type Yamhill Formation was deposited at middle to lower bathyal depths in poorly aerated water of a silled basin. A gradual shallowing occurred, reaching lower neritic conditions during the deposition of the more clastic sediments of the middle sandstone member, which were probably derived from the volcanic area to the south. Connection with open ocean currents during this time was good. In the southern part of the basin, a return to bathyal conditions followed the deposition of the middle sandstone member. In the central parts of the basin to the north, contemporaneous deposition occurred at a slightly deeper upper to middle bathyal depth. A trend toward shallower conditions and good connection with open ocean currents occurred during the deposition of the upper type Yamhill Formation.

Age and Correlation - Siletz River Volcanics

Foraminifera present in the sediments of the Siletz River Volcanics exposed along Mill Creek are indicative of an Upper Ulatisian age. The meager fauna includes *Vaginulinopsis mexicana nudocostata*, a form occurring no higher than the Upper Ulatisian and *Gyroidina orbicularis planata* and *Robulus coaledensis* which range no lower than Upper Ulatisian. The absence of younger faunal elements, common to the superjacent Yamhill Formation, adds support to this interpretation.

The fauna from the sediments of the Siletz River Volcanics is, in general, correlative with other sedimentary intervals associated with the uppermost parts of older Eocene volcanics in Oregon and Washington. *Amphistegina*, a common faunal element in most intervals occupying similar stratigraphic positions in the Northwest was not found during the present study. However, W. W. Rau (oral communication, 1973) indicated that he had observed *Amphistegina* fragments in samples collected from this part of the Mill Creek section.

Age and Correlation - Yamhill Formation

The rigorous application of Californian foraminiferal stages in the Northwest is difficult. Foraminiferal

ranges, diagnostic in California sections, may vary in northwestern sections to such an extent as to be misleading or unusable. This is due primarily to the removal of northwestern sections from stage type sections and to the influence of environmental conditions. These factors are especially apparent in the Yamhill fauna and may explain previous age determinations which are older than those presented in this study.

Several species, including *Amphimorphina californica*, *Angulogerina wilcoxensis*, and *Nodosaria latejugata*, which range no higher than Mallory's Upper Ulatisian (Mallory, 1959) in California, extend into younger rocks in the Yamhill Formation. An extreme example is provided by the occurrence of *Amphimorphina californica*. *Amphimorphina californica*, restricted to the Upper Ulatisian zone which bears its name in California, occurs in considerable abundance in Yamhill material assigned to the younger *Bulimina corrugata* zone of the Narizian stage. More striking, however, is its joint occurrence, in significant numbers, with *Amphimorphina jenkinsi*, a species which is restricted to the Upper Narizian zone of the same name! The higher range of *Nodosaria latejugata* in the Yamhill fauna is due to environmental conditions. *Nodosaria latejugata* is restricted to those intervals

on which a coarser substrate was in existence during deposition. The absence of this species in finer-grained portions of the section which intervene between the more clastic sections adds credence to this interpretation.

In addition to those species which range higher in the Yamhill material, several species, including *Cibicides hodgei*, *Planulina haydoni*, and *Uvigerinella* sp. have extended their ranges to lower horizons. *Cibicides hodgei* and *Planulina haydoni*, restricted to rocks of Upper Narizian and younger age, are found in abundance in rocks assigned to the lower Narizian. *Uvigerinella*, a genus which is recorded no lower than the Refugian stage, is found in abundance in one sample of Yamhill material which has been assigned an Upper Narizian age.

The above discussion emphasizes the importance of considering the total fauna rather than individual elements when making age evaluations. In the present study, those species mentioned above are excluded as important criteria for highly restricted age determination. However, their environmental significance is in no way lessened by the extension of the ranges.

The foraminiferal fauna of the type Yamhill Formation can best be correlated with Mallory's Narizian stage. Of the 2350 ft. of the type Yamhill, the lower 1600 ft. can be assigned to the lower Narizian *Bulimina corrugata* zone and the remaining 750 ft. to the Upper Narizian *Amphimorphina jenkinsi* zone.

The lowest exposure of the type Yamhill Formation in the type section outcrops approximately 140 ft. stratigraphically above the sediments associated with the Siletz River Volcanics. The 130 ft. of section immediately above this point, designated as the *Bulimina-Cyclammina* Zonule, contains a fauna which is well representative of Mallory's *Bulimina corrugata* zone of his Narizian stage. Foraminifera, found in abundance in this interval, which range no lower than Lower Narizian, include *Uvigerina garzaensis*, *Valvulineria jacksonensis welcomensis*, and *Virgulina bramletti*. Additional species, found in less significant numbers, include *Bolivina scabrata*, *Haplophragmoides obliquicameratus*, and *Quinqueloculina minuta*. Foraminifera which are abundant in, but not restricted to, the Narizian, include *Bulimina corrugata* and *Cassidulina globosa*.

In the upper Mill Creek section, the highest sample (PSUA2015) that contains a fauna of lower Narizian

age, is the highest sample assigned to the *Baggina-Karrerella* Zonule. At this point several species, including *Alabamina wilcoxensis californica*, *Gyroidina soldanii octocameratus*, and *Robulus pseudovortex*, which range no higher than Lower Narizian make their last appearances. Additional species, occurring in lesser numbers, which occur no higher, include *Bifarina nuttalli*, *Nodosaria deliciae* and *Robulus gyroscalprus*.

In both the upper Mill Creek and lower Mill-Gooseneck Creek sections the lowest samples, PSUA2016 and PSUA2028 respectively, which contain faunal elements of Mallory's Upper Narizian *Amphimorphina jenkinsi* zone, are the lowest samples of the *Valvulineria-Gyroidina* Zonule. The base of the Upper Narizian, in both instances, is taken to be the lowest joint occurrence of *Amphimorphina jenkinsi*, which is restricted to the Upper Narizian, and *Bulimina sculptilis*. Species which commonly occur in the Upper Narizian and are common to both sections include *Gyroidina orbicularis planata* and *Robulus welchi*. *Bulimina microcostata* and *Valvulineria tumeyensis*, also common in the Upper Narizian, are found in abundance in the *Valvulineria-Gyroidina* Zonule of the upper Mill Creek section.

A sample (PSUA2036) from north of the Yamhill River fault previously designated as part of the Nestucca Formation (Baldwin, *et al.*, 1955) contains a fauna diagnostic of an Upper Narizian age. Common species include *Amphimorphina jenkinsi* and *Valvulineria tumeyensis*.

An uncontrolled "grab" sample (PSUA2035) from the Yamhill Formation collected near the southern side of the Yamhill River fault contains a fauna that is strikingly similar to that of the beds north of the Yamhill River fault, mapped as Nestucca by Baldwin, *et al.*, 1955). An Upper Narizian age is again indicated by the abundance of *Amphimorphina jenkinsi* and *Valvulineria tumeyensis*.

The faunae contained in both of the above samples correlate well with the faunule of the *Valvulineria-Gyroidina* Zonule in the type Yamhill Formation. This close similarity of faunas of the same age and environment of deposition, aids in the understanding of the relationship between the type Yamhill, Yamhill and superjacent Nestucca Formations and adds support to the structural interpretation used in this paper.

In the study area the lithologic and biostratigraphic differences between the Yamhill Formation and superjacent Nestucca Formation are negligible. Although separated by a major structural feature, as indicated

by the disruption of the section from the Yamhill River fault to the uppermost part of the type Yamhill Formation, over two miles to the south, samples from adjacent sides of the fault contain very similar faunae. Vertical displacements associated with the Yamhill River fault, although as yet not exactly determined, were previously considered to be over 1000 ft. (Baldwin, *et al.*, 1955). This interpretation is not compatible with the biostratigraphic evidence presented in this paper. If displacements are great, as indicated by the disruption near the fault, they must be in a lateral sense. The distinction between the Yamhill Formation and Nestucca Formation in the study area may be unfounded or at best a facies relationship may exist between Yamhill and more typical Nestucca which is exposed north of the Yamhill River.

The fauna from the type Yamhill Formation correlates well with faunae described from other formations in the Northwest and California. South of the type section, near Dallas, Oregon, a good correlation exists with faunae described from rocks assigned to the Yamhill Formation (Baldwin, 1964). The faunae from the lowermost part of the Yamhill Formation in the Dallas area are somewhat older than the fauna from the type section of the Yamhill Formation.

The discrepancy indicates a slightly earlier depositional history for the area on the southern edge of the volcanics that separates the two areas. The faunae from the upper part of the Yamhill Formation in the Dallas area are of the same age as the upper part in the type section. Other formations in Oregon which are at least in part correlative with the type Yamhill Formation include the Moody Shale member of the Toledo Formation and the Coaledo.

The type Yamhill Formation correlates well with the McIntosh and Aldwell Formations of Washington. The Aldwell and McIntosh Formations, as in the case of the type Yamhill Formation, both contain the Ulatisian markers, *Amphimorphina californica* and *Nodosaria latejugata*, in association with a dominantly lower Narizian fauna. The Cowlitz Formation in southwestern Washington contains several species common to the upper type Yamhill, but because of environmental differences, a more complete correlation is lacking.

Many formations in California contain faunae which have been assigned a Narizian age. By biostratigraphic definition, all of these formations are at least in part correlative to the type Yamhill. Formations

which contain faunae which are very similar to those of the type Yamhill are the upper part of the Canoas siltstone member of the Kreyenhagen Formation (Cushman & Siegfus, 1942) and the Alhambra Formation (Smith, 1957).

SYSTEMATIC CATALOGUE

In the following systematics, the synonymy is based upon published figures and descriptions. In lieu of figured specimens, a more extensive synonymy has been attempted. Although not complete, it is hoped that it will provide ample published figures for comparison. All type and locality numbers refer to the collections of the Earth Sciences Museum at Portland State University, Portland, Oregon. Cushman's classification of Foraminifera (1948) is followed, except in the case of planktonic Foraminifera, where that of Bolli, Loeblich and Tappan (1957) has been used.

Phylum PROTOZOA

Class SARCODINA Butschli, 1882

Order FORAMINIFERA d'Orbigny, 1826

Family ASTORRHIZIDAE

Genus *Rhabdammina* M. Sars, 1869

Rhabdammina eocenica Cushman & G. D. Hanna

Rhabdammina eocenica Cushman & G. D. Hanna, 1927, p. 209, pl. 13, fig. 1; Smith, 1957, p. 148, pl. 17, fig. 4; Mallory, 1959, p. 104, pl. 1, figs. 1,2, pl. 27, fig. 1; Hornaday, 1969, p. 178, pl. 1, fig. 1; Weaver & Weaver, 1962, p. 18, pl. 1, figs. 2,3; Weaver & Molander, 1964, p. 176, pl. 1, fig. 1; Fairchild, Wesendunk & Weaver, 1969, p. 29, pl. 1, fig. 1.

Hypotype No. 00001, Loc. PSUA2013.

Family RHIZAMMINIDAE

Genus *Bathysiphon* M. Sars, 1872*Bathysiphon eocenica* Cushman & G. D. Hanna

Bathysiphon eocenica Cushman & G. D. Hanna, 1927, p. 210, pl. 13, figs. 2,3; Cushman & Siegfus, 1942, p. 400, pl. 15, fig. 1; Cushman & Simonson, 1944, p. 193, pl. 30, fig. 1; Cushman & Stone, 1947, p. 2, pl. 1, fig. 1; 1949, p. 75, pl. 13, fig. 3; Wilson, 1954, p. 131, pl. 12, fig. 2; Smith, 1957, p. 148, pl. 17, fig. 1; Mallory, 1959, p. 105, pl. 1, fig. 4; Hornaday, 1961, p. 178, pl. 1, fig. 2; Sullivan, 1962, p. 249, pl. 1, figs. 2,3; Weaver & Weaver, 1962, p. 176, pl. 1, fig. 2; Weaver & Molander, 1964, p. 176, pl. 1, fig. 2.

Bathysiphon cf. *B. eocenica* Cushman & G. D. Hanna, Cushman & McMasters, 1936, p. 508, pl. 74, fig. 1.

Hypotype No. 00002; Loc. PSUA2015.

Family LITUOLIDAE

Genus *Trochamminoides* Cushman, 1910*Trochamminoides contortus* Mallory

Trochamminoides contortus Mallory, 1959, p. 110, pl. 2, fig. 1.

Hypotype No. 00003; Loc. PSUA2024.

Genus *Haplophragmoides* Cushman, 1910*Haplophragmoides obliquicameratus* Marks

Haplophragmoides obliquicameratus Marks, 1951, p. 35, pl. 5, fig. 1.

Haplophragmoides sp. Wilson, 1954, p. 131, pl. 12, fig. 4.

Haplophragmoides cf. *H. obliquicameratus* Marks, Hornaday, 1961, p. 179, pl. 1, fig. 8; Weaver & Molander, 1964, p. 178, pl. 1, figs. 12, 13; Fairchild, Wesendunk & Weaver, 1969, p. 30, pl. 1, figs. 6, 7.

Hypotype No. 00004; Loc. PSUA2004.

Haplophragmoides (?) sp.

Hypotype No. 00005, Loc. PSUA2004.

Large, flat, coarsely agglutinated forms probably referable to this genus occur rarely in the lower and middle sandstone members of the type Yamhill Formation.

Haplophragmoides spp.

Hypotype No. 00006, and 00007, Loc. PSUA2002.

Small, highly variable forms occur in abundance sporadically throughout the type Yamhill Formation.

Genus *Ammobaculites* Cushman, 1910*Ammobaculites cubensis* Cushman & Bermudez

Ammobaculites cubensis Cushman & Bermudez, 1937, pp. 106, 107, pl. 16, figs. 2, 16, 17, 18; Sullivan, 1962, p. 252, pl. 2, figs. 4, 5.

Hypotype No. 00008, Loc. PSUA2012.

Genus *Cyclammina* H. B. Brady, 1876.*Cyclammina clarki* (G. D. Hanna)

Nonionina clarki Hanna, 1923, p. 324, pl. 59, fig. 2.

Cyclammina clarki? (Hanna) Cushman & Schenck, 1928, p. 306, pl. 42, fig. 1; Weaver & Molander, 1964, p. 178, pl. 2, fig. 2.

Cyclammina cf. *C. clarki* (Hanna) Cushman & Hobson, 1935, p. 55, pl. 18, fig. 3; Hornaday, 1961, p. 180, pl. 1, fig. 9; Wilson, 1954, p. 132, pl. 12, fig. 5; Smith, 1956, p. 87, pl. 9, fig. 5.

Cyclammina clarki (Hanna) Mallory, 1959, pp. 114, 115, pl. 27, fig. 4, pl. 39, fig. 4; Weaver & Weaver, 1962, p. 19, pl. 1, figs. 11, 12.

Hypotype No. 00009, Loc. PSUA2006.

Cyclammina pacifica Beck

Cyclammina pacifica Beck, 1943, p. 591, pl. 98, figs. 2,3;
 Detling, 1946, p. 352, pl. 46, fig. 1; Cushman, Stewart
 & Stewart, 1947, p. 74, pl. 9, figs. 1,2; Rau, 1948,
 p.157, pl. 27, figs. 7,8; 1951, p. 429, pl. 63,
 fig. 18, Hornaday, 1961, p. 180, pl. 1, fig. 11;
 Weaver & Molander, 1964, p. 178, pl. 2, fig. 2;

Hypotype No. 00010 and 00011; Loc. PSUA2003.

Cyclammina samanica Berry

Cyclammina samanica Berry, 1928, p. 393, text fig. 5;
 Cushman & Siegfus, 1942, p. 401, pl. 15, fig. 3;
 Mallory, 1959, p. 115, pl. 2, fig. 15; Hornaday,
 1961, p. 180, pl. 1, fig. 10; Weaver & Weaver, 1962,
 p. 19, pl. 1, fig. 13; Weaver & Molander, 1964,
 p. 178, pl. 2, figs. 3,4; Fairchild, Wesendunk &
 Weaver, 1969, p. 31, pl. 1, fig. 9.

Cyclammina cf. *C. samanica* Berry, Cushman & Simonson,
 1944, p. 193, pl. 30, fig. 2; Wilson, 1954, p. 132,
 pl. 12, fig. 6.

Hypotype No. 00012; Loc. PSUA2000.

Family TEXTULARIIDAE

Genus *Spiroplectammina* Cushman, 1927*Spiroplectammina directa* (Cushman & Siegfus)

Spiroplectoides directa Cushman & Siegfus, 1939, p. 26,
 pl. 6, figs. 7,8.

Bolivinopsis directa (Cushman & Siegfus) Cushman & Siegfus,
 1942, p. 409, pl. 16, figs. 27, 28.

Spiroplectammina directa (Cushman & Siegfus) Mallory,
 1959, pp. 116, 117, pl. 3, fig. 5; Fairchild, Wesendunk
 & Weaver, 1969, p. 31, pl. 1, fig. 10.

Spiroplectammina cf. *S. directa* (Cushman & Siegfus) Fair-
 child, Wesendunk & Weaver, 1969, p. 31, pl. 1, fig. 11.

Hypotype No. 00013 (microspheric individual), and
 00014 (megalospheric individual), Loc. PSUA2013.

Spiroplectamina mississippiensis (Cushman)

Textularia mississippiensis Cushman, Cushman & Applin, 1926, p. 166, pl. 6, figs. 10, 11; Cushman, 1929, p. 79, pl. 12, fig. 5; Howe & Wallace, 1932, p. 19, pl. 1, fig. 7; Cushman, 1935a, p. 7, pl. 1, figs. 3,4; Smith, 1957, p. 151, pl. 18, figs. 1,2,3.

Spiroplectamina mississippiensis (Cushman) Mallory, 1959, p. 118, pl. 39, fig. 1.

Spiroplectamina sp. Cushman & McMasters, 1936, p. 509, pl. 74, figs. 4,5.

Hypotype No. 00015; Loc. PSUA2011.

Genus *Vulvulina* d'Orbigny, 1826

Vulvulina curta Cushman & Siegfus

Vulvulina curta Cushman & Siegfus, 1935, p. 91, pl. 14, figs. 1,2; Mallory, 1959, p. 119, pl. 3, figs. 12,13; pl. 27, fig. 6; Fairchild, Wesendunk & Weaver, 1969, p. 32, pl. 2, fig. 3.

Vulvulina cf. *V. curta* Cushman & Siegfus, Weaver & Weaver, 1962, p. 20, pl. 2, fig. 3.

Hypotype No. 00016 (microspheric individual), and 00017 (megalospheric individual); Loc. PSUA2017.

Family VERNEULINIDAE

Genus *Verneuilina* d'Orbigny, 1840

Verneuilina sp. (?)

Verneuilina sp. (?) Cushman & Hobson, 1935, p. 56, pl. 8, fig. 6; Fairchild, Wesendunk & Weaver, 1969, p. 33, pl. 3, fig. 7.

Hypotype No. 00018; Loc. PSUA2000.

Genus *Gaudryina* d'Orbigny, 1839*Gaudryina* (*Pseudogaudryina*) *atlantica* (Bailey) (?)

Gaudryina atlantica (Bailey) Cushman & Barbat, 1932, p. 37,
pl. 5, fig. 14.

Gaudryina (*Pseudogaudryina*) *atlantica* (Bailey) (?) Smith,
1956, p. 88, pl. 9, fig. 2.

Hypotype No. 00019 and 00020; Loc. PSUA2012.

Family VALVULINIDAE

Genus *Dorothia* Plummer, 1931*Dorothia principensis* Cushman & Bermudez

Dorothia principensis Cushman & Bermudez, 1936, p. 57,
pl. 10, figs. 3,4; Cushman, 1937b, p. 87, pl. 9,
figs. 20, 21; Cushman & Siegfus, 1939, p. 24, pl. 6,
fig. 23; Cushman & Siegfus, 1942, p. 402, pl. 15,
fig. 9; Smith, 1957, p. 154, pl. 19, fig. 4; Mallory,
1959, p. 125, pl. 27, fig. 8; pl. 33, fig. 2; pl. 36,
fig. 3.

Hypotype No. 00021; Loc. PSUA2013.

Genus *Karreriella* Cushman, 1933*Karreriella media-aguaensis* Mallory

Karreriella media-aguaensis Mallory, 1959, p. 127, pl. 5,
figs. 5,6; Fairchild, Wesendunk & Weaver, 1969, p. 34,
pl. 4, fig. 2.

Hypotype No. 00022; Loc. PSUA2015.

Karreriella sp.

Karreriella sp. Mallory, 1959, p. 127, pl. 5, fig. 2.

Hypotype No. 00023; Loc. PSUA2010.

Genus *Tritaxilina* Cushman, 1911*Tritaxilina colei* Cushman & Siegfus

Tritaxilina colei Cushman & Siegfus, 1935, p. 92, pl. 14, figs. 5, 6; Cushman, 1937b, p. 155, pl. 18, figs. 1, 3; Kleinpell, 1938, p. 194, pl. 3, fig. 5; Cushman & Siegfus, 1942, p. 403, pl. 15, figs. 12, 13; Mallory, 1959, pp. 128, 129, pl. 27, fig. 9; Weaver & Weaver, 1962, p. 21, pl. 2, fig. 10; Rau, 1964, p. 615, pl. 5, fig. 2; Fairchild, Wesendunk & Weaver, 1969, p. 34, pl. 4, fig. 8.

Hypotype No. 00024; Loc. PSUA2013.

Family MILLIOLIDAE

Genus *Quinqueloculina* d'Orbigny, 1826*Quinqueloculina imperialis* Hanna & Hanna

Quinqueloculina imperialis Hanna & Hanna, 1924, p. 58, pl. 13, figs. 7, 8, 10; Beck, 1943, p. 592, pl. 98, figs. 9, 10; Rau, 1948, p. 159, pl. 27, figs. 12, 13, 14.

Hypotype No. 00025; Loc. PSUA2010.

Quinqueloculina minuta Beck

Quinqueloculina minuta Beck, 1943, p. 593, pl. 99, figs. 5, 6, 7; Detling, 1946, p. 352, pl. 46, fig. 4.

Hypotype No. 00026; Loc. PSUA2004.

Quinqueloculina spp.

Hypotype No. 00027; Loc. PSUA2003; Hypotype No. 00028; Loc. PSUA2004.

Rare specimens of this genus, not referable to a species, occur sporadically in the Yamhill Formation.

Genus *Spiroloculina* d'Orbigny, 1826*Spiroloculina* cf. *S. lamposa* Hussey

Spiroloculina lamposa Hussey, 1949, p. 121, pl. 26, fig. 6; Sullivan, 1962, p. 256, pl. 4, fig. 10.

Spiroloculina sp. Church, 1931, pl. A, fig. 11.

Spiroloculina (?) cf. *S. lamposa* Hussey, Smith, 1957, p. 155, pl. 19, fig. 11.

Spiroloculina cf. *S. lamposa* Hussey, Mallory, 1959, p. 131, pl. 5, fig. 13 (in part); Weaver & Weaver, 1962, p. 21, pl. 2, fig. 12.

Hypotype No. 00029; Loc. PSUA2014.

Spiroloculina wilcoxensis Cushman & Garrett

Spiroloculina wilcoxensis Cushman & Garrett, 1939, p. 78, pl. 13, figs. 5, 6; Cushman & Simonson, 1944, p. 194, pl. 30, figs. 4, 5, 6; Detling, 1946, p. 352, pl. 46, fig. 3; Hornaday, 1961, p. 181, pl. 2, fig. 3; Weaver & Molander, 1964, p. 180, pl. 3, fig. 3.

Hypotype No. 00030; Loc. PSUA2012.

Family TROCHAMMINIDAE

Genus *Trochammina* Parker & Jones, 1859*Trochammina globigeriniformis* (Parker & Jones)

Trochammina globigeriniformis (Parker & Jones), Cushman & Jarvis, 1928, p. 95, pl. 13, fig. 12; Cushman, 1947a, p. 51, pl. 15, figs. 8, 10, 11.

Trochammina cf. *T. globigeriniformis* (Parker & Jones), Smith, 1957, p. 156, pl. 19, figs. 14, 15, 16; Mallory, 1959, p. 133, pl. 5, fig. 16; Fairchild, Wesendunk & Weaver, 1969, p. 32, pl. 2, fig. 9; pl. 3, fig. 1.

Hypotype No. 00031; Loc. PSUA2005.

Family LAGENIDAE

Genus *Robulus* Montfort, 1808*Robulus alato-limbata* (Gümbel)*Cristellaria alato-limbatus* (Gümbel) Cushman & Applin, 1926, p. 171, pl. 18, fig. 8.*Robulus alato-limbatus* (Gümbel) Cushman, 1935a, p. 15, pl. 6, fig. 2; Cushman & Siegfus, 1942, p. 404, pl. 15, figs. 19, 20, 21.*Robulus alato-limbata* (Gümbel) Bandy, 1949, p. 58, pl. 8, fig. 1; Wilson, 1954, p. 133, pl. 14, fig. 3; Smith, 1957, p. 156, pl. 20, fig. 1; Mallory, 1959, p. 133, pl. 6, fig. 16; pl. 27, fig. 11; Hornaday, 1961, p. 182, pl. 2, figs. 11, 12, 13; Weaver & Weaver, 1962, p. 22, pl. 3, figs. 2, 3; Weaver & Molander, 1964, p. 180, pl. 3, fig. 6.*Robulus* cf. *R. alato-limbatus* (Gümbel) Cushman & Simonson, 1944, p. 194, pl. 30, fig. 8.*Robulus* cf. *R. alato-limbata* (Gümbel) Wilson, 1954, p. 133, pl. 14, fig. 2.*Lenticulina alato-limbata* (Gümbel) Fairchild, Wesendunk & Weaver, 1969, p. 40, pl. 5, fig. 15.

Hypotype No. 00032; Loc. PSUA2003.

Robulus arcuato-striatus carolinianus Cushman*Robulus arcuato-striatus carolinianus* Cushman, 1933, p. 4, pl. 1, fig. 9; Wilson, 1954, p. 133, pl. 13, figs. 4, 5; Mallory, 1959, pp. 134, 135; pl. 6, fig. 9; pl. 27, fig. 12; Weaver & Weaver, 1962, p. 22, pl. 3, fig. 4.*Robulus* cf. *R. arcuato-stratus carolinianus* Cushman, Cushman & Simonson, 1944, p. 194, pl. 30, fig. 10; Wilson, 1954, p. 134, pl. 13, fig. 2.*Robulus* aff. *R. arcuato-stratus carolinianus* Cushman, Smith, 1956, p. 88, pl. 10, fig. 7.

Hypotype No. 00033; Loc. PSUA2003.

Robulus articulatus texanus (Cushman & Applin)

Robulus articulata texana Cushman & Applin, 1926, p. 170, pl. 8, figs. 1, 2.

Robulus articulatus texanus (Cushman & Applin), Cushman & Dusenbury, 1934, p. 53, pl. 7, figs. 2, 3; Cushman, 1935a, p. 16, pl. 4, figs. 16, 17; Cushman & Simonson, 1944, p. 194, pl. 30, fig. 7; Cushman, Stewart & Stewart, 1947d, p. 75, pl. 9, fig. 8; Wilson, 1954, p. 134, pl. 13, fig. 6; Mallory, 1959, p. 135, pl. 6, fig. 13; Weaver & Molander, 1964, p. 180, pl. 3, fig. 7.

Robulus texanus (Cushman & Applin) Beck, 1943, p. 595, pl. 103, figs. 1, 2, 4, 5.

Lenticulina articulata texana (Cushman & Applin), Howe & Wallace, 1932, p. 31, pl. 5, figs. 1, 2; Fairchild, Wesendunk & Weaver, 1969, p. 41, pl. 5, fig. 19.

Hypotype No. 00034; Loc. PSUA2013.

Robulus cf. *R. calcar* (Linné)

Robulus cf. *R. calcar* (Linné) Rau, 1964, p. 615, pl. 5, fig. 4.

Hypotype No. 00035; Loc. PSUA2004.

Specimens from the Yamhill Formation compare well with Rau's figure of *R. cf. R. calcar* from the Twin Rivers Formation of Washington.

Robulus coaledensis Detling

Robulus coaledensis Detling, 1946, p. 353, pl. 48, fig. 1; Cushman & Stone, 1947, p. 5, pl. 1, fig. 9; Mallory, 1959, p. 136, pl. 7, fig. 11; pl. 8, fig. 8; Weaver & Molander, 1964, p. 181, pl. 4, figs. 2, 3.

Robulus sp.? Church, 1931, pl. B, figs. 7, 9.

Hypotype No. 00036; Loc. PSUA1999.

This species is represented by a single specimen from the Siletz River Volcanics.

Robulus cf. *R. cymricensis* (Tipton, Kleinpell & Weaver)

Lenticulina cymricensis Tipton, Kleinpell & Weaver, 1973, pp. 44-5, pl. 2, figs. 4, 5, 6.

Hypotype No. 00037; Loc. PSUA2016.

Specimens from the upper part of the Yamhill Formation are slightly more compressed than those figured by Tipton, *et al.* from the Temblor Formation.

Robulus deformis (Reuss)

Robulus deformis (Reuss) Weaver & Weaver, 1962, p. 22, pl. 3, figs. 6, 7; Weaver & Molander, 1964, p. 181, pl. 4, fig. 4.

Robulus cf. *R. deformis* (Reuss) Galloway & Morrey, 1929, p. 21, pl. 2, fig. 11; Mallory, 1959, p. 136, pl. 6, fig. 18.

Hypotype No. 00038; Loc. PSUA2004; Hypotype No. 00039; Loc. PSUA2011.

Robulus cf. *R. gyroscalprus* (Stache)

Robulus cf. *R. gyroscalprus* (Stache), Cushman & Siegfus, 1942, p. 405, pl. 5, fig. 24; Mallory, 1959, p. 136, pl. 8, fig. 1; Weaver & Weaver, 1962, p. 22, pl. 4, fig. 1.

Hypotype No. 00040; Loc. PSUA2004.

Robulus inornatus (d'Orbigny)

Robulina inornata d'Orbigny, 1846, p. 102, pl. 4, figs. 25, 26.

Robulus inornatus (d'Orbigny), Cushman & M. A. Hanna, 1927, p. 51, pl. 4, fig. 4; Cushman & G. D. Hanna, 1927, p. 217, pl. 14, fig. 5; Condit, 1930, p. 262, Toulmin, 1941, p. 577, pl. 78, fig. 19; Beck, 1943, p. 595, pl. 104, figs. 1, 2, 3, 4, 10, 14; Detling, 1946, p. 353, pl. 47, figs. 4, 5; Cushman, Stewart & Stewart, 1947c, p. 60, pl. 7, fig. 3; p. 97, pl. 13, fig. 2; Cushman & Stone, 1947, p. 5, pl. 1, fig. 8; Wilson, 1954, p. 134, pl. 13, fig. 6; Smith, 1956, p. 88, pl. 9, figs. 7, 8; Smith, 1957, p. 517, pl. 20, figs. 7, 8, 9, 10, 11; Mallory, 1959, p. 137, pl. 7, fig. 15; pl. 40, fig. 5; Hornaday, 1961, p. 182, pl. 2, fig. 5; Sullivan, 1962, p. 258, pl. 5, fig. 5; Weaver & Molander, 1964, p. 181, pl. 4, figs. 6, 7.

Robulus articulatus (Reuss)? Cushman & McMasters, 1936,
p. 511, pl. 74, fig. 14.

Robulus cf. *R. inornatus* (d'Orbigny) Smith, 1957, p. 158,
pl. 20, fig. 14.

Lenticulina inornata (d'Orbigny) Fairchild, Wesendunk &
Weaver, 1969, p. 42, pl. 6, fig. 1.

Hypotype No. 00041; Loc. PSUA2001; Hypotype No. 00042;
Loc. PSUA2004.

Robulus kincaidi Beck

Robulus kincaidi Beck, 1943, p. 595, pl. 102, figs. 1, 7;
Smith, 1957, p. 158, pl. 20, fig. 6; Mallory, 1959,
p. 137, pl. 6, fig. 17.

Hypotype No. 00043; Loc. PSUA2014.

Robulus limbosus hockleyensis (Cushman & Applin)

Cristellaris limbosus hockleyensis Cushman & Applin, 1926,
p. 171, pl. 8, fig. 3, 4.

Robulus limbosus hockleyensis (Cushman & Applin), Cushman
& Dunsenbury, 1934, p. 52, pl. 7, fig. 1; Cushman, 1935a,
p. 16, pl. 4, fig. 15; pl. 6, fig. 3; Cushman, 1939b,
p. 53, pl. 9, fig. 21; Cushman & Simonson, 1944, p. 194,
pl. 30, fig. 10; Smith, 1956, p. 89, pl. 10, fig. 5;
Mallory, 1959, p. 139, pl. 6, fig. 15; Weaver & Weaver,
1962, p. 23, pl. 14, fig. 5.

Robulus cf. *R. limbosus* (Cushman & Applin), Wilson, 1954,
p. 134, pl. 14, fig. 1.

Lenticulina limbosa hockleyensis (Cushman & Applin), Fair-
child, Wesendunk & Weaver, 1969, p. 42, pl. 6, fig. 2.

Hypotype No. 00044; Loc. PSUA2000.

Robulus mayi Cushman & Parker

Robulus mayi Cushman & Parker, 1931, p. 2, pl. 1, figs.
3, 4, 5; Mallory, 1959, p. 139, pl. 6, fig. 11;
Weaver & Weaver, 1962, p. 23, pl. 4, fig. 6.

Lenticulina cf. *L. mayi* (Cushman & Parker) Fairchild,
Wesendunk & Weaver, 1969, p. 42, pl. 6, figs. 7, 8.

Hypotype No. 00045; Loc. PSUA2036.

Robulus propinquus cowlitzensis Beck

Robulus propinquus cowlitzensis Beck, 1943, p. 595, pl. 104, figs. 6, 12; Weaver & Weaver, 1962, p. 23, pl. 4, fig. 7; Weaver & Molander, 1964, p. 181, pl. 4, fig. 8.

Lenticulina propinquus cowlitzensis (Beck) Fairchild, Wesendunk & Weaver, 1969, p. 42, pl. 6, fig. 9.

Hypotype No. 00046; Loc. PSUA2021.

Robulus pseudovortex Cole

Robulus pseudovortex Cole, 1927, p. 19, pl. 1, fig. 12; Cushman & McMasters, 1936, p. 510, pl. 74, fig. 12; Cushman & Siegfus, 1942, p. 404, pl. 15, fig. 23; Bandy, 1949, p. 61, pl. 8, figs. 9, 10; Cushman, Stewart & Stewart, 1949, p. 29, pl. 13, fig. 31; Smith, 1957, p. 158, pl. 20, figs. 12, 13; Mallory, 1959, p. 141, pl. 7, fig. 23; Weaver & Weaver, 1962, p. 24, pl. 4, fig. 8.

Lenticulina pseudovortex (Cole) Fairchild, Wesendunk & Weaver, 1969, p. 42, pl. 7, figs. 6, 11.

Hypotype No. 00047; Loc. PSUA2013.

Robulus terryi Coryell & Embich

Robulus terryi Coryell & Embich, 1937, p. 299, pl. 41, fig. 17.

Robulus cf. *R. terryi* Coryell & Embich, Smith, 1957, p. 159, pl. 21, fig. 1; Mallory, 1959, p. 141, pl. 6, fig. 1; Weaver & Weaver, 1962, p. 24, pl. 5, fig. 2; Weaver & Molander, 1964, p. 182, pl. 4, fig. 2.

Lenticulina cf. *L. terryi* (Coryell & Embich) Fairchild, Wesendunk & Weaver, 1969, p. 43, pl. 7, fig. 8.

Hypotype No. 00048; Loc. PSUA2013.

Robulus ulatisensis Boyd MS (in Mallory, 1959)

Robulus ulatisensis Boyd MS, Mallory, 1959, p. 142, pl. 6, fig. 10; pl. 40, fig. 4.

Hypotype No. 00049; Loc. PSUA2013.

This species is represented by one individual from locality PSUA2013.

Robulus weaveri Beck

Robulus weaveri Beck, 1943, p. 595, pl. 103, figs. 3, 8;
Mallory, 1959, p. 143, pl. 7, fig. 14; Weaver &
Weaver, 1962, p. 24, pl. 8, fig. 4.

Hypotype No. 00050; Loc. PSUA2014.

One specimen referred to this species was found at
locality PSUA2014.

Robulus welchi Church

Robulus welchi Church, 1931, p. 212, pl. C, figs. 13, 14;
1941, p. 182; Cushman & Siegfus, 1942, p. 404, pl. 15,
fig. 22; Beck, 1943, p. 596, pl. 102, figs. 4, 8;
Cushman & Simonson, 1944, p. 195, pl. 30, fig. 11;
Detling, 1946, p. 353, pl. 48, fig. 2; Cushman, Stewart
& Stewart, 1947e, p. 97, pl. 12, fig. 4; 1949, p. 130,
pl. 14, fig. 8; Smith, 1957, p. 159, pl. 21, figs. 4, 5,
6; Mallory, 1959, p. 143, pl. 7, fig. 8; Hornaday, 1961,
p. 183, pl. 3, fig. 3; Weaver & Weaver, 1962, p. 24,
pl. 5, fig. 5; Rau, 1964, p. 615, pl. 5, fig. 6; Weaver
& Molander, 1964, p. 182, pl. 5, figs. 3, 4.

Robulus aff. *R. welchi* Church, Smith, 1956, p. 89, pl. 10,
fig. 6.

Hypotype No. 00051; Loc. PSUA2032.

Robulus (?) sp. d (of Rau, 1943)

Robulus (?) sp. d, Rau, 1943, p. 596, pl. 102, figs. 5, 6.

Hypotype No. 00052; Loc. PSUA2006.

Specimens from the Yamhill Formation compare well with
those figured by Beck from the Cowlitz Formation of
Washington.

Robulus sp.

Hypotype No. 00053; Loc. PSUA2004; Hypotype No. 00054;
Loc. PSUA2006.

This species closely approximates some figured specimens
referred to *Vaginulinopsis mexicana vacavillensis* (Hanna).
In typical specimens, the sutures are raised but unlike
V. mexicana vacavillensis, are more continuous near the
umbilical region. This form may be intermediate between
a more typical *Robulus* and *Vaginulinopsis*.

Genus *Planularia* Defrance, 1824*Planularia* cf. *P. ouachitaensis*? Howe & Wallace*Planularia* cf. *P. ouachitaensis*? Howe & Wallace, Mallory, 1959, p. 147, pl. 9, fig. 6.

Hypotype No. 00055; Loc. PSUA2015.

Specimens from the Yamhill Formation are more complete than those figured by Mallory (1959).

Genus *Marginulina* d'Orbigny, 1826*Marginulina adunca* (Costa)*Pescadium aduncum* (Costa) Galloway & Morrey, 1931, p. 336, pl. 37, fig. 13.*Marginulina adunca* (Costa) Mallory, 1959, p. 148, pl. 9, figs. 11, 12; Weaver & Molander, 1964, p. 183, pl. 6, fig. 4; Fairchild, Wesendunk & Weaver, 1969, p. 44, pl. 8, fig. 1.*Marginulina* cf. *M. adunca* (Costa) Weaver & Weaver, 1962, p. 25, pl. 6, fig. 7.

Hypotype No. 00056; Loc. PSUA2015.

Marginulina eximia Neugeboren*Marginulina eximia* Neugeboren, 1851, p. 129, pl. 4, fig. 17; Cushman & Ponton, 1932, p. 54, pl. 7, fig. 8; Beck, 1943, p. 597, pl. 104, figs. 15, 16; Sullivan, 1962, p. 262, pl. 8, fig. 1; Weaver & Molander, 1964, p. 183, pl. 6, fig. 5; Fairchild, Wesendunk & Weaver, 1969, p. 44, pl. 8, fig. 4.*Marginulina eximia* Neugeboren (?) Mallory, 1959, p. 149, pl. 10, fig. 1.

Hypotype No. 00057; Loc. PSUA2006.

Marginulina holmesi Gaston n. sp.

Test large, elongate, composed of two distinct parts; early portion coiled, compressed, consisting of five to six chambers, gradually increasing in size as added; later portion rectilinear, comprised of four to five chambers, becoming increasingly more inflated; sutures distinct, slightly curved, becoming more depressed in later chambers, occasionally ornamented by one or more poorly developed, short costae at the base of the last chamber; wall finely perforate; aperture radiate at outer peripheral margin.

Holotype length 0.90 mm, breadth 0.28 mm, thickness 0.17 mm.

Holotype number 1, Locality PSUA2016.

Type locality: Locality PSUA2016, type Yamhill Formation.

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Marginulina inconspicua Hussey

Marginulina inconspicua Hussey, 1949, p. 123, pl. 26, fig. 10; Fairchild, Wesendunk & Weaver, 1969, p. 45, pl. 8, fig. 3.

Marginulina cf. *M. inconspicua* Hussey? Sullivan, 1962, p. 262, pl. 8, fig. 6.

Marginulina cf. *M. inconspicua* Hussey, Weaver & Molander, 1964, p. 183, pl. 6, fig. 6.

Hypotype No. 00058, Loc. PSUA2003.

Marginulina sischoae Mallory

Marginulina sischoae Mallory, 1959, pp. 150, 151; pl. 10, fig. 7; pl. 40, fig. 6.

Hypotype No. 00059, Loc. PSUA2013.

A single specimen was recorded from locality PSUA2013.

Marginulina subbullata Hantken

Marginulina subbullata Hantken, 1875, p. 39, pl. 4, figs. 9, 10; Cushman, 1925f, p. 62, pl. 10, fig. 3; Cole, 1927, p. 14, pl. 5, fig. 10; Cushman & Hanna, 1927, p. 216, pl. 13, fig. 11; Cushman, 1929, p. 85, pl. 12, fig. 20; Cushman & Laiming, 1931, p. 99, pl. 10, fig. 8; Cushman & Parker, 1931, p. 3, pl. 1, fig. 7; Cushman & Ponton, 1932, p. 53, pl. 7, fig. 7; Cushman, 1939a, p. 9, figs. 30, 31; Cushman, Stewart & Stewart, 1949, p. 131, pl. 14, fig. 10; Mallory, 1959, p. 151, pl. 9, figs. 13, 14; Weaver & Weaver, 1962, p. 26, pl. 6, fig. 11; Weaver & Molander, 1964, p. 183, pl. 6, fig. 7.

Marginulina cf. *M. subbullata* Hantken, Beck, 1943, p. 597, pl. 104, fig. 7.

Hypotype No. 00060 and 00061; Loc. PSUA2003.

Marginulina subrecta Franke

Dentalina communis? d'Orbigny, Cushman & Schenck, 1928, p. 307, pl. 42, fig. 8.

Dentalina cooperensis Cushman, Cushman & Simonson, 1944, p. 196, pl. 31, figs. 6, 7; Wilson, 1954, p. 135, pl. 14, figs. 9, 10; Smith, 1956, p. 89, pl. 11, figs. 4, 5.

Marginulina subrecta Franke, Cushman, 1935a, p. 18, pl. 7, fig. 3.

Hypotype No. 00062; Loc. PSUA2018.

Genus *Vaginulinopsis* Sylvestri, 1904

Vaginulinopsis asperuliformis (Nuttall)

Cristellaria asperuliformis Nuttall, 1930, p. 282, pl. 23, figs. 9, 10.

Marginulina asperuliformis (Nuttall) Cushman & Siegfus, 1942, p. 408, pl. 16, figs. 18 - 29; Todd & Kniker, 1952, p. 15, pl. 2, figs. 32, 33, 34.

Vaginulinopsis asperuliformis (Nuttall) Graham & Classen, 1955, p. 17, pl. 2, figs. 46, 47, 48; Mallory, 1959, p. 155, pl. 27, fig. 20; Fairchild, Wesendunk & Weaver, 1969, p. 46, pl. 8, fig. 11.

Vaginulinopsis fragaria texasensis Smith, 1957, (NOT Cushman and Applin), p. 162, pl. 21, fig. 18.

Hypotype No. 00063 (juvenile?) and 00064; Loc. PSUA2013.

Vaginulinopsis mexicana nudicostata (Cushman & G. D. Hanna)

Cristellaria mexicana nudicostata Cushman & G. D. Hanna, 1927, p. 216, pl. 14, fig. 2.

Robulus mexicanus nudicostatus (Cushman & G. D. Hanna), Cushman & McMasters, 1936, p. 511, pl. 74, figs. 15, 16; Cushman & M. A. Hanna, 1927, p. 50, pl. 4, fig. 2.

Hemicristellaria vacavillensis (G. D. Hanna) Israelsky, 1940, p. 573, pl. 3, fig. 5.

Marginulina mexicana nudicostata (Cushman & G. D. Hanna), Cushman & Stone, 1949, p. 79, pl. 14, figs. 2, 3.

(?) *Marginulina mexicana* var. B, Laiming, 1943, p. 198, pl. 83, fig. 5.

Vaginulinopsis mexicana nudicostata (Cushman & G. D. Hanna), Smith, 1957, p. 162, pl. 22, fig. 3; Mallory, 1959, p. 157, pl. 28, fig. 1; pl. 40, figs 2, 3.

Hypotype No. 00065, Loc. PSUA1999.

A single specimen was found in the sediments associated with the Siletz River Volcanics.

Vaginulinopsis saundersi (Hanna & Hanna)

Cristellaria saundersi Hanna & Hanna, 1924, p. 61, pl. 13, figs. 5, 6, 15.

Vaginulinopsis saundersi (Hanna & Hanna) Beck, 1943, p. 598, pl. 105, figs. 1, 2, 4, 5, 10; Smith, 1957, p. 162, pl. 22, figs. 1, 2; Weaver & Molander, 1964, p. 184, pl. 6, fig. 9.

Vaginulinopsis (?) aff. *V. saundersi* (Hanna & Hanna) Smith, 1957, p. 163, pl. 22, fig. 4.

Hypotype No. 00066; Loc. PSUA2022.

Genus *Dentalina* d'Orbigny, 1826*Dentalina approximata* Reuss

Dentalina approximata Reuss, Cushman & Barksdale, 1930, p. 65, pl. 11, fig. 11; Smith, 1957, p. 164, pl. 22, fig. 5; Mallory, 1959, p. 161, pl. 12, fig. 6.

Dentalina cf. *D. approximata* Reuss, Cushman & McMasters, 1936, p. 512, pl. 75, figs. 7, 8.

Dentalina sp. Israelsky, 1940, p. 576, pl. 3, fig. 12 (not 13).

Hypotype No. 00067; Loc. PSUA2003.

Dentalina colei Cushman & Dusenbury

Vaginulina legumen elegans Cole, 1927, p. 21, pl. 3, figs. 10, 11.

Dentalina colei Cushman & Dusenbury, 1934, p. 54, pl. 7, figs. 10, 11, 12; Toulmin, 1941, p. 584, pl. 79, fig. 12; Beck, 1943, p. 598, pl. 105, fig. 18; Cushman & Todd, 1946, p. 49, pl. 8, fig. 2; Cushman, 1951, p. 19, pl. 6, figs. 8, 9, 10; Rau, 1956, p. 73, pl. 14, figs. 12, 17; Mallory, 1959, p. 162, pl. 12, fig. 9; Weaver & Molander, 1964, p. 184, pl. 6, fig. 11; Fairchild, Wesendunk & Weaver, 1969, p. 37, pl. 5, fig. 17.

Hypotype No. 00068; Loc. PSUA2003.

Dentalina communis (d'Orbigny)

Nodosaria (*Dentalina*) *communis* d'Orbigny, 1826, p. 254, no. 35; Cushman & M. A. Hanna, 1927, p. 52, pl. 4, figs. 11, 12; Cushman & G. D. Hanna, 1927, p. 214, pl. 13, fig. 10.

Dentalina communis (d'Orbigny) Beck, 1943, p. 598, pl. 104, fig. 22; Detling, 1946, p. 353, pl. 48, figs. 3, 4; Smith, 1957, p. 165, pl. 22, fig. 9; Mallory, 1959, p. 162, pl. 12, fig. 11; Weaver & Weaver, 1962, p. 26, pl. 7, fig. 6.

Dentalina cf. *D. communis* (d'Orbigny) Cushman & Parker, 1931, p. 3, pl. 1, fig. 8; Kleinpell, 1938, p. 210, pl. III, fig. 13; Cushman, Stewart & Stewart, 1949, p. 131, pl. 15, fig. 2; Wilson, 1954, p. 135, pl. 14, fig. 6; Weaver & Molander, 1964, p. 184, pl. 6, fig. 12; Fairchild, Wesendunk & Weaver, 1969, p. 38, pl. 5, fig. 3.

Dentalina communis (?) (d'Orbigny) Cushman & Schenck, 1928, p. 307, pl. 42, fig. 8; Cushman & Ponton, 1932, p. 55, pl. 7, figs. 12, 13; Cushman & McMasters, 1936, p. 511, pl. 75, fig. 6.

Dentalina sp. Israelsky, 1940, p. 576, pl. 3, fig. 13.

Nodosaria roemeri Hanna & Hanna, 1924, p. 60, pl. 13, fig. 21.

Hypotype No. 00069; Loc. PSUA2003.

Dentalina cf. *D. communis* (d'Orbigny)

Hypotype No. 00070; Loc. PSUA2003.

These specimens differ from the commonly figured *D. communis* in having chambers that are more inflated and sutures that are more oblique. The difference may be due to dimorphic variation.

Dentalina consobrina d'Orbigny

Nodosaria (Dentalina) consobrina d'Orbigny, 1846, p. 46, pl. 2, figs. 1, 2, 3; Cushman & G. D. Hanna, 1927, p. 214, pl. 13, figs. 12, 13; Cushman & M. A. Hanna, 1927, p. 52, pl. 4, figs. 7, 8.

Dentalina consobrina d'Orbigny, Cushman & Schenck, 1928, p. 308, pl. 42, figs. 9, 10, 11; Cushman, 1929, p. 86, pl. 12, figs. 27, 28, 29; Cushman & Barksdale, p. 64, pl. 11, figs. 9, 10; Kleinpell, 1938, p. 210, pl. III, figs. 12, 14, 15; pl. 17, fig. 4; Wilson, 1954, p. 135, pl. 14, fig. 7; Smith, 1957, p. 166, pl. 22, figs. 16, 17; Mallory, 1959, p. 163, pl. 12, fig. 12; pl. 41, fig. 5; Hornaday, 1961, p. 184, pl. 4, fig. 9; Sullivan, 1962, p. 263, pl. 9, figs. 2, 3.

Dentalina consobrina d'Orbigny (?) Cushman & Dusenbury, 1934, p. 55, pl. 1, figs. 13, 14, 15; Smith, 1956, p. 90, pl. 11, fig. 1.

Dentalina cf. *D. consobrina* d'Orbigny, Cushman & McMaster, 1936, p. 511, pl. 74, figs. 18, 19, 20; Cushman, 1946a, p. 69, pl. 24, figs. 23, 24, 25, 26, 27; Rau, 1956, p. 73, pl. 14, figs. 13, 14.

Nodosaria consobrina (d'Orbigny) Detling, 1946, p. 353, pl. 48, fig. 5, 6.

Hypotype No. 00071; Loc. PSUA2003.

Dentalina cooperensis Cushman

Dentalina cooperensis Cushman, 1933b, p. 8, pl. 1, fig. 17; Cushman, 1935a, p. 20, pl. 8, figs. 3, 4; Cushman & Simonson, 1944, p. 196, pl. 31, figs. 5, 6, 7; Bermudez, 1949, p. 143, pl. 9, fig. 46; Hornaday, 1961, p. 185, pl. 4, fig. 8; Weaver & Molander, 1964, p. 184, pl. 6, fig. 13; Fairchild, Wesendunk & Weaver, 1969, p. 38, pl. 5, fig. 4.

Hypotype No. 00072; Loc. PSUA2003.

Dentalina dusenburyi Beck

Dentalina capita (Boll)? Cushman & Dusenbury, 1934, p. 56, pl. 7, fig. 20.

Dentalina dusenburyi Beck, 1943, p. 599, pl. 105, figs. 20, 23; Cushman, Stewart & Stewart, 1947b, p. 76, pl. 10, figs. 1, 2, 3; Rau, 1948a, p. 167, pl. 30, fig. 24; Smith, 1956, p. 90, pl. 11, fig. 6; Mallory, 1959, p. 163, pl. 12, fig. 14; Weaver & Molander, 1964, p. 184, pl. 6, fig. 14.

Dentalina cf. *D. dusenburyi* Beck, 1943, p. 599, pl. 105, fig. 14.

Hypotype No. 00073; Loc. PSUA2014.

Dentalina jacksonensis (Cushman & Applin)

Nodosaria jacksonensis Cushman & Applin, 1926, p. 170, pl. 7, figs. 14, 15, 16; Cushman, 1927e, p. 153, pl. 24, fig. 3; Cole, 1928, p. 208, pl. 3, fig. 12.

Nodosaria cf. *N. jacksonensis* (Cushman & Applin), Cole & Ponton, 1930, p. 33, pl. 6, fig. 1.

Dentalina jacksonensis (Cushman & Applin), Cushman & Ponton, 1932, p. 55, pl. 7, figs. 10, 11; Cushman, 1935a, p. 20, pl. 8, figs. 7, 8, 9; Cushman & McMasters, 1936, p. 511, pl. 75, figs. 3, 4, 5; Coryell & Embich, 1937, p. 298, pl. 42, fig. 8; Toulmin, 1941, p. 585, pl. 79, fig. 16; Cushman & Simonson, 1944, p. 196, pl. 32, fig. 8; Rau, 1956, p. 74, pl. 14, figs. 8, 9; Mallory, 1959, p. 165, pl. 12, fig. 18.

Dentalina cf. *D. jacksonensis* Howe, 1939, p. 44, pl. 6, fig. 2.

Hypotype No. 00074; Loc. PSUA2012.

Specimens referable to this species were found only at locality PSUA2012 in the Yamhill Formation.

Dentalina jarvisi Cushman & Todd

Dentalina jarvisi Cushman & Todd, 1945, p. 22, pl. 3, fig. 22.

Hypotype No. 00075; Loc. PSUA2012.

Dentalina spinosa d'Orbigny

Dentalina spinosa d'Orbigny, Cushman, 1929, p. 86,
pl. 13, figs. 7, 8; Kleinpell, 1938, p. 215,
pl. 4, fig. 3; Smith, 1956, p. 91, pl. 10, fig. 10;
Smith, 1957, p. 165, pl. 22, fig. 10; Mallory, 1959,
p. 167, pl. 12, fig. 26.

Hypotype No. 00076; Loc. PSUA2011.

Genus *Nodosaria* Lamarck, 1812*Nodosaria arundinea* Schwager

Nodosaria arundinea Schwager, Cushman & G. D. Hanna, 1927,
p. 215, pl. 13, fig. 14; Cushman & Parker, 1931, p. 6,
pl. 1, figs. 17, 18, 19; Wilson, 1954, p. 136, pl. 14,
fig. 12; Smith, 1956, p. 91, pl. 11, fig. 8; Mallory,
1959, p. 169, pl. 13, fig. 10; pl. 28, fig. 7; pl. 41,
fig. 4; Hornaday, 1961, p. 185, pl. 4, fig. 5.

Nodosaria arundinea Schwager (?) Smith, 1957, p. 166,
pl. 22, fig. 21.

Hypotype No. 00077; Loc. PSUA2004.

Nodosaria chirana Cushman & Stone

Nodosaria chirana Cushman & Stone, 1947, p. 6, pl. 1,
figs. 18, 19, 20, 21; Cushman, Stewart & Stewart, 1949,
p. 131, pl. 15, fig. 1; Mallory, 1959, p. 170, pl. 13,
fig. 21; Hornaday, 1961, p. 185, pl. 4, fig. 7;
Weaver & Weaver, 1962, p. 27, pl. 7, fig. 13.

Hypotype No. 00078; Loc. PSUA2018.

Nodosaria clavaeformis Neugeboren

Nodosaria clavaeformis Neugeboren, Graham & Classen, 1955,
p. 15, pl. 2, fig. 32; Fairchild, Wesendunk & Weaver,
1969, p. 35, pl. 4, fig. 16.

? *Ellipsonodosaria* sp. A, Cushman & Siegfus, 1942, p. 417,
pl. 7, figs. 15, 16, 17, 18.

Hypotype No. 00079; Loc. PSUA2003.

Nodosaria deliciae Martin

Nodosaria deliciae Martin, 1943, p. 107, pl. 6, fig. 3;
Smith, 1957, p. 167, pl. 22, fig. 18; Mallory,
1959, p. 170, pl. 13, fig. 13; pl. 36, fig. 10.

Hypotype No. 00080; Loc. PSUA2014.

Nodosaria holserica Schwager

Nodosaria holserica Schwager, Galloway & Morrey, 1929, p.
17, pl. 2, fig. 4; Kleinpell, 1938, p. 218, pl. 4,
fig. 9; Smith, 1956, p. 91, pl. 10, fig. 9; Sullivan,
1962, p. 265, pl. 10, fig. 2; Fairchild, Wesendunk &
Weaver, 1969, p. 36, pl. 4, fig. 5.

Nodosaria cf. *N. holserica* Schwager, Fairchild, Wesen-
dunk & Weaver, 1969, p. 36, pl. 4, figs. 4, 11.

Nodosaria cookei Cushman, 1935a, p. 22, pl. 9, fig. 1.

Hypotype No. 00081; Loc. PSUA2003.

Nodosaria latejugata Gümbel

Nodosaria latejugata Gümbel, 1868, p. 619, pl. 1, fig.
32; Cushman & G. D. Hanna, 1927, p. 212, pl. 13,
figs. 15, 16, 17; Cushman & M. A. Hanna, 1927,
p. 52, pl. 5, figs. 1, 2, 3; Cushman & Ponton,
1932, p. 58, pl. 7, figs. 15, 16; Cushman & McMaster,
1936, p. 512, pl. 75, figs. 11, 12; Graham & Classen,
1955, p. 16, pl. 2, figs. 33, 34; Smith, 1957,
p. 167, pl. 22, fig. 23; Mallory, 1959, p. 171,
pl. 13, fig. 20; pl. 28, fig. 8; pl. 41, fig. 1;
Weaver & Weaver, 1962, p. 28, pl. 7, figs. 15, 16.

Nodosaria cf. *N. latejugata* Gümbel, Fairchild, Wesendunk
& Weaver, 1969, p. 36, pl. 4, fig. 15.

Nodosaria raphanus (Linnaeus) G. D. Hanna, 1923, p. 321,
pl. 58, fig. 1.

Hypotype No. 00082 and 00083; Loc. PSUA2003.

Nodosaria pyrula d'Orbigny

Nodosaria pyrula d'Orbigny, 1826, p. 253, no. 13;
Cushman & Schenck, 1928, p. 308, pl. 43, figs. 1, 2;
Howe, 1939, p. 48, pl. 5, fig. 16; Wilson, 1954,
p. 136, pl. 14, fig. 14; Mallory, 1959, p. 172,
pl. 13, fig. 19; pl. 41, fig. 2; Hornaday, 1961,
p. 185, pl. 4, fig. 6; Weaver & Weaver, 1962,
p. 28, pl. 7, fig. 18; Weaver & Molander, 1964,
p. 185, pl. 6, fig. 17.

Nodosaria cf. *N. pyrula* d'Orbigny, Beck, 1943, p. 599,
pl. 105, figs. 19, 21; Detling, 1946, p. 354, pl. 48,
fig. 7; Smith, 1956, p. 91, pl. 11, fig. 9;
Fairchild, Wesendunk & Weaver, 1969, p. 37, pl. 4,
fig. 12.

Hypotype No. 00084; Loc. PSUA2015.

Genus *Pseudoglandulina* Cushman, 1928

Pseudoglandulina conica (Neugeboren)

Glandulina conica Neugeboren, 1850, p. 51, pl. 1,
fig. 5.

Pseudoglandulina conica (Neugeboren), Cushman &
Barksdale, 1930, p. 65, pl. 12, figs. 1, 2, 3;
Beck, 1943, p. 599, pl. 105, fig. 12; Rau, 1956,
p. 74, pl. 15, figs. 1, 2; Smith, 1957, p. 168,
pl. 23, figs. 1, 2; Mallory, 1959, p. 173, pl. 33,
fig. 4; Weaver & Weaver, 1962, p. 28, pl. 18,
fig. 12; Weaver & Molander, 1964, p. 185, pl. 6,
fig. 18; pl. 7, fig. 1.

Nodosaria laevigata Hanna & Hanna, 1924, p. 59,
pl. 13, fig. 9.

Pseudoglandulina turbinata Detling, 1946, p. 354,
pl. 48, fig. 8 (juvenile).

Hypotype No. 00085 (microspheric individual) and
00086 (megalospheric individual); Loc. PSUA2003;
Hypotype No. 00087 (immature specimen); Loc. PSUA2004.

An ontogenetic series of *P. conica*, constructed from
Yamhill specimens, includes in the earlier stages,
forms referred to *P. turbinata* by Detling.

Pseudoglandulina ovata (Cushman & Applin)

Nodosaria (*Glandulina*) *laevigata ovata* Cushman & Applin, 1926, p. 169, pl. 17, figs. 12, 13; Cushman & G. D. Hanna, 1927, p. 215, pl. 14, fig. 1.

Glandulina laevigata ovata Cushman & Applin, Israelsky, 1940, p. 576, pl. 6, fig. 7.

Pseudoglandulina ovata (Cushman & Applin) Weaver & Molander, 1964, p. 185, pl. 7, fig. 2.

Hypotype No. 00088; Loc. PSUA2003.

Genus *Saracenaria* Defrance, 1824

Saracenaria hantkeni Cushman

Saracenaria arcuata hantkeni Cushman, 1933b, p. 4, pl. 1, figs. 11, 12.

Saracenaria hantkeni Cushman, Beck, 1943, p. 600, pl. 106, figs. 9, 12; Cushman, 1946b, p. 14, pl. 3, fig. 21; Rau, 1951, p. 435, pl. 64, fig. 6; Mallory, 1959, p. 153, pl. 27, fig. 19; Weaver & Molander, 1964, p. 185, pl. 7, fig. 3; Fairchild, Wesendunk & Weaver, 1969, p. 46, pl. 8, fig. 10.

Hypotype No. 00089; Loc. PSUA2004.

Saracenaria moresiana Howe & Wallace

Saracenaria moresiana Howe & Wallace, 1932, p. 42, pl. 2, fig. 8; Coryell & Embich, 1937, p. 295, pl. 42, fig. 3; Weaver & Weaver, 1962, p. 28, pl. 8, fig. 5; Weaver & Molander, 1964, p. 186, pl. 7, fig. 7.

Saracenaria cf. *S. moresiana* Howe & Wallace, Mallory, 1959, p. 153, pl. 11, figs. 4, 5.

Hypotype No. 00090; Loc. PSUA2014.

Genus *Lagena* Walker & Jacob, 1798*Lagena acuticosta* Reuss

Lagena acuticosta Reuss, 1861, p. 305, pl. 1, fig. 4; Cushman, 1935a, p. 23, pl. 9, figs. 5, 6; Kleinpell, 1938, p. 224, pl. VIII, fig. 13; Cushman & Siegfus, 1942, p. 409, pl. 16, fig. 24; Mallory, 1959, p. 174, pl. 14, fig. 1; pl. 28, fig. 10; pl. 41, fig. 8; Weaver & Molander, 1964, p. 186, pl. 7, fig. 10.

Lagena cf. *L. acuticosta* Reuss, Cushman & Simonson, 1944, p. 196, pl. 31, fig. 9; Wilson, 1954, p. 137, pl. 15, fig. 3; Hornaday, 1961, p. 186, pl. 4, fig. 12.

Hypotype No. 00091; Loc. PSUA2011.

Lagena costata (Williamson)

Entosolenia costata Williamson, 1858, p. 9, pl. 1, fig. 18.

Lagena costata (Williamson), Cushman, 1935a, p. 23, pl. 9, figs. 7, 8; Beck, 1943, p. 601, pl. 107, fig. 36; Smith, 1957, p. 169, pl. 23, fig. 9; Mallory, 1959, p. 175, pl. 14, fig. 3; pl. 41, fig. 7; Weaver & Molander, 1964, p. 186, pl. 7, fig. 12.

Lagena cf. *L. costata* (Williamson), Cushman, Stewart & Stewart, 1949, p. 132, pl. 14, fig. 6.

Hypotype No. 00092; Loc. PSUA2011.

Lagena hexagona (Williamson)

Entosolenia squamosa hexagona Williamson, 1848, p. 20, pl. 2, fig. 23.

Lagena hexagona (Williamson), Beck, 1943, p. 602, pl. 107, fig. 23; Cushman & Todd, 1945, p. 33, pl. 5, fig. 14; Mallory, 1959, p. 175, pl. 14, fig. 7; Sullivan, 1962, p. 267, pl. 10, fig. 9; Weaver & Molander, 1964, p. 187, pl. 7, fig. 13; Fairchild, Wesendunk & Weaver, 1969, p. 40, pl. 5, fig. 13.

Lagena hexagona (Williamson)?, Smith, 1957, p. 170, pl. 23, fig. 12.

Hypotype No. 00093; Loc. PSUA2013.

Lagena marginata Walker & Boys

Lagena marginata Walker & Boys, Brady, 1884, p. 476, pl. 59, fig. 22; Kleinpell, 1938, p. 225, pl. 10, fig. 5; Renz, 1948, p. 142, pl. 5, fig. 30; Smith, 1956, p. 92, pl. 10, fig. 1; Fairchild, Wesendunk & Weaver, 1969, p. 40, pl. 5, fig. 14.

Hypotype No. 00094; Loc. PSUA2004.

Lagena cf. *L. semistriata* Williamson

Lagena cf. *L. semistriata* Williamson, Beck, 1943, p. 602, pl. 107, fig. 32.

Hypotype No. 00095; Loc. PSUA2015.

Lagena substriata Williamson

Lagena cf. *L. substriata* Williamson, Beck, 1943, p. 602, pl. 107, fig. 30; Mallory, 1959, p. 176, pl. 14, fig. 8.

Hypotype No. 00096; Loc. PSUA2003.

Lagena vulgaris Williamson

Lagena vulgaris Williamson, Cushman, 1946a, p. 95, pl. 40, fig. 3; Mallory, 1959, p. 176, pl. 14, fig. 9; Weaver & Molander, 1964, p. 187, pl. 7, fig. 14.

Hypotype No. 00097; Loc. PSUA2003.

Family POLYMORPHINIDAE

Genus *Guttulina* d'Orbigny, 1839*Guttulina irregularis* (d'Orbigny)

Guttulina byramensis (Cushman), Cushman & Schenck, 1928, p. 309, pl. 43, figs. 6, 7, 8.

Guttulina irregularis (d'Orbigny) Cushman, 1929, p. 89, pl. 13, figs. 15, 16; Beck, 1943, p. 602, pl. 106, figs. 3, 15; Cushman & Simonson, 1944, p. 196, pl. 31, figs. 10, 11, 12; Wilson, 1954, p. 137, pl. 15, fig. 4; Mallory, 1959, p. 177, pl. 14, fig. 13.

Hypotype No. 00098; Loc. PSUA2003.

Guttulina problema d'Orbigny

Guttulina problema d'Orbigny, 1846, p. 224, pl. 12, figs. 26, 27, 28; Cushman & Schenck, 1928, p. 310, pl. 43, figs. 9, 10, 11; Cushman & Ponton, 1932, p. 61, pl. 8, figs. 3, 4; Cushman, 1935a, p. 23, pl. 9, fig. 12; Beck, 1943, p. 602, pl. 106, figs. 11, 17, 20; Detling, 1946, p. 354, pl. 48, fig. 11; Smith, 1956, p. 92, pl. 11, fig. 10.

Hypotype No. 00099; Loc. PSUA2004.

Family NONIONIDAE

Genus *Nonion* Montfort, 1808

Nonion florinense Cole

Nonion florinense Cole, 1927, p. 22, pl. 4, fig. 4; Cushman, 1939a, p. 5, pl. 1, figs. 17, 18; Cushman, Stewart & Stewart, 1949, p. 132, pl. 14, fig. 7; Fairchild, Wesendunk & Weaver, 1969, p. 71, pl. 22, fig. 1.

Hypotype No. 00100; Loc. PSUA2019.

Nonion planatum Cushman & Thomas

Nonion planatum Cushman & Thomas, 1930, p. 37, pl. 3, fig. 5; Beck, 1943, p. 603, pl. 107, figs. 12, 13; Mallory, 1959, p. 181, 182, pl. 15, fig. 2; Weaver & Weaver, 1962, p. 29, pl. 8, fig. 7.

Hypotype No. 00101; Loc. PSUA2003.

Genus *Nonionella* Cushman, 1925

Nonionella jacksonensis Cushman

Nonionella jacksonensis Cushman, Cushman, Stewart & Stewart, 1947e, p. 100, pl. 13, fig. 5.

Hypotype No. 00102; Loc. PSUA2003.

Genus *Elphidium* Montfort, 1908*Elphidium* cf. *E. californicum* Cook MS

Elphidium cf. *E. californicum* Cook MS, Sullivan, 1962, p. 268, pl. 11, fig. 13; Tipton, Kleinpell & Weaver, 1973, p. 63, pl. 11, fig. 8.

Hypotype No. 00103; Loc. PSUA2004.

Elphidium (?) sp.

Hypotype No. 00104; Loc. PSUA2006.

Rare specimens in the Yamhill material are very poorly preserved and are referred to *Elphidium* on general form.

Family HETEROHELICIDAE

Genus *Plectofrondicularia*, Liebus, 1903*Plectofrondicularia californica* Cushman & Stewart

Plectofrondicularia californica Cushman & Stewart, 1926, p. 39, pl. 6, figs. 9, 10, 11; Cushman, 1929, p. 90, pl. 13, figs. 18, 19; Kleinpell, 1938, p. 239, pl. 4, figs. 17, 19; Fairchild, Wesendunk & Weaver, 1969, p. 47, pl. 8, fig. 19; pl. 9, fig. 1.

Hypotype No. 00105; Loc. PSUA2011.

Plectofrondicularia minuta Sullivan

Plectofrondicularia minuta Mallory, 1959, p. 213, pl. 18, figs. 3, 4; Sullivan, 1962, p. 269, pl. 73, figs. 1, 2, 3, 4; Fairchild, Wesendunk & Weaver, 1969, p. 47, pl. 9, figs. 2, 3.

Hypotype No. 00106; Loc. PSUA2001.

Plectofrondicularia sacatensis Hornaday

Plectofrondicularia sacatensis Hornaday, 1961, p. 187, pl. 4, figs. 17, 18, 19.

Hypotype No. 00107 and 00108; Loc. PSUA2000.

Plectofrondicularia searsi Cushman, Stewart & Stewart

Plectofrondicularia searsi Cushman, Stewart & Stewart, 1947d, p. 78, pl. 10, fig. 5; pl. 11, fig. 8; Cushman, Stewart & Stewart, 1949, p. 132, pl. 15, fig. 5; Mallory, 1959, p. 214, pl. 17, fig. 17.

Hypotype No. 00109; Loc. PSUA2019.

Genus *Amphimorphina* Neugeboren, 1850

Amphimorphina californica Cushman & McMasters

Amphimorphina californica Cushman & McMasters, 1936, p. 513, pl. 75, figs. 21, 22, 23, 24, 25; Rau, 1956, p. 75, pl. 15, figs. 6, 7, 8, 9, 10; Mallory, 1959, p. 215, pl. 18, fig. 6; Fairchild, Wesendunk & Weaver, 1969, p. 49, pl. 9, fig. 19.

Amphimorphina cf. *A. californica* Cushman & McMasters, Weaver & Weaver, 1962, p. 30, pl. 19, fig. 1.

Hypotype No. 00110; Loc. PSUA2004.

Amphimorphina jenkinsi (Church)

Plectofrondicularia jenkinsi Church, 1931, p. 208, pl. a, figs. 5, 7, 8, 9.

Amphimorphina jenkinsi (Church) Mallory, 1959, p. 216, pl. 18, fig. 5; Weaver & Weaver, 1962, p. 31, pl. 19, fig. 2.

Hypotype No. 00111; Loc. PSUA2019.

Genus *Nodogenerina* Cushman, 1927

Nodogenerina adolphina (d'Orbigny)

Nodosaria (Dentalina) adolphina d'Orbigny, Cushman & G. D. Hanna, 1927, p. 213, pl. 13, figs. 8, 9.

Dentalina adolphina (d'Orbigny) Cushman, 1929, p. 86, pl. 13, figs. 3, 4.

Nodogenerina adolphina (d'Orbigny), Mallory, 1959, p. 216, pl. 18, fig. 8; pl. 41, fig. 10; Weaver & Molander, 1964, p. 188, pl. 8, fig. 8.

Hypotype No. 00112 and 00113; Loc. PSUA2014.

Nodogenerina bradyi Cushman

Nodogenerina bradyi Cushman, 1927c, p. 79; Detling, 1946, p. 356, pl. 49, figs. 9, 10; Mallory, 1959, p. 216, pl. 18, fig. 12.

Hypotype No. 00114; Loc. PSUA2030.

Nodogenerina lepidula (Schwager)

Nodosaria lepidula Schwager, Galloway & Morrey, 1931, p. 337, pl. 38, fig. 1.

Nodogenerina lepidula (Schwager) Cushman, 1948b, p. 531, pl. 26, fig. 36; Mallory, 1959, p. 217, pl. 18, fig. 10; Weaver & Weaver, 1962, p. 29, pl. 8, fig. 9; Weaver & Molander, 1964, p. 189, pl. 8, fig. 11.

Hypotype No. 00115; Loc. PSUA2003.

Family BULIMINIDAE

Genus *Robertina* d'Orbigny, 1846*Robertina washingtonensis* Beck

Robertina washingtonensis Beck, 1943, p. 604, pl. 107, figs. 17, 19, 24.

Hypotype No. 00116; Loc. PSUA2004.

A single specimen from the Yamhill Formation is referred to this species.

Genus *Bulimina* d'Orbigny, 1826*Bulimina alsatica* Cushman & Parker

Bulimina alsatica Cushman & Parker, 1937, p. 39, pl. 4, figs. 6, 7; Cushman & Parker, 1947, p. 102, pl. 24, figs. 10, 11; Rau, 1964, p. G18, pl. 5, fig. 16.

Bulimina cf. *B. alsatica* Cushman & Parker, Rau, 1964, p. G18, pl. 5, fig. 14.

Hypotype No. 00117; Loc. PSUA2001.

Bulimina corrugata Cushman & Siegfus

Bulimina corrugata Cushman & Siegfus, 1935, p. 92, pl. 14, fig. 7; Cushman & Siegfus, 1942, p. 411, pl. 16, fig. 38; Cushman & Parker, 1947, p. 93, pl. 22, fig. 2; Graham & Classen, 1955, p. 19, pl. 3, fig. 17; Smith, 1956, p. 95, pl. 13, fig. 7; Rau, 1956, p. 75, pl. 15, fig. 5; Smith, 1957, p. 174, pl. 24, fig. 8; Mallory, 1959, p. 189, pl. 28, fig. 13; Weaver & Weaver, 1962, p. 31, pl. 9, fig. 3; Rau, 1964, p. 617, pl. 5, fig. 11; Fairchild, Wesendunk & Weaver, 1969, p. 53, pl. 11, fig. 5.

Bulimina cf. *B. corrugata* Cushman & Siegfus, Fairchild, Wesendunk & Weaver, 1969, p. 54, pl. 11, fig. 6.

Hypotype No. 00118; Loc. PSUA2003.

Bulimina curtissima Cushman & Siegfus

Bulimina curtissima Cushman & Siegfus, 1942, p. 412, pl. 17, fig. 2; Mallory, 1959, p. 189, pl. 15, fig. 18; Weaver & Weaver, 1962, p. 31, pl. 9, fig. 4.

Hypotype No. 00119; Loc. PSUA2016.

Bulimina instabilis Cushman & Parker

Bulimina instabilis Cushman & Parker, 1936, p. 44, pl. 8, fig. 3; Hornaday, 1961, p. 188, pl. 5, fig. 3.

Hypotype No. 00120; Loc. PSUA2016.

Bulimina lirata Cushman & Parker

Bulimina lirata Cushman & Parker, 1936, p. 43, pl. 8, fig. 2; Cushman & Simonson, 1944, p. 198, pl. 32, fig. 13; Cushman & Parker, 1947, p. 95, pl. 22, fig. 10; Smith, 1957, p. 174, pl. 24, fig. 13; Mallory, 1959, p. 193, pl. 37, fig. 1; Weaver & Weaver, 1962, p. 32, pl. 9, figs. 8, 9; Rau, 1964, p. 618, pl. 5, fig. 17; Fairchild, Wesendunk & Weaver, 1969, p. 54, pl. 11, fig. 9.

Bulimina cf. *B. lirata* Cushman & Parker, Cushman & Siegfus, 1942, p. 413, pl. 17, fig. 3.

Hypotype No. 00121; Loc. PSUA2003.

Bulimina microstata Cushman & Parker

Bulimina microstata Cushman & Parker, 1936, p. 39, pl. 7, fig. 2; Cushman, 1946a, p. 95, pl. 22, fig. 9; Mallory, 1959, p. 194, pl. 16, fig. 9; Hornaday, 1961, p. 188, pl. 6, fig. 2; Sullivan, 1962, p. 274, pl. 14, fig. 6; Weaver & Molander, 1964, p. 189, pl. 8, fig. 18; Fairchild, Wesendunk & Weaver, 1969, p. 54, pl. 11, fig. 10.

Hypotype No. 00122; Loc. PSUA2016.

Bulimina ovata d'Orbigny

Bulimina ovata d'Orbigny, 1846, p. 185, pl. 11, figs. 13, 14; Cushman & Ponton, 1932, p. 67, pl. 9, figs. 1, 2; Cushman & Parker, 1937, p. 47, pl. 6, figs. 4, 5; Cushman & Parker, 1947, p. 106, pl. 25, figs. 8, 9; Toulmin, 1941, p. 597, pl. 80, figs. 25, 26; Mallory, 1959, p. 195, pl. 16, fig. 4; Weaver & Molander, 1964, p. 189, pl. 8, fig. 19.

Praeglobulimina ovata (d'Orbigny) Fairchild, Wesendunk & Weaver, 1969, p. 55, pl. 11, fig. 19.

Hypotype No. 00123; Loc. PSUA2028.

Bulimina ovata cowlitzensis Beck

Bulimina ovata cowlitzensis Beck, 1943, p. 605, pl. 107, fig. 22; Hornaday, 1961, p. 189, pl. 5, fig. 3; Weaver & Weaver, 1962, p. 32, pl. 9, figs. 10, 11.

Hypotype No. 00124; Loc. PSUA2003.

Bulimina schencki Beck

Bulimina schencki Beck, 1943, p. 605, pl. 107, figs. 28, 33; Mallory, 1959, p. 196, pl. 16, fig. 15; Weaver & Molander, 1964, p. 190, pl. 8, fig. 15.

Bulimina capita? Cushman & Dusenbury, 1934, p. 61, pl. 8, fig. 10.

Hypotype No. 00125; Loc. PSUA2003.

Bulimina sculptilis Cushman

Bulimina sculptilis Cushman, 1923b, p. 23, pl. 3, fig. 3;
 Cushman & Schenck, 1928, p. 311, pl. 43, fig. 16;
 Cushman & Parker, 1947, p. 103, pl. 24, fig. 12;
 Bermudez, 1949, p. 184, pl. 12, fig. 5; Wilson,
 1954, p. 139, pl. 15, fig. 12; Smith, 1956, p. 95,
 pl. 12, fig. 9; pl. 13, fig. 4; Hornaday, 1961,
 p. 189, pl. 5, fig. 4; Weaver & Molander, 1964,
 p. 190, pl. 9, figs. 3, 4.

Bulimina jacksonensis Cushman & Stone, 1947, p. 13,
 pl. 2, fig. 11; Cushman, 1946a, p. 23, pl. 25.

Bulimina cf. *B. sculptilis* Cushman, Cushman & McMasters,
 1936, p. 513, pl. 75, fig. 27.

Hypotype No. 00126; Loc. PSUA2029.

Genus *Globobulimina* Cushman, 1927*Globobulimina pacifica* Cushman

Globobulimina pacifica Cushman, 1927c, p. 67, pl. 14,
 fig. 12; Beck, 1943, p. 606, pl. 107, fig. 16;
 Kleinpell, 1938, p. 260, pl. VIII, fig. 7; Wilson,
 1954, p. 139, pl. 15, fig. 14; Mallory, 1959,
 p. 198, pl. 16, fig. 17; Weaver & Weaver, 1962,
 p. 32, pl. 9, fig. 15; Weaver & Molander, 1964,
 p. 190, pl. 9, fig. 5; Fairchild, Wesendunk & Weaver,
 1969, p. 55, pl. 11, fig. 16.

Globobulimina cf. *G. pacifica* Cushman, Cushman & Hobson,
 1935, p. 62, pl. 9, fig. 3; Fairchild, Wesendunk &
 Weaver, 1969, p. 55, pl. 11, fig. 17.

Hypotype No. 00127; Loc. PSUA2003.

Genus *Virgulina* d'Orbigny, 1826*Virgulina bramletti* Galloway & Morrey

Virgulina bramletti Galloway & Morrey, 1929, p. 37,
 pl. 5, fig. 14; Cushman, 1929, p. 94, pl. 13,
 fig. 30; Cushman & Laiming, 1931, p. 109, pl. 12,
 fig. 4; Cushman, 1937a, p. 19, pl. 3, figs. 6, 7,
 8, 9; Sullivan, 1962, p. 275, pl. 15, figs. 1, 2.

Fursenkoina bramletti (Galloway & Morrey), Fairchild,
 Wesendunk & Weaver, 1969, p. 68, pl. 21, fig. 4;
 pl. 22, fig. 11.

Hypotype No. 00128; Loc. PSUA2019.

Virgulina sp.

Hypotype No. 00129: Loc. PSUA2003.

Specimens are too poorly preserved to be referred to a specific level.

Genus *Bolivina* d'Orbigny, 1839*Bolivina basisenta* Cushman & Stone

Bolivina basisenta Cushman & Stone, 1947, p. 15, pl. 2, fig. 20; Cushman, Stewart & Stewart, 1947c, p. 61, pl. 8, fig. 7; Cushman, Stewart & Stewart, 1949, p. 133, pl. 15, fig. 8; Weaver & Weaver, 1962, p. 33, pl. 10, fig. 2.

Hypotype No. 00130; Loc. PSUA2018.

Bolivina basisenta oregonensis Cushman, Stewart & Stewart

Bolivina basisenta oregonensis Cushman, Stewart & Stewart, 1949, p. 133, pl. 15, fig. 7; Weaver & Weaver, 1962, p. 33, pl. 10, fig. 3.

Hypotype No. 00131; Loc. PSUA2018.

Bolivina jacksonensis Cushman & Applin

Bolivina sp. Cushman, 1923b, p. 19, pl. 3, fig. 2.

Bolivina jacksonensis Cushman & Applin, 1926, p. 167, pl. 7, figs. 3, 4; Cole, 1928, p. 212; Howe & Wallace, 1932, p. 58, pl. 11, fig. 11; Ellisor, 1933, p. 13, fig. 3; Cushman, 1935a, p. 37, pl. 14, figs. 11, 12, 13; Cushman, 1937a, p. 57, pl. 7, figs. 17, 18; Cushman & Simonson, 1944, p. 198, pl. 32, fig. 15; Wilson, 1954, p. 140, pl. 15, fig. 15; Hornaday, 1961, p. 190, pl. 6, fig. 8; Weaver & Molander, 1964, p. 191, pl. 9, fig. 9.

Bolivina cf. *B. jacksonensis* Cushman & Applin, Detling, 1946, p. 357, pl. 50, fig. 4.

Hypotype No. 00132; Loc. PSUA2004.

Bolivina kleinPELLI Beck

Bolivina kleinPELLI Beck, 1943, p. 606, pl. 107,
fig. 39; Mallory, 1959, p. 201, pl. 16, fig. 20.

? *Bolivina* cf. *B. kleinPELLI* Beck, Cushman, Stewart
& Stewart, 1947c, p. 62, pl. 8, fig. 8.

Brizalina kleinPELLI (Beck), Fairchild, Wesendunk &
Weaver, 1969, p. 52, pl. 10, fig. 7.

Hypotype No. 00133; Loc. PSUA2004.

Bolivina scabrata Cushman & Bermudez

Bolivina scabrata Cushman & Bermudez, Mallory, 1959,
p. 202, pl. 16, fig. 25; Weaver & Weaver, 1962,
p. 33, pl. 10, fig. 7.

Hypotype No. 00134; Loc. PSUA2001.

Genus *Bifarina* Parker & Jones, 1872*Bifarina eleganta* (Plummer)

Siphogenerina eleganta Plummer, 1926, p. 126, pl. 8, fig. 1.

Bifarina eleganta (Plummer) Mallory, 1959, p. 204, pl. 17,
fig. 2; Weaver & Weaver, 1962, p. 34, pl. 10, fig. 9.

Hypotype No. 00135; Loc. PSUA2011.

Bifarina nuttalli Cushman & Siegfus

Loxostomum applini Nuttall (NOT Plummer), 1930, p. 285,
pl. 24, figs. 4, 5.

Bifarina nuttalli Cushman & Siegfus, 1939, p. 28, pl. 6,
fig. 6; Cushman & Siegfus, 1942, p. 413, pl. 17, fig. 4;
Mallory, 1959, p. 204, pl. 29, fig. 2; Rau, 1964, p. G19,
pl. 6, fig. 3.

Hypotype No. 00136; Loc. PSUA2003.

Genus *Chiloguembelina* Loeblich & Tappan, 1956*Chiloguembelina martini* (Pijpers)

Gumbelina venezuelana Nuttall, 1935, p. 126, pl. 15, figs. 2, 3, 4; Cushman, 1939, p. 62, pl. 10, figs. 50, 51, 52, 53; Cushman & Todd, 1945, p. 94, pl. 15, fig. 9; Cushman, 1946, p. 22, pl. 4, fig. 29; Cushman & Stone, 1947, p. 10, pl. 1, fig. 28; Cushman and Stainforth, 1951, p. 149, pl. 27, fig. 23.

Hypotype No. 00137; Loc. PSUA2011.

Genus *Uvigerinella* d'Orbigny, 1828*Uvigerinella* sp.

Hypotype No. 00138; Loc. PSUA2019.

Although specimens are abundant in one sample from the upper part of the Yamhill Formation, they could not be referred to a species. The forms show some affinity with *U. californica*, but they differ in having very fine costae.

Genus *Uvigerina* d'Orbigny, 1826*Uvigerina churchi* Cushman & Siegfus

Uvigerina churchi Cushman & Siegfus, 1939, p. 29, pl. 6, fig. 16; Mallory, 1959, p. 206, pl. 17, fig. 6; Hornaday, 1961, p. 191, pl. 8, figs. 1, 2, 3, 4; Rau, 1964, p. G20, pl. 6, fig. 9; Weaver & Weaver, 1962, p. 34, pl. 10, fig. 10.

Uvigerina cf. *U. churchi* Cushman & Siegfus, Beck, 1943, p. 607, pl. 108, fig. 30.

Hypotype No. 00139; Loc. PSUA2017.

Uvigerina churchi demicostata Mallory

Uvigerina churchi demicostata Mallory, 1959, p. 207, pl. 17, fig. 10; Weaver & Molander, 1964, p. 191, pl. 9, fig. 11.

Hypotype No. 00140; Loc. PSUA2011.

Uvigerina garzaensis Cushman & Siegfus

Uvigerina garzaensis Cushman & Siegfus, 1939, p. 28, pl. 6, fig. 15; Cushman & Siegfus, 1942, p. 414, pl. 17, fig. 5; Cushman & Simonson, 1944, p. 199, pl. 32, figs. 20, 21; Detling, 1946, p. 357, pl. 50, fig. 8; Cushman & Stewart, 1949, p. 80, pl. 14, fig. 10; Cushman, Stewart & Stewart, 1949, p. 133, pl. 15, fig. 9; Rau, 1951, p. 445, pl. 65, fig. 19; Wilson, 1954, p. 141, pl. 16, fig. 4; Graham & Classen, 1955, p. 22, pl. 3, fig. 34; Smith, 1956, p. 97, pl. 13, fig. 2; Smith, 1957, p. 177, pl. 26, fig. 9; Mallory, 1959, p. 208, pl. 37, fig. 2; Hornaday, 1961, p. 191, pl. 8, fig. 5; Weaver & Weaver, 1962, p. 34, pl. 10, fig. 11; Weaver & Molander, 1964, p. 191, pl. 10, fig. 1; Rau, 1964, p. G20, pl. 6, fig. 6; Fairchild, Wesendunk & Weaver, 1969, p. 56, pl. 12, fig. 9.

Hypotype No. 00141; Loc. PSUA2017.

Uvigerina yazooensis Cushman

Uvigerina yazooensis Cushman, 1933b, p. 13, pl. 1, fig. 29; Mallory, 1959, p. 210, pl. 37, fig. 4; Weaver & Weaver, 1962, p. 34, pl. 10, fig. 12.

Uvigerina yazooensis (?) Cushman, Smith, 1957, p. 179, pl. 26, fig. 6.

Hypotype No. 00142; Loc. PSUA2017.

Genus *Angulogerina* Cushman, 1927*Angulogerina wilcoxensis* (Cushman & Ponton)

Pseudouvigerina wilcoxensis Cushman & Ponton, 1932, p. 66, pl. 8, fig. 18.

Angulogerina wilcoxensis (Cushman & Ponton), Cushman & Garrett, 1939, p. 84, pl. 14, figs. 24, 25; Toulmin, 1941, p. 599, pl. 80, fig. 30; Smith, 1957, p. 179, pl. 25, fig. 9.

Hypotype No. 00143; Loc. PSUA2002.

Family ROTALIIDAE

Genus *Discorbis* Lamarck, 1804*Discorbis baintoni* Mallory*Discorbis baintoni* Mallory, 1959, p. 228, pl. 19,
fig. 16.

Hypotype No. 00144; Loc. PSUA2003.

Genus *Valvulineria* Cushman, 1926*Valvulineria jacksonensis welcomensis* Mallory*Valvulineria jacksonensis welcomensis* Mallory, 1959,
p. 231, pl. 20, fig. 3; Weaver & Molander, 1964,
p. 193, pl. 10, fig. 9.

Hypotype No. 00145; Loc. PSUA2011.

Valvulineria scrobiculata (Schwager)*Anomalina scrobiculata* Schwager, 1883, p. 129,
pl. 29, fig. 18.*Gyroidina scrobiculata* (Schwager), Israelsky, 1940,
p. 578, pl. 4, figs. 4, 5, 6.*Valvulineria scrobiculata* (Schwager), Cushman & Ponton,
1932, p. 70, pl. 9, fig. 5; Cushman & Garrett, 1939,
p. 85, pl. 14, figs. 32, 33; Mallory, 1959, p. 232,
pl. 20, fig. 6; Weaver & Molander, 1964, p. 193,
pl. 10, fig. 10.*Valvulineria* cf. *V. scrobiculata* (Schwager) Beck,
1943, p. 608, pl. 108, figs. 21, 22, 23.

Hypotype No. 00146; Loc. PSUA2000.

Specimens referred to this species were recorded only
from the lowermost sample of the Yamhill Formation.

Valvulineria tumeyensis Cushman & Simonson

Eponides pygmaea Hantken, Church, 1931, p. 202,
pl. A, figs. 1, 2, 3.

Valvulineria tumeyensis Cushman & Simonson, 1944, p. 201,
pl. 33, figs. 13, 14; Detling, 1946, p. 358, pl. 50,
fig. 11; Hornaday, 1961, p. 191, pl. 9, figs. 1, 2, 3,
4; Weaver & Weaver, 1962, p. 36, pl. 12, fig. 1;
Weaver & Molander, 1964, p. 193, pl. 11, figs. 1, 2, 3.

Valvulineria chirana Cushman & Stone, Cushman, Stewart,
& Stewart, 1949, p. 134, pl. 16, fig. 2.

Valvulineria aff. *V. tumeyensis* Cushman & Simonson,
Fairchild, Wesendunk & Weaver, 1969, p. 60, pl. 14,
fig. 7.

Hypotype No. 00147; Loc. PSUA2017.

Genus *Gyroidina* d'Orbigny, 1826

Gyroidina condoni (Cushman & Schenck)

Eponides condoni Cushman & Schenck, 1928, p. 313, pl. 44,
figs. 6, 7; Beck, 1943, p. 608, pl. 108, figs. 27, 29,
31.

Gyroidina condoni (Cushman & Schenck) Wilson, 1954, p. 142,
pl. 16, fig. 10; Smith, 1956, p. 97, pl. 14, figs. 6, 7;
Hornaday, 1961, p. 192, pl. 9, fig. 5; Sullivan, 1962,
p. 280, pl. 18, fig. 2; Weaver & Molander, 1964,
p. 193, pl. 11, fig. 4; Fairchild, Wesendunk & Weaver,
1969, p. 73, pl. 23, fig. 11.

Gyroidina cf. *G. condoni* (Cushman & Schenck) Weaver &
Molander, 1964, p. 193, pl. 11, fig. 5; Fairchild,
Wesendunk & Weaver, 1969, p. 73, pl. 23, fig. 10.

Gyroidina condoni rotundiformis Cushman & Simonson, 1944,
p. 201, pl. 33, figs. 17, 18, 19.

Gyroidina cf. *G. planulata* Cushman & Renz, Cushman,
Stewart & Stewart, 1947e, p. 102, pl. 12, fig. 15.

Hypotype No. 00148; Loc. PSUA2019.

Gyroidina orbicularis planata Cushman

Gyroidina orbicularis planata Cushman, 1935a, p. 45, pl. 18, fig. 3; Cushman & Siegfus, 1942, p. 419, pl. 17, fig. 32; Rau, 1951, p. 447, pl. 66, figs. 4, 5, 6; Mallory, 1959, p. 235, pl. 29, fig. 16; Weaver & Weaver, 1962, p. 36, pl. 13, figs. 1, 2; Rau, 1964, p. G21, pl. 6, fig. 10; Fairchild, Wesendunk & Weaver, 1969, p. 73, pl. 23, fig. 9.

Hypotype No. 00149 and 00150; Loc. PSUA2003.

Gyroidina simiensis Cushman & McMasters

Gyroidina simiensis Cushman & McMasters, 1936, p. 514, pl. 76, fig. 3.

Hypotype No. 00151; Loc. PSUA2007.

Gyroidina soldanii octocamerata Cushman & G. D. Hanna

Gyroidina soldanii octocamerata Cushman & G. D. Hanna, 1927, p. 223, pl. 14, figs. 16, 17, 18; Cushman & M. A. Hanna, 1927, p. 56, pl. 5, fig. 7; Cushman & Schenck, 1928, p. 312, pl. 44, figs. 3, 4, 5; Cushman, 1935a, p. 45, pl. 18, fig. 4; Smith, 1957, p. 181, pl. 27, fig. 5; Mallory, 1959, p. 236, pl. 30, fig. 1; pl. 42, fig. 1.

Hypotype No. 00152; Loc. PSUA2011.

Genus *Eponides* Montfort, 1808*Eponides mexicana* (Cushman)

Pulvinulina mexicana Cushman, 1925a, p. 300, pl. 7, figs. 7, 8; Cushman & G. D. Hanna, 1927, p. 222, pl. 14, figs. 13, 14, 15.

Eponides mexicana (Cushman), Cushman & M. A. Hanna, 1927, p. 54, pl. 5, figs. 8, 9; Howe, 1939, p. 75, pl. 9, fig. 31; pl. 10, figs. 1, 2, 3; Smith, 1957, p. 182, pl. 22, fig. 10; Mallory, 1959, p. 237, pl. 37, fig. 11; Weaver & Weaver, 1962, p. 37, pl. 13, fig. 4.

Eponides aff. *E. mexicana* (Cushman) Smith, 1957, p. 183, pl. 27, fig. 15.

Eponides guaybalensis yeguaensis Weinzierl & Applin, Cushman & Dusenbury, 1934, p. 62, pl. 9, fig. 1.

Eponides primus Martin, 1943, p. 113, pl. 9, fig. 4.

Hypotype No. 00153; Loc. PSUA2003.

Eponides minima Cushman

Eponides minima Cushman, 1933b, p. 17, pl. 2, fig. 8;
Cushman & McMasters, 1936, p. 514, pl. 76, fig. 2;
Beck, 1943, p. 608, pl. 108, figs. 16, 17, 19;
Cushman, Stewart & Stewart, 1949, p. 135, pl. 15,
fig. 12; Mallory, 1959, p. 238, pl. 41, fig. 13.

Hypotype No. 00154; Loc. PSUA2003.

Eponides umbonata (Reuss)

Rotalina umbonata Reuss, 1851, p. 75, pl. 5, fig. 35.

Eponides umbonata (Reuss) Cole, 1928, p. 15, pl. 2,
fig. 6; Cushman, 1929, p. 98, pl. 14, fig. 8; Nuttall,
1932, p. 26, pl. 6, figs. 4, 5; Cushman, 1935a, p. 48,
pl. 9, fig. 10; Kleinpell, 1938, p. 322, pl. 6, figs.
9, 12; Cushman & Stewart, 1949, p. 81, pl. 14, fig. 13;
Smith, 1956, p. 98, pl. 15, fig. 2; Smith, 1957,
p. 183, pl. 27, figs. 12, 14; Mallory, 1959, p. 239,
pl. 30, fig. 3; Weaver & Weaver, 1962, p. 37, pl. 14,
figs. 2, 3.

Eponides cf. *E. umbonata* (Reuss), Cushman & Simonson,
1944, p. 201, pl. 34, figs. 4, 5.

Hypotype No. 00155; Loc. PSUA2015.

Genus *Parrella* Finlay, 1939

Parrella tenuicarinata (Cushman & Siegfus)

Pulvinulinella tenuicarinata Cushman & Siegfus, 1933,
p. 95, pl. 14, fig. 11; Cushman & Siegfus, 1942,
p. 42, pl. 18, fig. 4.

Parrella tenuicarinata (Cushman & Siegfus), Mallory,
1959, p. 240, pl. 21, fig. 5.

Hypotype No. 00156; Loc. PSUA2013.

A single specimen was recorded from locality PSUA2013
in the Yamhill Formation.

Parrella (?) sp. of Smith, 1957

Parrella (?) sp. Smith, 1957, p. 184, pl. 27, fig. 8.

Hypotype No. 00157; Loc. PSUA2004.

Genus *Epistomina* Terquem, 1883

Epistomina eocenica Cushman & M. A. Hanna

Epistomina eocenica Cushman & M. A. Hanna, 1927, p. 53, pl. 5, figs. 4, 5; Cushman & Schenck, 1928, p. 313, pl. 44, fig. 9; Weinzierl & Applin, 1929, p. 407; Cushman & McMasters, 1936, p. 515, pl. 76, fig. 5; Cushman & Simonson, 1944, p. 202, pl. 34, fig. 6; Cushman & Stone, 1949, p. 82, pl. 14, fig. 17; Fairchild, Wesendunk & Weaver, 1969, p. 75, pl. 25, fig. 2.

Epistomina cf. *E. eocenica* Cushman & M. A. Hanna, Fairchild, Wesendunk & Weaver, 1969, p. 75, pl. 25, fig. 6.

Hypotype No. 00158; Loc. PSUA2006.

Genus *Baggina* Cushman, 1926

Baggina californica Cushman (?)

Baggina californica Cushman, 1931, p. 14, pl. 2, fig. 11; Kleinpell, 1938, p. 324, pl. 13, fig. 30; Fairchild, Wesendunk & Weaver, 1969, p. 59, pl. 14, fig. 11.

Hypotype No. 00159; Loc. PSUA2011.

Family CASSIDULINIDAE

Genus *Ceratobulimina* Toula, 1915

Ceratobulimina alazanensis Cushman & Harris

Ceratobulimina alazanensis Cushman & Harris, 1927a, p. 174, pl. 29, fig. 5; pl. 30, figs. 3, 4, 5; Weaver & Molander, 1964, p. 194, pl. 13, fig. 1.

Hypotype No. 00160; Loc. PSUA2013.

Genus *Alabamina* Toulmin, 1941*Alabamina wilcoxensis californica* Mallory

Alabamina wilcoxensis californica Mallory, 1959,
p. 227, pl. 19, figs. 11, 12.

Hypotype No. 00161; Loc. PSUA2002.

Genus *Cassidulina* d'Orbigny, 1826*Cassidulina crassipunctata?* Cushman & Hobson

Cassidulina crassipunctata Cushman & Hobson, 1935, p. 63,
pl. 9, fig. 10; Rau, 1964, p. G23, pl. 7, fig. 3.

Hypotype No. 00162; Loc. PSUA2035 .

Cassidulina globosa Hantken

Cassidulina globosa Hantken, 1875, p. 54, pl. 16, fig. 2;
Cushman, 1925d, p. 56, pl. 9, figs. 25, 26; Cushman,
1927e, p. 167, pl. 26, fig. 13; Cole & Ponton, 1930,
p. 44, pl. 7, fig. 7; Church, 1931, p. 212, pl. C,
figs. 4, 5; Cushman, 1935a, p. 49, pl. 20, fig. 12;
Cushman & Siegfus, 1942, p. 421, pl. 18, fig. 3;
Beck, 1943, p. 609, pl. 108, figs. 13, 14; Cushman
& Simonson, 1944, p. 202, pl. 34, fig. 7; Detling,
1946, p. 358, pl. 51, fig. 3; Cushman & Stone, 1947,
p. 23, pl. 3, fig. 8; Cushman, Stewart & Stewart,
1947e, p. 103, pl. 12, fig. 14; Cushman, Stewart &
Stewart, 1949, p. 135, pl. 16, fig. 3; Rau, 1951,
p. 449, pl. 67, fig. 5; Wilson, 1954, p. 143, pl. 17,
fig. 1; Graham & Classen, 1955, p. 26, pl. 14, fig. 14;
Smith, 1956, p. 100, pl. 14, fig. 2; Smith, 1957, p. 187,
pl. 28, fig. 13; Mallory, 1959, p. 226, pl. 33, fig. 11;
Hornaday, 1961, p. 193, pl. 10, fig. 3; Weaver & Weaver,
1962, p. 38, pl. 16, fig. 3; Weaver & Molander, 1964,
p. 195, pl. 13, fig. 4; Rau, 1964, p. G23, pl. 7,
fig. 4.

Cassidulina cf. *C. globosa* Hantken, Cushman & Stone,
1949, p. 82, pl. 14, fig. 20.

Globocassidulina globosa (Hantken) Fairchild, Wesendunk
& Weaver, 1969, p. 69, pl. 22, fig. 15.

Hypotype No. 00163; Loc. PSUA2013.

Family CHILOSTOMELLIDAE

Genus *Allomorphina* Reuss, 1850*Allomorphina macrostoma* Karrer

Allomorphina macrostoma Karrer, Cushman & Todd, 1949a, p. 68, pl. 12, figs. 4, 5; Nuttall, 1935, p. 129, pl. 15, fig. 28; Cushman & McMasters, 1936, p. 516, pl. 76, fig. 7; Weaver & Molander, 1964, p. 195, pl. 13, figs. 6, 7; Fairchild, Wesendunk & Weaver, 1969, p. 70, pl. 22, fig. 16.

Hypotype No. 00164; Loc. PSUA2003.

Genus *Chilostomella* Reuss, 1850*Chilostomella hadleyi* Keijzer

Chilostomella hadleyi Keijzer, Cushman & Todd, 1949b, p. 88, pl. 15, figs. 12, 13, 14; Fairchild, Wesendunk & Weaver, 1969, p. 70, pl. 22, fig. 10.

Chilostomella cf. *C. hadleyi* Keijzer, Weaver & Weaver, 1962, p. 38, pl. 16, figs. 5, 6; Weaver & Molander, 1964, p. 196, pl. 14, fig. 1.

Hypotype No. 00165; Loc. PSUA2015.

Chilostomella ovoidea Reuss

Chilostomella ovoidea Reuss, Cushman, 1925, p. 74, pl. 11, fig. 1; Cushman & Renz, 1948, p. 126, pl. 9, fig. 16; Cushman & Todd, 1949, p. 89, pl. 15, figs. 17, 18, 19.

Hypotype No. 00166; Loc. PSUA2011.

Genus *Chilostomelloides* Cushman, 1926*Chilostomelloides cyclostoma* (Rzehak)

Chilostomelloides cyclostoma (Rzehak) Cushman & Todd, 1949b, p. 96, pl. 16, fig. 17; Graham & Classen, 1955, p. 27, pl. 4, fig. 15; Fairchild, Wesendunk & Weaver, 1969, p. 70, pl. 22, fig. 17.

Hypotype No. 00167; Loc. PSUA2015.

Genus *Pullenia* Parker & Jones, 1862

Pullenia salisburyi Stewart & Stewart

Pullenia salisburyi Stewart & Stewart, 1930, p. 72, pl. 8, fig. 2; Cushman & Laiming, 1931, p. 117, pl. 14, fig. 2; Beck, 1943, p. 609, pl. 108, figs. 8, 12; Cushman & Todd, 1943, p. 20, pl. 3, figs. 10, 11; Renz, 1948, p. 12, fig. 24; Smith, 1957, p. 188, pl. 28, fig. 11; Mallory, 1959, p. 247, pl. 34, fig. 3; pl. 38, fig. 1.

Hypotype No. 00168; Loc. PSUA2003.

Family HANTKENINIDAE

Genus *Pseudohastigerina* Banner & Blow, 1959

Pseudohastigerina micra (Cole)

Nonion micrum Cole, 1927, p. 22, pl. 5, fig. 12; Weinzierl & Applin, 1929, p. 400, pl. 43, fig. 6; Cushman, 1935a, p. 30, pl. 11, figs. 14, 15; Cushman, 1939a, p. 5, pl. 1, figs. 20, 21, 22; Cushman, 1939b, p. 61, pl. 10, figs. 41, 42, 43; Mallory, 1959, p. 181, pl. 15, fig. 3; pl. 28, fig. 12.

Hastigerina micra (Cole) Bolli, 1957a, p. 161, pl. 35, figs. 1, 2; Fairchild, Wesendunk & Weaver, 1969, p. 60, pl. 15, figs. 1, 7.

Globigerinella micra (Cole) Sullivan, 1962, p. 285, pl. 22, fig. 7.

Pseudohastigerina micra (Cole) Banner & Blow, 1959, p. 19.

Hypotype No. 00169; Loc. PSUA2011.

Genus *Hantkenina* Cushman, 1924

Hantkenina sp.

Hypotype No. 00170; Loc. PSUA2020.

A single, badly preserved specimen is referred to this genus.

Family GLOBIGERINIDAE

Genus *Globigerina* d'Orbigny, 1826*Globigerina coalingensis* Cushman & G. D. Hanna

Globigerina coalingensis Cushman & G. D. Hanna, 1927,
p. 219, pl. 14, fig. 4; Mallory, 1959, p. 249,
pl. 34, fig. 6.

Hypotype No. 00171; Loc. PSUA2019.

Globigerina eocaena Gümbel

Globigerina eocaena Gümbel, Tipton, Kleinpell &
Weaver, 1973, p. 63, pl. 11, fig. 8.

Globigerina ouachitaensis Howe & Wallace, Sullivan,
1962, p. 285, pl. 22, figs. 1, 2.

Hypotype No. 00172; Loc. PSUA2016.

Globigerina patagonica Todd & Kniker

Globigerina patagonica Todd & Kniker, 1952, p. 26,
pl. 24, fig. 32.

Hypotype No. 00173; Loc. PSUA2004.

Globigerina senni (Beckmann)

Globigerina senni (Beckmann) Bolli, 1957a, p. 163,
pl. 35, figs. 10, 11, 12.

Globigerina cf. *G. senni* (Beckmann) Fairchild,
Wesendunk & Weaver, 1969, p. 62, pl. 17, fig. 8.

Hypotype No. 00174; Loc. PSUA2011.

Globigerina triloculinoides Plummer

Globigerina triloculinoides Plummer, 1926, p. 134,
pl. 8, fig. 10; Cushman, 1940a, p. 72, pl. 12, fig.
15; Toulmin, 1941, p. 607, pl. 82, fig. 3; Beck,
1943, p. 609, pl. 108, figs. 2, 3; Graham & Classen,
1955, p. 28, pl. 5, fig. 1; Smith, 1957, p. 189,
pl. 28, fig. 16; Mallory, 1959, p. 250, pl. 30, fig. 6;
pl. 38, fig. 3; Weaver & Weaver, 1962, p. 40, pl. 18,
figs. 3, 4; Weaver & Molander, 1964, p. 197, pl. 15,
figs. 1, 2.

Globigerina cf. *G. triloculinoides* Plummer, Smith,
1957, p. 189, pl. 28, fig. 17.

Hypotype No. 00175; Loc. PSUA2003.

Genus *Globorotaloides* Bolli, 1957

Globorotaloides suteri Bolli

Globorotaloides suteri Bolli, 1957, p. 117,
pl. 27, fig. 9.

Hypotype No. 00176; Loc. PSUA2011.

Family GLOBOROTALIIDAE

Genus *Globorotalia* Cushman, 1927

Globorotalia bolivariana (Petters)

Globigerina wilsoni bolivariana Petters, 1954,
p. 39, pl. 8, fig. 9.

Globorotalia bolivariana (Petters) Bolli, 1957a,
p. 169, pl. 37, figs. 14, 15, 16; Fairchild,
Wesendunk & Weaver, 1969, p. 61, pl. 15, figs.
3, 4, 5.

Hypotype No. 00177; Loc. PSUA2016.

Globorotalia collactea Finlay

Globorotalia collactea Finlay, 1934, p. 327,
figs. 164, 165.

Hypotype No. 00178; Loc. PSUA2004.

Globorotalia pentacameratus Subbotina

Globorotalia pentacameratus Subbotina, 1947, pp. 128,
129, pl. VII, figs. 12-17.

Hypotype No. 00179; Loc. PSUA2003.

Family ANOMALINIDAE

Genus *Anomalina* d'Orbigny, 1826*Anomalina garzaensis* Cushman & Siegfus

Anomalina garzaensis Cushman & Siegfus, 1939, p. 32, pl. 7, fig. 3; Cushman & Siegfus, 1942, p. 422, pl. 18, fig. 6; Graham & Classen, 1955, p. 30, pl. 5, fig. 12; Mallory, 1959, p. 259, pl. 31, fig. 1; Weaver & Weaver, 1962, p. 41, pl. 20, fig. 3; Weaver & Molander, 1964, p. 198, pl. 16, fig. 4.

Anomalina cf. *A. garzaensis* Cushman & Siegfus, Fairchild, Wesendunk & Weaver, 1969, p. 74, pl. 25, fig. 3.

Hypotype No. 00180; Loc. PSUA2015.

Genus *Planulina* d'Orbigny, 1826*Planulina haydoni* Cushman & Schenck

Planulina haydoni Cushman & Schenck, 1928, p. 316, pl. 45, fig. 7; Cushman & Simonson, 1944, p. 202, pl. 34, figs. 11, 12; Detling, 1946, p. 358, pl. 51, fig. 1; Wilson, 1954, p. 144, pl. 17, fig. 3; Smith, 1956, p. 100, pl. 16, fig. 5.

Cibicides aff. *C. haydoni* (Cushman & Schenck), Weaver & Molander, 1964, p. 199, pl. 17, fig. 5.

Hypotype No. 00181; Loc. PSUA2011.

Genus *Cibicides* Montfort, 1808*Cibicides cocoaensis* (Cushman)

Eponides cocoaensis Cushman, 1935a, p. 47, pl. 19, figs. 1, 2.

Cibicides cf. *C. cocoaensis* (Cushman), Mallory, 1959, p. 264, pl. 26, fig. 3; Weaver & Molander, 1964, p. 198, pl. 17, fig. 2.

Hypotype No. 00182; Loc. PSUA2004.

Cibicides hodgei Cushman & Schenck

Cibicides hodgei Cushman & Schenck, 1928, p. 315, pl. 45, figs. 3, 4, 5; Beck, 1943, p. 611, pl. 109, fig. 1; Cushman & Simonson, 1944, p. 202, pl. 34, figs. 14, 15; Detling, 1946, p. 359, pl. 51, figs. 6, 8; Smith, 1956, p. 101, pl. 16, fig. 1; Mallory, 1959, p. 265, pl. 24, fig. 6; Hornaday, 1961, p. 194, pl. 13, fig. 1; Sullivan, 1962, p. 287, pl. 23, fig. 8; Weaver & Molander, 1964, p. 199, pl. 17, fig. 6; Fairchild, Wesendunk & Weaver, 1969, p. 65, pl. 19, fig. 5.

Cibicides warreni Cushman, Stewart & Stewart, 1947e, p. 104, pl. 13, fig. 11; Cushman, Stewart & Stewart, 1949, p. 135, pl. 16, fig. 5.

Cibicides cf. *C. hodgei* Cushman & Schenck, Wilson, 1954, p. 144, pl. 17, fig. 5.

Hypotype No. 00183 and 00184; Loc. PSUA2003.

Cibicides laurissae Mallory

Cibicides laurissae Mallory, 1959, p. 267, pl. 24, fig. 8; Weaver & Molander, 1964, p. 199, pl. 18, fig. 1.

Hypotype No. 00185; Loc. PSUA2003.

Cibicides lobatus (d'Orbigny)

Cibicides lobatus (d'Orbigny), Bandy, 1944, p. 374, pl. 62, fig. 1; Rau, 1964, p. G24, pl. 7, fig. 9.

Hypotype No. 00186; Loc. PSUA2003.

Cibicides mcmasteri Beck

Cibicides mcmasteri Beck, 1943, p. 612, pl. 109, figs. 2, 4, 15.

Hypotype No. 00187; Loc. PSUA2003.

Cibicides natlandi olequanensis Beck

Cibicides natlandi olequanensis Beck, 1943, p. 612,
pl. 109, figs. 3, 20, 22.

Hypotype No. 00188; Loc. PSUA2003.

Cibicides pachyderma (Rzehak)

Cibicides pachyderma (Rzehak) Galloway & Morrey, 1931,
p. 345, pl. 39, fig. 6; Mallory, 1959, p. 268,
pl. 31, fig. 5.

Hypotype No. 00189; Loc. PSUA2013.

Genus *Cibicidoides* Brotzen, 1936

Cibicidoides coalingensis (Cushman & G. D. Hanna)

Anomalina coalingensis Cushman & G. D. Hanna, 1927,
p. 221, pl. 14, figs. 10, 11, 12; Cushman & Schenck,
1928, p. 315, pl. 45, fig. 6; Cushman & Simonson,
1944, p. 202, pl. 34, figs. 9, 10.

Cibicidoides coalingensis (Cushman & G. D. Hanna), Wilson,
1954, p. 145, pl. 17, fig. 4; Smith, 1956, p. 101,
pl. 16, fig. 2; Smith, 1957, p. 195, pl. 30, figs.
2, 3; Mallory, 1959, p. 273, pl. 38, fig. 11;
Fairchild, Wesendunk & Weaver, 1969, p. 75, pl. 25,
fig. 1.

Hypotype No. 00190; Loc. PSUA2003.

Cibicidoides venezuelanus (Nuttall)

Cibicides venezuelanus Nuttall, 1935, p. 131, pl. 15,
figs. 25, 26, 27; Cushman & Siegfus, 1942, p. 423,
pl. 18, fig. 8; Cushman & Stone, 1949, p. 83,
pl. 14, fig. 19; Graham & Classen, 1955, p. 32,
pl. 6, fig. 8; Fairchild, Wesendunk & Weaver,
1969, p. 67, pl. 21, fig. 6.

Cibicidoides venezuelanus (Nuttall), Smith, 1957,
p. 197, pl. 30, figs. 1, 5; Mallory, 1959,
p. 274, pl. 31, fig. 6.

Hypotype No. 00191 and 00192; Loc. PSUA2009.

DESCRIPTION OF LOCALITIES

Most of the following localities are on Mill Creek, a northward flowing tributary of the Yamhill River. The remaining localities are on Gooseneck Creek, a tributary of Mill Creek. All of the localities are along a generally north-south line extending from the southernmost part of Yamhill County approximately six miles into the northern part of Polk County, Oregon. The numbers refer to the collections of the Earth Science Museum at Portland State University, Portland, Oregon. The Sheridan (USGS 1956 ed.) and Dallas (USGS 1957 ed.) Quadrangles were used.

LOCALITY PSUA1999

Siletz River Volcanics.

NE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 4, T7S, R6W, Dallas Quadrangle, Oregon. Located on east bank of Mill Creek, 35' north of bridge. Buff colored volcanic sandstone.

LOCALITY PSUA2000

Type Yamhill Formation, lower member.

Located on west bank of Mill Creek, about 300' downstream from bridge. Approximately 175' stratigraphically above PSUA1999. Grey mudstone.

LOCALITY PSUA2001

Type Yamhill Formation, lower member.

Located on west bank of Mill Creek, 84' stratigraphically above sample PSUA2000. Grey mudstone.

LOCALITY PSUA2002

Type Yamhill Formation, lower member.

Located on west bank of Mill Creek, 200' stratigraphically above sample PSUA2001. Grey mudstone.

LOCALITY PSUA2003

Type Yamhill Formation, lower member.

Located on west bank of Mill Creek, 77' stratigraphically above sample PSUA2002. Grey siltstone.

LOCALITY PSUA2004

Type Yamhill Formation, lower member.

Located on east bank of Mill Creek, 63' stratigraphically above sample PSUA2003. Grey siltstone.

LOCALITY PSUA2005

Type Yamhill Formation, lower member.

Located on east bank of Mill Creek, 50' stratigraphically above sample PSUA2004. Greenish-grey sandy siltstone.

LOCALITY PSUA2006

Type Yamhill Formation, middle sandstone member.

Located on east bank of Mill Creek, 53' stratigraphically above sample PSUA2005, near upper contact of concretionary layer and greenish, fine-grained silty sandstone.

LOCALITY PSUA2007

Type Yamhill Formation, middle sandstone member.

Located on west bank of Mill Creek, 120' stratigraphically above sample PSUA2006. Fine-grained greenish-sandstone underlain by conspicuous coarse-grained greenish sandstone.

LOCALITY PSUA2008

Type Yamhill Formation, middle sandstone member.

Located on west bank of Mill Creek, 148' stratigraphically above sample PSUA2007. Very fine-grained greenish sandstone.

LOCALITY PSUA2009

Type Yamhill Formation, middle sandstone member.

Located on east bank of Mill Creek, 58' stratigraphically above sample PSUA2008. Greenish-grey fine-grained argillaceous sandstone.

LOCALITY PSUA2010

Type Yamhill Formation, middle sandstone member.

Located on west bank of Mill Creek, 183' stratigraphically above sample PSUA2009. Greenish fine-grained sandstone.

LOCALITY PSUA2011

Type Yamhill Formation, middle sandstone member.

Located on west bank of Mill Creek, 77' stratigraphically above sample PSUA2010. Greenish, fine-grained sandstone.

LOCALITY PSUA2012

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 58' stratigraphically above sample PSUA2011. Greenish-grey sandy siltstone.

LOCALITY PSUA2013

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 64' stratigraphically above sample PSUA2012. Grey sandy siltstone.

LOCALITY PSUA2014

Type Yamhill Formation, upper member.

Located on east bank of Mill Creek, 68' stratigraphically above sample PSUA2013. Well indurated, brownish fine-grained sandstone.

LOCALITY PSUA2015

Type Yamhill Formation, upper member.

Located on east bank of Mill Creek, 62' stratigraphically above sample PSUA2014.

LOCALITY PSUA2016

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 82' stratigraphically above sample PSUA2015. Grey siltstone.

LOCALITY PSUA2017

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 46' stratigraphically above sample PSUA2016. Grey siltstone.

LOCALITY PSUA2018

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 57' stratigraphically above sample PSUA2017. Grey siltstone.

LOCALITY PSUA2019

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 149' stratigraphically above sample PUSA2018. Grey siltstone.

LOCALITY PSUA2020

Type Yamhill Formation, upper member.

NW¼, SW¼, Sec. 53, T6S, R6W, Sheridan Quadrangle, Oregon. Located on west bank of Mill Creek, 200' upstream from the contact of grey siltstones with the brown sandstone marker bed. Grey siltstone.

LOCALITY PSUA2021

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 45' stratigraphically below sample PSUA2020. Brownish fine-grained sandstone.

LOCALITY PSUA2022

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 800' upstream from Dallas Coast highway bridge, 142' stratigraphically below sample PSUA2021. Grey siltstone.

LOCALITY PSUA2023

Type Yamhill Formation, upper member.

NW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec. 43, T6S, R6W. Located on east bank of Gooseneck Creek, 620' downstream from Harmony Road bridge. Grey siltstone.

LOCALITY PSUA2024

Type Yamhill Formation, upper member.

Located on east bank of Gooseneck Creek, 120' stratigraphically above sample PSUA2023. Grey siltstone.

LOCALITY PSUA2025

Type Yamhill Formation, upper member.

Located on west bank of Gooseneck Creek, 65' stratigraphically above sample PSUA2024. Grey siltstone.

LOCALITY PSUA2026

Type Yamhill Formation, upper member.

Located on west bank of Gooseneck Creek, 99' stratigraphically above sample PSUA2025. Grey siltstone.

LOCALITY PSUA2027

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 182' stratigraphically above sample PSUA2026, about 650' downstream from the confluence of Mill and Gooseneck Creek. Grey siltstone.

LOCALITY PSUA2028

Type Yamhill Formation, upper member.

Located on east bank of Mill Creek, 64' stratigraphically above sample PSUA2027. Grey siltstone.

LOCALITY PSUA2029

Type Yamhill Formation, upper member.

Located on east bank of Mill Creek, 140' stratigraphically above sample PSUA2028. Grey siltstone.

LOCALITY PSUA2030

Type Yamhill Formation, upper member.

Located on east bank of Mill Creek, 86' stratigraphically above sample PSUA2029. Grey siltstone.

LOCALITY PSUA2031

Type Yamhill Formation, upper member.

NW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec. 41, T6S, R6W. Located on the west bank of Mill Creek, 150' downstream from the mouth of an unnamed tributary of Mill Creek, 137' stratigraphically above sample PSUA2030. Grey siltstone.

LOCALITY PSUA2032

Type Yamhill Formation, upper member.

Located on west bank of Mill Creek, 74' stratigraphically above sample PSUA2031. Grey siltstone.

LOCALITY PSUA2033

Yamhill Formation.

Located on east bank of Mill Creek, 800' downstream from sample PSUA2032. Grey siltstone.

LOCALITY PSUA2034

Yamhill Formation.

SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 39, T6S, R6W. Located on west bank of Mill Creek, 200' upstream from the bridge. Grey siltstone.

LOCALITY PSUA2035

Yamhill Formation.

SW $\frac{1}{4}$, Sec. 67, T6S, R6W. Located on east bank of Mill Creek, 200' upstream from highway bridge. Grey siltstone.

LOCALITY PSUA2036

Nestucca Formation.

SE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 65, T6S, R6W. Located on west bank of Mill Creek, 100' downstream from a bridge near the Mill Creek School. Grey siltstone.

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Figure 3. Sample Locality Map.