

GSA Data Repository Item # 91-21

Title of article Evolution of a Permo-Triassic sedimentary melange,

Grindstone terrane, east-central Oregon

Author(s) Charles D. Blome and Merlynd K. Nestell

see Bulletin v. 103, p. 1280 - 1296

Contents

15 pg.

SUPPLEMENTARY DATA 8138B

Locality Descriptions

Samples bearing USGS MR and DR numbers in parens were processed at the U.S. Geological Survey facilities in Menlo Park, California and Denver, Colorado. Samples with a "35S" prefix were collected by Nestell and are housed at the University of Texas at Arlington, Arlington, Texas. All radiolarian faunas are assignable to the radiolarian zonal scheme proposed by Ishiga (1986a, 1986b).

1. 82CB-101A (USGS MR 4578). USGS Suplee (7.5') quad.: T.17S., R.26E., NW¹/₄, NE¹/₄, sec. 20, east side of Bull Creek; locality not illustrated in Fig. 1. Black chert clast from chert pebble conglomerate, Begg Member of the Vester Formation. Radiolarian fauna poorly preserved, of Pennsylvanian or Permian age.
2. 82CB-105A-E, (USGS MR 4591-4595). USGS Delintment Lake (15') quad.: T.18S., R.25E., SW¹/₄, SW¹/₄, corner sec. 27, north side of unnamed reservoir. Small exposure of red and green chert approximately 10 ft thick; samples 82CB-105A-D *insitu*, 105E float; all samples red chert. 82CB-105B,C&E collected for radiolarians (see Fig. 2), samples 105A&D collected for petrographic analyses. All radiolarian faunas assignable to the *Pseudoalbaillella globosa* Zone (late Leonardian to early Guadalupian).
3. 82CB-108A-G (USGS DR 117-123). USGS Suplee (7.5') quad.: T.18S., R.25E., SE¹/₄, NE¹/₄, sec. 10, top of butte. Small exposure of red chert, individual chert beds much thicker (ave. 6 in) than other beds. Samples collected at approx. 1 ft. intervals, from east to west across chert exposure. These samples represent a recollection of loc. 82CB-108 (see Blome and others, 1986, p. 91). *Pseudoalbaillella lomentaria* Zone (middle to late Wolfcampian).
4. 82CB-109A-C (USGS MR 4909-4611). USGS Delintment Lake (15') quad.: T.18S., R.25E., NW¹/₄, NW¹/₄, sec. 27. Green tuff associated with chert breccia, very minor red and green chert lenses intermixed; 109A thin-section sample of thin-bedded green tuff, 109B and 109C thin-bedded, green and gray tuff, respectively. Radiolarians assignable to the *Neoalbaillella optima* Zone (late Guadalupian to Djulfian).
5. 82CB-111A,B (USGS MR 4613-4614). USGS Delintment Lake (15') quad.: T.18S., R.25E., SW¹/₄, SE¹/₄, sec. 21. Small, low lying chert exposure of thinly-bedded red chert, 111A *insitu*, 111B float from near base of exposure. Radiolarian fauna from 111A correlates with the *Follicucullus monacanthus* Zone (late Leonardian to early Guadalupian). Fauna from 111B assignable to the top of the *Pseudoalbaillella lomentaria* or the *Ps. scalprata* m. *rhombothoracata* Zone (late Wolfcampian).
6. 82CB-114A-C (USGS MR 4619-4621). USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.25E., NW¹/₄, NW¹/₄, sec. 17, 0.2 mi. NE of eastern extension of Three Buttes. Approximately 20 ft of red, somewhat metamorphosed chert is exposed, chert grades into light brown cherty tuff; 114A,B collected near base of exposure (NE side), 114C approx. 4 ft above base.

Faunas from 114A,B assignable to the *Albaillella sinuata* Zone (Leonardian). Fauna from 114C assignable to the *Pseudoalbaillella* sp. C Zone (late Leonardian).

7. 82CB-115 (USGS MR 4622). USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.25E., SW¹/4, NE¹/4, sec. 18, north flank of Three Buttes. Black chert float. *Follicucullus scholasticus* or *Neoalbaillella optima* Zones (late Guadalupian to Djulfian).
8. 83CB-101A,B (USGS MR 4084). USGS Twelvemile Reservoir (7.5') quad.: T.18S., R.24E., SW¹/4, NE¹/4, sec. 25, approximately same location as Merriam and Berthiaume's (1943) loc. 21. Greenish-black chert beneath and overlying black limestone, 101A near base of outcrop (barren of radiolarians), 111B (for petrographic analyses) approx. 4 ft. above the base and overlying black limestone.
9. 83CB-106A,B (USGS MR 3770-3771). USGS Suplee (7.5') quad.: T.18S., R.25E., NW¹/4, SE¹/4, sec. 11, top of butte. Small exposure of red and green chert, approx. 20 ft of section exposed, both samples red chert. These samples represent a recollection of loc. 82CB-106 (see Blome and others, 1986, p. 91). *Pseudoalbaillella lomentaria* Zone (middle to late Wolfcampian).
10. 85CB-039. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.24E., SW¹/4, NE¹/4, sec. 23. Recemented coarse-grained cataclastic limestone containing abundant angular chert fragments, sand to pebble in size.
11. 85CB-040A-C (USGS DR 027-029). USGS Funny Butte (7.5') quad., T.18S., R.27E., SW¹/4, SE¹/4, sec. 8, south of hill 5361; locality not illustrated in Fig. 1. Chert cobble (float). Begg Member of the Vester Formation, chert clasts from conglomerate bed, most of outcrop silty and recrystallized crinoidal limestone with minor chert, siltstone, and volcaniclastic clasts. 85CB-040A-C dark green chert clasts, outcrop also contains abundant fusulinid, bryozoan, coral, and crinoid fragments, 040B and 040C black chert clasts. All chert clasts barren of radiolarians.
12. 85CB-040D (USGS DR 030). USGS Funny Butte (7.5') quad., T.18S., R.27E., SW¹/4, SE¹/4, sec. 8, northwest of hill 5361; locality not illustrated in Fig. 1. Begg(?) Member of the Vester Formation, siliceous mudstone float sample, very typical of the overlying Upper Triassic Rail Cabin Mudstone Member of the Vester Formation (Blome and others, 1986), collected on north slope of loc. 46. Radiolarian fauna undifferentiated Late Permian (probably Guadalupian to Djulfian in age).
13. 85CB-041 (USGS DR 031). USGS Suplee (7.5') quad., T.18S., R.25E., NE¹/4, SW¹/4, sec. 10. Float exposure of dark siliceous mudstone topographically beneath exposures of Permian limestone. Radiolarian fauna of undifferentiated Late Permian (probably Guadalupian) age).
14. 85CB-042 (USGS DR 032). USGS Twelvemile Reservoir (7.5') quad., T.19S., R.25E., NW¹/4, SW¹/4, sec. 6. Upslope of Merriam and Berthiaume's (1943) loc. 13. Unnamed chert unit. Black chert (secondary? or spicular) interbedded with lighter-colored, recrystallized limestone, limestone beds pinch and swell, outcrop approximately 10 ft thick.

Follicucullus monacanthus to *Neoalbaillella optima* Zones (late Leonardian to Djulfian)

15. 85CB-044A₁&A₂, (USGS DR 034&035). USGS Delintment Lake (15') quad, T.18S., R.25E., NE¹/₄, NW¹/₄, sec. 29. Red chert clasts (float) from conglomerate mapped as the Spotted Ridge Formation by Merriam and Berthiaume (1943), collected very near sandstone beds, radiolarians well preserved. *Pseudoalbaillella scalprata* m. *rhombothoracata* Zone (late Wolfcampian).
16. 85CB-044B (USGS DR 036). Approximately same locality as for 85CB-044A₁. Large silty mudstone concretions within conglomerate beds in the Grindstone terrane (mapped as the Spotted Ridge Formation by Merriam and Berthiaume, 1943), concretions typically contain *Nuculana*-type bivalves and wood fragments
17. 85CB-045A,B (USGS DR 037&038). USGS Suplee (7.5') quad, T.18S., R.25E., NE¹/₄, SW¹/₄, sec. 9. Dark red chert beds at top of topographic high, strike N40° W, dip 80° SW. Sample 045B from same lithology as 045A except chert beds display current laminations, and alternating dark and light red laminae. Radiolarians poorly preserved (Pennsylvanian or Permian).
18. 85CB-046. USGS Suplee (7.5') quad.: T.18S., R.25E., boundary between SW¹/₄ and SE¹/₄, sec. 9, east of South Fork of Trout Creek. Coarse chert-grain siltstone.
19. 85CB-047A,B. USGS Suplee (7.5') quad.: T.18S., R.25E., 047A = NW¹/₄, NW¹/₄, sec. 10, 047B = NE¹/₄, NW¹/₄, sec. 10. Chert-grain sandstone, comprises a large portion of the matrix of the Grindstone terrane.
20. 86CB-044A (USGS DR 304). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., NW¹/₄, NW¹/₄, sec. 20, just east of dirt rd. near 5080 ft. elevation line. Small piece of green chert float. *Pseudoalbaillella globosa* Zone (late Leonardian to Early Guadalupian).
21. 86CB-044B (USGS DR 305). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., NE¹/₄, NE¹/₄, sec. 19, just west of dirt rd. near 5080 ft. elevation line. Dark green chert float with dark, replaced radiolarians. Radiolarians poorly preserved (undifferentiated Permian).
22. 86CB-044C. USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., NW¹/₄, sec. 20, just east of dirt rd. near 5060 ft. elevation line. Thin-section sample from approx. 200 ft. of chert grain siltstone and sandstone with interbedded fine siltstone. Grades into chert pebble conglomerate in small areas.
23. 86CB-045 (USGS DR 306). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., boundary between the SW¹/₄ and SE¹/₄ of the SE 1/4 sec. 18, just NE of junction of two dirt rds. south of Three Buttes. Thin-bedded siliceous mudstone, very unlike other red chert of the Grindstone terrane, no visible radiolarians, outcrop very similar to red chert outcrop on the northwest end of Three Buttes (Coyote Butte). *Follicucullus scholasticus* Zone (late Guadalupian).

24. 86CB-046A,B (USGS DR 307&308). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., SE¹/₄, NE¹/₄, sec. 18, south flank of Three Buttes, topographically below most easterly saddle, between 5220 and 5240 ft elevation lines. Samples very black, very aphanitic pieces of chert float. Radiolarians from 046A poorly preserved (late Permian undifferentiated); fauna from 046B probably *Pseudoalbaillella globosa* Zone (late Leonardian to early Guadalupian).
25. 86CB-047 (USGS DR 308). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., SE¹/₄, NE¹/₄, sec. 18, south flank of Three Buttes, sample approx. 75 ft southwest of loc. 86CB-046. Green chert rubble surrounded by siltstone/sandstone matrix. This green chert very similar to chert on the southwest side of Wade Butte. *Follicucullus scholasticus* Zone (late Guadalupian).
26. 86CB-048A-C (USGS DR 310-312). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., SW¹/₄, NE¹/₄, sec. 18, just south of 5246 ft. elevation mark. 040A green chert float, 040B&C red chert float. Radiolarians from 048A poorly preserved (Permian undifferentiated); 048B barren; fauna from 048C *Follicucullus monacanthus* to *F. scholasticus* Zones (Guadalupian undifferentiated).
27. 86CB-049A&B (DR 313&314). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., SW¹/₄, NE¹/₄, sec. 18, southwest of 5246 ft elevation mark. Red chert samples from large rubble outcrop situated below saddle of the two western buttes. *Follicucullus scholasticus* Zone (late Guadalupian).
28. 86CB-050 (DR 315). USGS Delintment Lake (15') quad, T.19S., R.25E., boundary between SW¹/₄, SE¹/₄, sec. 17, large pod of chert south of dirt rd. leading to Williams Reservoir. Gray/black and green chert rubble on small topographic high, weathers buff white with extensive iron staining. Radiolarians of Early Triassic (Scythian) age.
29. 86CB-051 (USGS DR 316). USGS Delintment Lake (15') quad, T.19S., R.25E., NW¹/₄, SE¹/₄, sec. 17, east side of dirt rd. leading to Williams Reservoir. Banded and massive green to buff chert, beds to 8 in. thick, dipping almost vertical. *Follicucullus scholasticus* Zone (late Guadalupian).
30. 86CB-052A,B (USGS DR 317-318). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.24E., SE¹/₄, NW¹/₄, sec. 13, along 4820 ft. elevation line, north of east-west drainage. Small pieces of red chert from chert rubble pile. Radiolarians from 052A poorly preserved (late Permian undifferentiated; 052B *Follicucullus monacanthus* to *F. scholasticus* Zones (Guadalupian undifferentiated).
31. 86CB-053 (USGS DR 319). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.24E., SW¹/₄, SW¹/₄, sec. 13, southwest of Tucker Butte (5217 ft elevation mark). Small pieces of red chert from chert rubble, chert rubble encircles southwest and west side of Tucker Butte. Limestone predominates on northeast and east sides. *Follicucullus monacanthus* Zone (early Guadalupian).
32. 86CB-054 (USGS DR 320). USGS Twelvemile Reservoir (7.5') quad, T.19S., R.24E., south boundary between secs. 13 and 14 directly west of Tucker Butte (5217 ft elevation mark). Large exposure of red chert collected

- near fence line, 30-40 ft above drainage, part of trend which enwraps southwest and west flank of Tucker Butte. *Follicucullus scholasticus* Zone (late Guadalupian).
33. 86CB-055 (USGS DR 321). USGS Suplee (7.5') quad, T.17S., R.25E., SW¹/4, SE¹/4, sec. 34, along 5120 ft elevation line. Black argillite float, softer than the Rail Cabin Mudstone Member of the Vester Formation (Blome and others, 1987), collected on slope flank near limestone pod. Radiolarians poorly preserved (?Early Triassic).
34. 86CB-056 (USGS DR 322). USGS Suplee (7.5') quad, T.18S., R.25E., NW¹/4, NW¹/4, sec. 11, west side of 4wd rd. Red chert from very eroded, low chert outcrop, mostly rubble, somewhat metamorphosed and fractured; outcrop near topographic high. *Follicucullus monacanthus* Zone (early Guadalupian).
35. 86CB-057 (USGS DR 323). USGS Suplee (7.5') quad, T.18S., R.25E., NW¹/4, NW¹/4, sec. 11, west side of 4wd rd., top of knoll. Approximately part of the same chert trend (ENE) containing 86CB-056, chert more altered to the north in direction of basalt caps. Very little outcrop exposed, high angle (almost vertical) dip. Nearly barren of identifiable radiolarians.
36. 86CB-058 (USGS DR 324). USGS Suplee (7.5') quad, T18S, R25E, SE¹/4, NE¹/4, sec. 3, directly west (WSW) of 5338 ft elevation mark. Red chert collected between jeep 4wd rd. and knoll; dark red, radiolarians not as well preserved as those collected to the south. *Pseudoalbaillella* sp. C to *Pseudoalbaillella globosa* Zones (late Leonardian to early Guadalupian).
37. 86CB-059A. USGS Suplee (7.5') quad., T.17S., R.25E., NW¹/4, SE¹/4, sec. 34, along 5280 ft elevation line. Small pieces of chert-grain sandstone collected for thin-section, mudstone matrix, mapped as the Weberg Member of the Snowshoe Formation by Dickinson and Vigrass (1965).
38. 86CB-059B (USGS DR 571). USGS Suplee (7.5') quad., T17S., R25E., NW¹/4, SE¹/4, sec. 34, just northwest of 86CB-059A. Small limestone concretions from silty shale and mudstone, mapped as the Warm Springs Member of the Snowshoe Formation by Dickinson and Vigrass (1965). 86CB-059B1 small, ellipsoidal carbonate concretion approx. 4 in. diameter containing well preserved radiolarians, micrite interior. Middle Jurassic (early Bajocian) radiolarians assignable to Zone 1B of Pessagno and others (1987, see Fig. 3).
39. 86CB-060. USGS Suplee (7.5') quad, T.18S., R.25E., SW¹/4, SW¹/4, sec. 3, directly northwest of North Fork of Trout Creek and dirt rd., along 4720 ft elevation line. Thin-section sample of chert-grain breccia forming large rounded outcrops which initially resemble chert pebble conglomerate.
40. 86CB-061 (USGS DR 572). USGS Twelvemile Reservoir quad., T.18S., R.24E., NW¹/4, SW¹/4, sec. 24. Small carbonate concretion containing well preserved radiolarians from mudstone matrix, south flank of Wade Butte. Mapped as undifferentiated Jurassic rocks by Merriam and Berthiaume (1943) and Buddenhagen (1967). Middle Jurassic (early Bajocian)

radiolarians assignable to Zone 1B of Pessagno and others (1987, see Fig. 3).

41. 86CB-062. USGS Twelvemile Reservoir (7.5') quad, T.18S., R.25E., SE¹/₄, NW¹/₄, sec. 30, north of drainage and west of dirt rd. heading northwest, approx. along 4840 ft elevation line. Thin-section sample of chert-grain sandstone collected directly west of Mississippian limestone exposure mapped as (type section) of the Coffee Creek Formation by Merriam and Berthiaume, 1943).
42. 86CB-063. USGS Twelvemile Reservoir (7.5') quad, T.18S., R.25E., SE¹/₄, NW¹/₄, sec. 30, approx. same loc. as 86CB-062 except 40-50 ft to the southwest. Thin-section sample of volcaniclastic sandstone, containing fossil wood debris.
43. 86CB-064. USGS Twelvemile Reservoir (7.5') quad, T.18S., R.25E., SW¹/₄, SE¹/₄, sec. 30, west side of dirt rd., along 4860 ft elevation line, west flank of Spike Butte. Thin-section sample of the Spotted Ridge volcaniclastic sandstone, greenish in color.
44. 87CB-017A,B (USGS DR 560 and 561 respectively). USGS Delintment Lake (15') quad., T.18S., R.25E., NE¹/₄, SW¹/₄, sec. 20, saddle between two topographic highs, south flank of ridge. Both samples red mudstone float. Poorly preserved radiolarians, 017A Late Permian undifferentiated; 017B Pennsylvanian or Permian undifferentiated.
45. 87CB-018 (USGS DR 562). USGS Twelvemile Reservoir (15') quad., T.19S., R.25E., NW¹/₄, NW¹/₄, sec. 17, eastern flank of Three Buttes (Coyote Butte). Small pod of red and green chert near sedimentary contact with Permian limestone. *Pseudoalbaillella globosa* Zone (late Leonardian to early Guadalupian).
46. 35S-01. USGS Funny Butte (7.5') quad, T.18S., R.27E., NE¹/₄, SE¹/₄, sec. 8; locality not illustrated in Fig. 1. Equivalent to Dickinson and Vigrass (1965, p. 26) localities D4-D7. Corals, fusulinids, and other fossils of Mississippian to Triassic age occur in the cobbles weathering from the Begg Member (mapped as Brisbois Member by Dickinson and Vigrass, 1965) of the Vester Formation.
47. 35S-02. USGS Twelvemile Reservoir (7.5') quad, T.28S., R.25E., SE¹/₄, NW¹/₄, sec. 30. Type section of Coffee Creek Formation (CC in Fig. 1) as mapped by Merriam and Berthiaume (1943). Also locality DS1 of Sada and Danner (1973). Medium sized limestone pod and surrounding float contains fusulinids, corals, brachiopods, and mollusc fragments.
48. 35S-03. USGS Twelvemile Reservoir (7.5') quad, T.19S., R.24E., NW¹/₄, NE¹/₄, sec. 12. Small outcrops of fusulinid-bearing limestone on N. side of rd. at dam of Twelvemile Reservoir.
49. 35S-04. USGS Suplee (7.5') quad, T.17S., R.25E., SE¹/₄, NE¹/₄, sec. 12. Top of isolated limestone pod about one mile northeast of A. Bernard ranch house, not illustrated in Fig. 1. Equivalent to Skinner and Wilde (1966) locality OR-4 and to Dickinson and Vigrass (1965) locality V192. Localities 35S-17, 17A, and 17B are at base of the pod, and across and in the drainage to the north.

50. 35S-05. USGS Suplee (7.5') quad, T.17S., R.25E., NE¹/4, SW¹/4, sec. 6. Top of isolated limestone pod about 1/2 mi NE of 35S-04, not illustrated in Fig. 1. Equivalent to Skinner and Wilde (1966) locality OR-5, and to Dickinson and Vigrass (1965, p. 16) locality V193.
51. 35S-06. USGS Suplee (7.5') quad, T.17S., R.25E., SW¹/4, SE¹/4, sec. 36. Equivalent to Dickinson and Vigrass (1965, p. 26) localities V175, V177, and to Skinner and Wilde (1966) locality OR-12. Fusulinids and other fossils of Permian and Triassic age occur in the cobbles weathering from the Begg Member (mapped as Brisbois Member by Dickinson and Vigrass, 1965) of the Vester Formation.
52. 35S-07. USGS Suplee (7.5') quad, T.18S., R.25E., center sec. 10. Fusulinid-bearing cobbles weathering from conglomerate on the north side of the rd. Locality 35S-23 is across stream on hill to the southwest.
53. 35S-08. USGS Twelvemile Reservoir (7.5') quad, T.18S., R.25E., SW¹/4, NW¹/4, sec. 32. Along ridge on east side of small tributary which enters Grindstone Creek from the north. Equivalent to Skinner and Wilde (1966) locality OR-3.
54. 35S-09. USGS Twelvemile Reservoir (7.5') quad, T.18S., R.25E., SE¹/4, NW¹/4, sec. 32. Near 35S-8 along ridge on east side of small tributary which enters Grindstone Creek from the north. Numerous exposures of fusulinid-bearing Permian limestone occur in a NE-SW trend across sections 29 and 32.
55. 35S-10. USGS Twelvemile Reservoir (7.5') quad, T.19S., R.24E., NE¹/4, SW¹/4, sec. 13, on northeast slopes of prominent knob (Tuckers Butte) composed of steeply dipping, fine-grained, fusulinid-bearing Permian limestone.
56. 35S-11. USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., center E line SW¹/4, sec. 18, small pod of fusulinid-bearing Coyote Butte limestone just N of dirt track.
57. 35S-12A-C. USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., NW¹/4, NW¹/4, sec. 17, along north side of easternmost prominent butte of Coyote Butte (Three Buttes). Fine-grained fusulinid-bearing limestone.
58. 35S-13. USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., S of center NE¹/4, sec. 18, north side of middle butte. Scarce large fusulinids in fine-grained limestone.
59. 35S-14. USGS Twelvemile Reservoir (7.5') quad, T.19S., R.25E., center sec. 18, on northwest side of southwesternmost butte. Scarce large fusulinids in fine-grained limestone.
60. 35S-15. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.24E., center sec. 23, NW of Black Snag Creek. Coarse-grained gray limestone.
61. 35S-16. USGS Suplee (7.5') quad.: T.17S., R.26E., NE¹/4, SW¹/4, sec. 6, topographic high west of dirt rd, not illustrated in Fig. 1. Equivalent to Skinner and Wilde's (1966) loc. OR-5.

62. 35S-17A. USGS Suplee (7.5') quad.: T.17S., R.25E., NE¹/₄, NE corner of sec. 12, large limestone pod north of dirt rd. along Crook and Grant County boundary, not illustrated in Fig. 1. Equivalent to Skinner and Wilde's (1966) loc. OR-4.
63. 35S-17B. USGS Suplee (7.5') quad.: T.17S., R.25E., NE¹/₄. NE corner sec. 12, small limestone pod north of dirt rd. near Crook and Grant County boundary, not illustrated in Fig. 1. Equivalent to Skinner and Wilde's (1966) loc. OR-4.
64. 35S-17C. USGS Suplee (7.5') quad: T.17S., R.25E., SE¹/₄, SE corner of sec. 1, small limestone pod north of dirt rd. near Crook and Grant County boundary, not illustrated in Fig. 1. Equivalent to Skinner and Wilde's (1966) loc. OR-4.
65. 35S-18. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.25E., SW¹/₄, NW¹/₄, sec. 6, near topographic high. Fusulinid-bearing limestone, interbedded with chert and limestone topographically below.
66. 35S-19. USGS Delintment Lake (15') quad.: T.18S., R.25E., NE¹/₄, SW¹/₄, sec. 20, west of topographic high. Small pod of sandy crinoidal limestone.
67. 35S-20. USGS Delintment Lake (15') quad.: T.18S., R.25E., NE¹/₄, SW¹/₄, sec. 20, south of topographic high. Pod of crinoidal limestone.
68. 35S-21. USGS Twelvemile Reservoir (7.5') quad.: T.18S., R.25E., SE¹/₄, NE¹/₄, sec. 30, near boundary with sec. 29. Fusulinid-bearing limestone float.
69. 35S-22. USGS Suplee (7.5') quad.: T.18S., R.25E., SE¹/₄, SW¹/₄, sec. 10. Small oolitic limestone pod, west of drainage.
70. 35S-23. USGS Suplee (7.5') quad: T.18S., R.25E., NE¹/₄, SW¹/₄, sec. 10, SW of 4wd rd. to Weberg Butte. Fusulinid-bearing cobbles weathering from the Begg Member of the Vester Formation.
71. 35S-24. USGS Suplee (7.5') quad, T.18S., R.25E., center E line, NW¹/₄, sec. 16. Prominent large limestone pod capping hill. Unnamed Devonian limestone.
72. 35S-36. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.25E., SE¹/₄, SW¹/₄, sec. 18, north of dirt rd. Fusulinid-bearing Permian limestone.
73. 35S-37. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.24E., NW¹/₄, NW¹/₄, sec. 24, near boundary with sec. 13. Large exposure of limestone between Tucker Butte and large unnamed butte to the south.
74. 35S-38. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.24E., center SW¹/₄, sec. 13, near top of Tucker Butte (5217 ft. elevation).
75. 35S-39. USGS Delintment Lake (15') quad.: T.19S., R.25E., NW¹/₄, SE¹/₄, sec. 17, east of dirt rd. and west of drainage. Small pod of oolitic limestone.

76. 35S-40. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.24E., SE¹/₄, SW¹/₄, sec. 12, near boundary with sec. 13. Coral- and brachiopod-rich limestone near top of thick limestone succession.
77. 35S-41. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.24E., NE¹/₄, NW¹/₄, sec. 13. Gray crinoidal limestone near base of thick limestone succession.
78. 35S-42. USGS Twelvemile Reservoir (7.5') quad.: T.19S., R.24E., SE¹/₄, NW¹/₄, sec. 13, west of spring and north of drainage.
79. 35S-43: USGS Suplee (7.5') quad.: T.17S., R.25E., SW¹/₄, SW¹/₄, sec. 34, near boundary with sec. 3, directly NW of 35S-44. Small limestone pod.
80. 35S-44. USGS Suplee (7.5') quad.: T.17S., R.25E., NE¹/₄, NW¹/₄, sec. 3. Large lenticular limestone pod west of "Seeps".
81. 35S-45. USGS Suplee (7.5') quad.: T.17S., R.25E., SW¹/₄, SW¹/₄, southwestern corner of sec. 34, directly south of "Seep". Small limestone pod.
82. 35S-46. USGS Suplee (7.5') quad.: T.18S., R.25E., NW¹/₄, NW¹/₄, NW corner of sec. 11. Small limestone pod
83. 35S-47. USGS Twelvemile Reservoir (7.5') quad.: T.18S., R.25E., NW¹/₄, NW¹/₄, sec. 32. Limestone exposure containing the gastropod *?Worthenia* and a Permian conodont assigned to *Sweetognathus*.
84. 35S-48. USGS Twelvemile Reservoir (7.5') quad.: T.18S., R.25E., SW¹/₄, SW¹/₄, sec. 29. Fusulinid-bearing crinoidal limestone.
85. 35S-49. USGS Twelvemile Reservoir (7.5') quad.: T.18S., R.25E., SE¹/₄, NW¹/₄, sec. 30. Fossiliferous sandstone cobble near Mississippian limestone exposure (mapped as type section of the Coffee Creek Formation by Merriam and Berthiaume, 1943).
86. BR-1. USGS Twelvemile Reservoir (7.5') quad: T.19S., R.25E., SE¹/₄, SW¹/₄, sec. 19. Coral- and brachiopod-bearing limestone pod approx. 0.5 mi. northwest of the old Berger Ranch.
87. BR-2. USGS Twelvemile Reservoir (7.5') quad: T.19S., R.25E., SE¹/₄, SW¹/₄, sec. 19. Small limestone pod approx. 0.5 mi. northwest of old Berger Ranch and just to the east of loc. BR-1.

Figure Captions

Fig. 1. Radiolarian, fusulinid, and conodont collection localities in the Grindstone terrane. Larger numbers denote section number; smaller numbers denote localities.

Fig. 2a. Occurrence of Permian radiolarian taxa for chert localities (82CB-to 85CB-series) within the Grindstone terrane, east-central Oregon. Shaded pattern indicates presence of taxa. The poor preservation of some faunas precluded relative abundance determinations.

Fig. 2b. Occurrence of Permian radiolarian taxa for chert localities (85CB- to 87CB- series) within the Grindstone terrane, east-central Oregon. Shaded pattern indicates presence of taxa. The poor preservation of some faunas precluded relative abundance determinations.

Fig. 3. Occurrence of fusulinid taxa from the Grindstone and Izee (Begg Member of the Vester Formation) terranes, east-central Oregon. Shaded pattern indicates presence of taxa, 35S-1 in text = 35S001 in Fig. , etc. The poor preservation of some faunas precluded relative abundance determinations.

Fig. 4. Relative abundances of radiolarian taxa from carbonate concretions from Middle Jurassic clastic sedimentary rocks, Warm Springs Member of the Snowshoe Formation, and from undifferentiated Jurassic clastic sedimentary rocks near Wade Butte. R = Rare (1-5 specimens), C = Common (6-20 specimens), and A = Abundant (> 20 specimens).

References Cited

- Ishiga, H., 1986a, Late Carboniferous and Permian radiolarian biostratigraphy of southwest Japan: Journal of Geosciences, Osaka City University, v. 29, art. 3, p. 89-100.
- _____, 1986b, Radiolarian biostratigraphy of the Japanese Permian: Fourth North American Paleontological Convention, Boulder, Colorado, Aug. 12-15, 1986, p. A21.

FIGURE 1

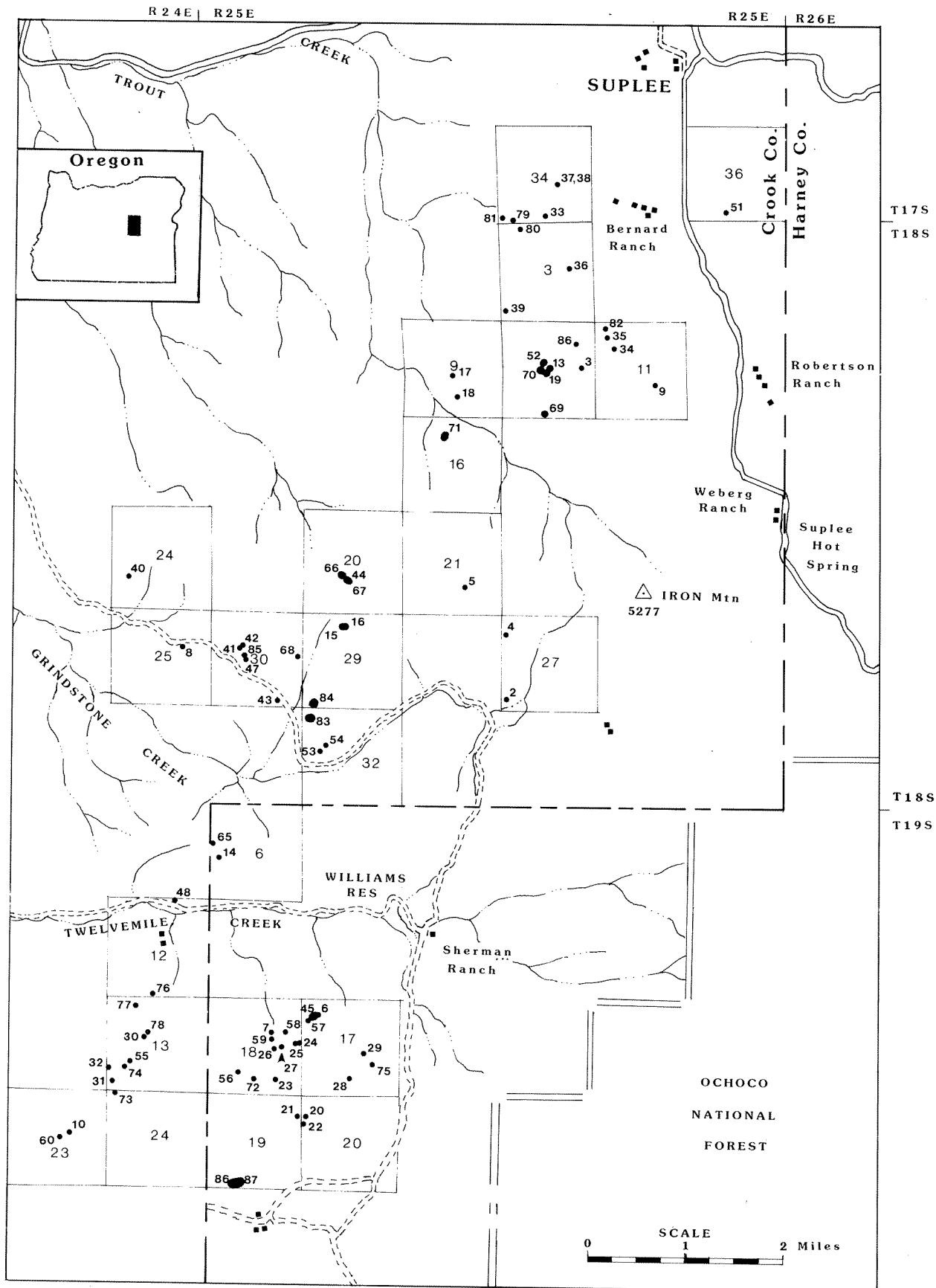


FIGURE 2a

GRINDSTONE RADIOLARIAN FAUNAS	PRESENCE/ABSENCE	
	= Taxa Present	
Albaillella asymmetrica	82CB-105B	
Albaillella triangularis	82CB-105C	
Albaillella sp.	82CB-105E	
Archaeosermantis venusta	82CB-108A	
Entactinia densissima	82CB-108B	
Entactinia itsukaichiensis	82CB-108C	
Entactinia modesta	82CB-108D	
Entactinia sp.	82CB-108E	
Entactiosphaera? crassispinosa	82CB-108F	
Follicucullus bipartitus	82CB-108G	
Follicucullus charveti	82CB-109A	
Follicucullus monacanthus	82CB-109B	
Follicucullus scholasticus m. I	82CB-109C	
Follicucullus scholasticus m. II	82CB-111A	
Follicucullus ventricosus	82CB-111B	
Follicucullus sp.	82CB-114A	
Hegleria mammifera	82CB-114B	
Helioentactinia nazarovi	82CB-114C	
Ishigaum trifustis	82CB-115	
Ishigaum sp.	83CB-101	
Latentifistula crux	83CB-106A	
Latentifistula aff. crux	83CB-106B	
Latentifistula patagilateralis	85CB-040A	
Latentifistula texana	85CB-040B	
Latentifistula sp.	85CB-040C	
Meschedea permica	85CB-040D	
Nazarovella gracilis	85CB-041	
Nazarovella sp.		
Neobaillella sp.		
Parentactinia nakatsugawaensis		
Pseudoalbaillella aff. annulata		
Pseudoalbaillella fusiformis		
Pseudoalbaillella globosa		
Pseudoalbaillella lomentaria		
Pseudoalbaillella aff. lomentaria		
Pseudoalbaillella longicornis		
Pseudoalbaillella aff. longicornis		
Pseudoalbaillella ornata		
Ps. scalprata m. postscalprata		
Ps. scal. m. rhombothoracata		
Ps. scalprata m. scalprata		
Pseudoalbaillella aff. scalprata		
Pseudoalbaillella sp.		
Pseudotormentus kamigoriensis		
Tetragregnon? japonicum		
Sample barren		

FIGURE 2b

GRINDSTONE RADIOLARIAN FAUNAS	
PRESENCE/ABSENCE	
[Black Box]	= Taxa Present
<i>Albaillella asymmetrica</i>	85CB-044A1
<i>Albaillella triangularis</i>	85CB-044A2
<i>Albaillella</i> sp.	85CB-045A
<i>Archaeosemantis venusta</i>	85CB-045B
<i>Entactinia densissima</i>	86CB-044A
<i>Entactinia itsukaichiensis</i>	86CB-044B
<i>Entactinia modesta</i>	86CB-045
<i>Entactinia</i> sp.	86CB-046A
<i>Entactiosphaera?</i> <i>crassispinosa</i>	86CB-046B
<i>Follicucullus bipartitus</i>	86CB-047
<i>Follicucullus charveti</i>	86CB-048A
<i>Follicucullus monocanthus</i>	86CB-048B
<i>Follicucullus scholasticus</i> m. I	86CB-049A
<i>Follicucullus scholasticus</i> m. II	86CB-049B
<i>Follicucullus ventricosus</i>	86CB-050
<i>Follicucullus</i> sp.	86CB-051
<i>Hegleria mammifera</i>	86CB-052A
<i>Helioentactinia nazarovi</i>	86CB-052B
<i>Ishigum trifustis</i>	86CB-053
<i>Ishigum</i> sp.	86CB-054
<i>Latentifistula crux</i>	86CB-055
<i>Latentifistula</i> off. <i>crux</i>	86CB-056
<i>Latentifistula patagilateralis</i>	86CB-057
<i>Latentifistula texana</i>	86CB-058
<i>Latentifistula</i> sp.	87CB-017A
<i>Meschedea permica</i>	87CB-017B
<i>Nazarovella gracilis</i>	87CB-018
<i>Nazarovella</i> sp.	
<i>Neopalaillella</i> sp.	
<i>Parentactinia nakatsugawaensis</i>	
<i>Pseudoalbaillella</i> aff. <i>annulata</i>	
<i>Pseudoalbaillella</i> <i>fusiformis</i>	
<i>Pseudoalbaillella</i> <i>globosa</i>	
<i>Pseudoalbaillella</i> <i>lomentaria</i>	
<i>Pseudoalbaillella</i> aff. <i>lomentaria</i>	
<i>Pseudoalbaillella</i> <i>longicornis</i>	
<i>Pseudoalbaillella</i> off. <i>longicornis</i>	
<i>Pseudoalbaillella</i> <i>ornata</i>	
<i>Ps. scalprata</i> m. <i>postscalprata</i>	
<i>Ps. scal.</i> m. <i>rhombothoracata</i>	
<i>Ps. scalprata</i> m. <i>scalprata</i>	
<i>Pseudoalbaillella</i> aff. <i>scalprata</i>	
<i>Pseudoalbaillella</i> sp.	
<i>Pseudotormentus kamigoriensis</i>	
<i>Tetragregon?</i> <i>japonicum</i>	
Sample barren	

FIGURE 3

FIGURE 4

RELATIVE ABUNDANCE	R = Rare < 5/200	C = Common 5-10/200	A = Abundant > 10/200	86CB-059B	86CB-061
<i>Acanthoicrus</i> sp.					
<i>Hilgumastera</i> sp.					
<i>Hilarisex</i> sp.					
<i>Homoeoparonella</i> sp.					
<i>Hsuum belliatulum</i>					
<i>Hsuum roseobudense</i>					
<i>Hsuum sp.</i>					
<i>Lupherium</i> aff. <i>nitidum</i>					
<i>Lupherium</i> sp.					
<i>Napora</i> <i>bearensis</i>					
<i>Napora</i> sp.					
<i>Pantanellum</i> <i>buntonense</i>					
<i>Pantanellum</i> <i>vigrassi</i>					
<i>Parvicincingula</i> <i>matura</i>					
<i>Parvicincingula</i> sp.					
<i>Perispyridium</i> <i>facetum</i>					
<i>Perispyridium</i> <i>tamarackense</i>					
<i>Ristola</i> sp.					
<i>Tetradityma</i> sp.					
<i>Turantha</i> <i>barbarea</i>					
<i>Tetrads gratioosa</i>					
<i>Zartus</i> <i>imlayi</i>					
<i>Zartus</i> <i>jurasicus</i>					
<i>Zartus</i> <i>aff. jurasicus</i>					
<i>Zartus thayieri</i>					