Table 2. Radiolarian data (previously unpublished) from the west-central part of the Howard Pass quadrangle, Alaska—Continued.

[All faunas identified by C.D. Blome and K.M. Reed unless otherwise indicated. Letters in field number refer to collector: ABs, S. Bie; AD, J.A. Dumoulin; ADo, J.H. Dover; AK, J.S. Kelley; ANs, S.W. Nelson; ANw, W.H. Nelson; ARm, R.T. Miyaoka; (A)Tr, I.L. Tailleur; and SK, S.M. Karl. Lithologic data under remarks are chiefly field descriptions; thin section observations by J.A. Dumoulin. No., number; loc, locality]

Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
1 Mlri	**Howard Pass C-5** 68°44'50"/ 158°55'20"	Poorly preserved forms including *Albaillella* sp. aff. *A. cartalla* (fragments only) *Belowea* sp. *Scharfenbergia concentrica* *Scharfenbergia* sp. aff. *S. ruestae*. [92AD51E; USGS DR 1521]	Mississippian (Meramecian to Chesterian).	White-weathering, gray chert, 1 m below(?) mafic sill. In thin section, chert is fine-grained and pale gray, with 5–25 percent radiolarians; tests chiefly filled with chalcedony or, less commonly, opaque material.
		Poorly preserved forms including *Belowea* sp. *Scharfenbergia impella* group (usage of Holdsworth and Murchey, 1988) *Scharfenbergia* sp. cf. *S. tailleurense.* [92AD51I; USGS DR 1522]	late Early to early Late Mississippian (Osagean to Meramecian).	A 5-cm-thick layer of light-gray to light-green chert, within an interval of red chert; ≈13 m stratigraphically below(?) 92AD51E. In thin section, chert is pale-gray and very fine grained, and contains abundant radiolarians; tests filled with coarser crystalline quartz or chalcedony.
4 IPMap	**Howard Pass C-5** 68°38'20"/ 158°57'40"	Poorly preserved forms including *Scharfenbergia impella* group *Scharfenbergia* sp. cf. *S. ruestae* Won. No abaillellids present. Abundant sponge spicules. [92ADo201; USGS DR 1473]	Mississippian (late Osagean to possibly Chesterian).	Black chert, locally orange-weathering.
5 JTro	**Howard Pass C-5** 68°39'08"/ 158°54'35"	Numerous robust-spined, bipolar radiolarians. Abundant spicules (some robust stauracts or hexactines) visible on etched surfaces. Bipolar spines exhibit an internal spicule that extends to the internal shell. Slight torsion of spines suggests *Pseudostylosphaera japonica* (Nakaseko and Nishimura). *Eptingium* sp. (posssibly *E. manfredi* Dumitrica). A nassellarian that strongly resembles *Triassocampe* (possible *T. scalaris* Dumitrica, Kozur and Mostler). Several other nassellarians; in one, the apical chamber was swollen, wider than the upper chambers. *Sarla kretaensis* Kozur and Krahl. [92AK22a; USGS DR 1586]	Middle Triassic (Ladinian undifferentiated).	Chert, greenish gray, locally baritic, very thin and crumpled lens, thicker bedded; some small radiolarians.
		Etched surface shows numerous heavy grooved spines and large bipolar forms. The sample is a radiolarite that also contains abundant sponge spicules. *Eptingium manfredi* Dumitrica. *Triassistephanidium laticorne* Dumitrica. *Pseudostylosphaera compacta* (Nakaseko and Nishimura) (polar spines lacking torsion). All nassellarians poorly preserved. [92AK22b; USGS DR 1587]	Middle Triassic (Ladinian undifferentiated).	Chert, greenish gray, very thin and crumpled lens, thicker bedded; some small radiolarians. Sample from bank about 10 m to east of 92AK22a; chert is rusty weathering, and contains siliceous shale interbeds and no barite.
6 JIPip	**Howard Pass C-5** 68°39'00"/ 158°51'20"	Poorly preserved forms including *Betraccium* cf. *B. deweveri* Blome ?*Livarella* sp. (casts) ?*Pseudoheliodiscus* sp. (broken cortical ring) *Saitoum* sp. (broken). [92ADo297A; USGS DR 1485]	Late Triassic (probably late Norian; *Betraccium deweveri* Zone of Blome, 1984).	Gray, translucent, thin-bedded chert that contains thin argillite partings.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
8 IPMap	**Howard Pass C-5** 68°39'10"/ 158°45'50"	Poorly preserved forms including ?*Belowea* sp. (fragments) ?*Paleoxyphostyla* sp. (robust spines only) *Scharfenbergia impella* group (flattened and distorted tests of younger morphotypes). [92ADo275A; USGS DR 1482]	Mississippian (possibly Meramecian-Chesterian).	Medium- to dark-gray, thin- to thick-bedded chert containing abundant carbonate interbeds.
9 IPMap	**Howard Pass C-5** 68°38'06"/ 158°42'30"	Poorly preserved forms including *Albaillella* sp. (one broken short-bodied test) *Scharfenbergia impella* group (flattened and distorted tests). Robust sponge spicules. [92ADo272A; USGS DR 1480]	Mississippian (Osagean-Meramecian)	Sample of chert that underlies zone of reddish cherty argillite; some light-weathering bedding surfaces have radiolarians.
10 JIPip	**Howard Pass C-5** 68°37'50"/ 158°52'40"	Poorly preserved forms including Medial and distal parts of spines questionably belonging to ?*Capnuchosphaera* sp. and (or) ?*Icrioma* sp. [92ABs180B; USGS DR 1506]	?Late Triassic	Sample from an interval of unit JIPip too small to show on geologic map; sample is greenish gray chert that overlies unit IPMap. Conodonts (table 1) from dolostone layers in unit IPMap at this locality are Mississippian .
11 JIPip	**Howard Pass C-5** 68°37'30"/ 158°51'50"	Poorly preserved assemblage including ?*Eptingium* sp. (heavy triradiate spine fragments) *Triassocampe* sp. (casts with little ornamentation). 92ADo226B; USGS DR 1477)	Middle Triassic (probably Ladinian)	Grayish-green chert and cherty argillite; fairly radiolarian-rich.
12 IPMap	**Howard Pass C-5** 68°37'30"/ 158°51'40"	Poorly preserved assemblage including *Scharfenbergia impella* group *Scharfenbergia tailleurense* Holdsworth and Murchey Abundant twisted, bladed spines. [92ADo225B; USGS DR 1476]	Probably Mississippian (late Meramecian or slightly younger).	Sample from top of black, locally orange-weathering chert unit, just below contact with red chert and argillite of unit PIPs.
13 JTRo	**Howard Pass C-5** 68°34'50"/ 158°55'55"	Poorly preserved assemblage including *Capnuchosphaera* sp. (tumidaspine fragments only) ?*Pseudoheliodiscus* sp. (cortical ring fragments). [92ADo194B; USGS DR 1472]	Late Triassic (late Carnian or Norian)	Radiolarian-rich, medium-gray- to tan-weathering, predominantly cherty rocks; tan color may reflect bleaching and alteration.
15 JIPe	**Howard Pass C-5** 68°35'55"/ 158°48'00"	Poorly preserved forms including ?*Latentifistula* sp. (recrystallized central portions) ?*Nazarovella* sp. (guttered arms only) *Pseudotormentus* sp. (Y-shaped central part and arms) Abundant recrystallized spumellarians with no external meshwork. Large sponge spicules. [92ABs172; USGS DR 1504]	Permian (post-Wolfcampian)	Light-greenish-gray to light-gray chert abundantly stained with iron-oxide; underlies Otuk Formation.
16 JIPe	**Howard Pass C-5** 68°35'30"/ 158°48'05"	Poorly preserved forms including *Eptingium manfredi manfredi* (partial test and spines) *Plafkerium* sp. cf. *P. firmum* *Pseudostylosphaera coccostyla* *Triassocampe* sp. aff. *T. deweveri* *Triassocampe* sp. [92ABs181A; USGS DR 1509]	Middle Triassic (Ladinian)	
		Poorly preserved forms including *Capnodoce* sp. aff. *C. baldiensis* Blome ?*Pseudostylosphaera* sp. (partial tests) Abundant casts of *Triassocampe* spp. [92ABs181B; USGS DR 1510]	Late Triassic (probably Carnian; *Capnodoce* Zone of Blome, 1984, and Blome and others, 1988).	

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
17 PMk	**Howard Pass C-5** 68°35'/ 158°43.5'	Bipolar (two-spine forms). Incomplete robust tests (granular) with ?bifurcating points; also isolated, heavily grooved spines. Unidentifiable entactiniids. [92ATr38A; USGS DR 1583]	Probably Paleozoic	Rubble and subcrop of thick-bedded black chert.
18 JTrO	**Howard Pass C-5** 68°34'55"/ 158°43'15"	Etched surface—granular, with pits and rare casts and molds of spumellarians; no spines seem to be connected to these "molds;" spicules are abundant. The +80 fraction mostly composed of flakes (veinlets), a few coarse-meshed spumellarian fragments preserved. Fragment of a nassellarian that has costae resembling those of *Corum* Blome. Several broken spines assignable to *Capnuchosphaera* De Wever. A few *Khalerosphaera* spine fragments. Heavy grooved spines. A non-age diagnostic and poorly preserved conodont fragment. [92ATr38C; USGS DR 1585]	Late Triassic (late Carnian to late middle Norian).	Chert rubble, just below subcrop contact with *Monotis*-bearing limestone.
19 JTrO	**Howard Pass C-5** 68°36'15"/ 158°37'55"	Poorly preserved forms including ?*Canoptum* sp. (casts only) ?*Capnuchosphaera* sp. (tumidaspine fragments) *Triassocampe* sp. [92ADo264B; USGS DR 1479]	Triassic, undifferentiated (?Carnian)	Grayish-green chert, just below contact with *Monotis*-bearing limestone.
20 PMap	**Howard Pass C-5** 68°37'01"/ 158°35'05"	Poorly preserved forms including ?*Belowea* sp. (fragments) *Scharfenbergia impella* group (sensu Won) Poorly preserved undescribed spumellarians. Rare sponge spicules. [92ADo283A; USGS DR 1484]	Mississippian (Visean, undifferentiated).	Rubble of medium-gray to grayish-green chert; locally orange-weathering, covered with black lichen, and containing abundant radiolarians. No limestone interbeds.
21 PMk	**Howard Pass C-5** 68°35'45"/ 158°27'20"	Poorly preserved forms including Broken arms questionably belonging to the *Scharfenbergia impella* group Large, broken grooved spines. [92AD59G; USGS DR 1524]	Pre-Permian (?Mississippian)	Light-gray chert that contains from few to 25 percent radiolarians; local green-weathering laminae. Thin section is light-brown, fine-grained chert with thin laminae of dark-brown mud and 10–20 percent spicules and radiolarians. Conodonts (table 1) from limestone immediately underlying the chert at this locality are Mississippian (probably late Osagean).
25 JPip	**Howard Pass C-3** 68°38'15"/ 157°32'35"	Spumellarian casts stand out in high relief on etched surfaces. Radiolarite, but radiolarians and spicules pervasively poorly preserved and recrystallized. Spicules are flattened and could be poorly preserved fragments of *Pseudoheliodiscus* Kozur and Mostler. Isolated spines assignable to *Capnuchosphaera* sp. Several poorly preserved nassellarians (interior casts and at least two with numerous chambers; these are questionably assigned to *Latium* Blome or *Canoptum* Pessagno). [92ATr09A; USGS DR 1578]	Late Triassic (late Carnian to late middle Norian).	Ribbon-bedded, medium-greenish-gray-weathering, medium- to dark-gray chert; sample from top 1 ft of north-dipping, ≈5-m-thick section.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
25 JPip [cont.]	**Howard Pass C-3** 68°38'15"/ 157°32'35"	Etched surfaces show radiolarian outlines as simple forms. Small spicules and spines are present. The >80 fraction (the smallest residue for the third wash) contains a few featureless spheres. A few fragments of nassellarians exhibit costae similar to *Corum perfectum* Blome. *Corum* sp. ?*Latium* sp. *Triassocampe* sp. *Xipha pessagnoi* (Nakaseko & Nishimura) *Xipha* sp. [92ATr9B; USGS DR 1579]	Late Triassic (Carnian)	Sample from bottom 1 ft of ≈5-m-thick chert section, upper part of which was sampled as 92ATr9A
		The etched surface shows numerous spicules or perhaps broken spines, but radiolarian preservation poor. A fragment of a large spumellarian exhibits a complex mesh and a heavy grooved spine. A spindle-like cast of a nassellarian interior (consisting of six rings that do not change appreciably in diameter). A few hexactine spicules, but spicules are not common. [92ATr9C; USGS DR 1580]	Mesozoic	Sample from 1-ft interval in middle of ≈5-m-thick chert section, upper part of which was sampled as 92ATr9A.
PMap		Etched surfaces show the rock is radiolarian-rich—spines and spicules abundant; large pieces of clear quartz are common. Some matrix fragments exhibit veins(?) that intersect at several angles; interstices are filled with crystalline(?) quartz. One short, grooved primary spine. Rare short fragments of very robust spicules. Fragments of "ladders," both coarse and regular pores. Bladed spines that have spinules on the blade edges. Several poorly preserved fragments of ?latentifistulid centers (suggesting *Paronaella impella* Group forms). Fragments of spicules that have a curved, flattened double head, like a long curved double-bladed axe. [92ATr9X; USGS DR 1581]	Late Paleozoic. (While the forms are poorly preserved and are not identifiable to the species level, the presence of ladder-like forms and bladed spines are consistent with late Paleozoic faunas and probably pre-Permian faunas).	Sample from nodular, concretionary chert mass (probable interval of unit PMap that is too small to show on the geologic map).
26 JPip	**Howard Pass C-3** 68°38'2.4"/ 157°32'45"	Poorly preserved forms including *Capnodoce* sp. (partial tests that have broken primary spines) *Corum* sp. (broken tests) ?*Pseudosaturniforma* sp. (partial cortical ring). [92AD21A; USGS DR 1515]	Late Triassic (late Carnian to middle Norian; *Capnodoce* Zone of Blome, 1984, and Blome and others, 1988).	Sample from uppermost m of ≈5-m-thick chert interval; green, gray, and tan banded chert in 5-cm-thick beds. In thin section, fine-grained, dark, laminated chert containing ~~with~~ a few percent spicules and radiolarians.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
26 JPip [cont.]	**Howard Pass C-3** 68°38'2.4"/ 157°32'45"	Poorly preserved forms including *Capnuchosphaera* sp. (broken tumidaspines only) *Latium* sp. (casts) ?*Xenorum* sp. (broken spines and partial cortical shells) *Xipha striata* Blome. [92AD21B; USGS DR 1516]	Late Triassic (early to middle Norian; probably *Xipha striata* Subzone of the *Capnodoce* Zone of Blome, 1984).	Sample from 2 m below top of ≈5-m-thick chert interval; green and white banded chert in 5-cm-thick beds. In thin section, chert is fine-grained, greenish-brown, clay-rich(?) and contains minor spicules and radiolarians.
28 PMap	**Howard Pass C-3** 68°37'52"/ 157°30'50"	Etched surfaces show abundant radiolarians and hints of spicules. Quite thoroughly recrystallized, preservation of all radiolarians is poor. Several varieties of spumellarians suggested. Several poor triangular to tetrahedral forms that probably are varieties of *Scharfenbergia.* Coarse forms are probably spumellarians with matrix. A few stubby albaillellids (resembling *A. cartalla* Ormiston and Lane). Fragment of a taller, narower albaillellid. [92ATr8A; USGS DR 1575]	Mississippian (probably Osagean to Meramecian).	Gray to varicolored chert rubble, locally green and glassy.
		Etched surfaces appear uniformly recrystallized; radiolarians are casts only. Fragments of multi-shelled spumellarians possessing simple, thin spines. Fragments of thick spicules, simple and bladed spines with spinules. A long ichnofossil (?worm tube). A few forms resemble scharfenbergids. Multi-spined spumellarians. Scraps of pore mesh and portions of "latentifistulid" rays (not ladders) that have irregular pore patterns; these last suggest the "*Paronaella impella* group" for which Holdsworth and Murchey (1988) indicate a range of late Osagean to Morrowan(?). [92ATr8B1; USGS DR 1576]	Late Paleozoic (probably pre-Permian)	Rubble of dark gray chert ≈20 m downhill from 92ATr8A.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
28 IPMap [cont.]	**Howard Pass C-3** 68°37'52"/ 157°30'50"	Etched surface has very well aligned but somewhat squashed radiolarians, granular, heavily recrystallized. Many recrystallized spumellarians that have broken, delicate spines. Numerous flat (not tetrahedral) triangular forms referable to *Scharfenbergia*—possibly *Sharfenbergia ruestae* (Ormiston and Lane) (see Holdsworth and Murchey, 1988, plate 34.4, figs. 16 and 17). Poorly preserved multi-shell spumellarians. Moderately robust spicules. Several very poorly preserved and broken forms assignable to *Albaillella* Deflandre; these appear to be short tests and could be *A.* cf *A. cartalla* Ormiston and Lane, which Holdsworth and Murchey (1988) suggested is a pre-Chesterian taxon. [92ATr8B2; USGS DR 1577]	Mississippian (probably Meramecian)	Chert rubble lithologically identical to, but ≈20 m downslope from, 92ATr8A.
31 JIPe	**Howard Pass C-3** 68°37.5'/ 157°34.4'	Short, blunt spines of *Eptingium* (or possibly a *Pseudostylosphaera*). Bipolar, three- and four-spined forms that have stout spines. Fragmentary nassellarian that has a rounded cephalic area. [91Tr22C; USGS DR 1598]	Triassic (probably Ladinian or Carnian).	Rubble of light-weathering, medium gray chert.
34 JIPip	**Howard Pass C-3** 68°36.5'/ 157°34.75'	Fragment of *Livarella* sp. ?*Capnodoce* sp. Etched pieces contain many thin-rimmed *Pseudoheliodiscus* (cf. the form shown in plate 33.2 of Blome and others, 1988, and some that have broader rims). No nassellarians found. Rare grooved spines (none including main part of test.) Three-spined forms uniformly lacking mesh details. [91Tr15C; USGS DR 1595]	Late Triassic (probably Norian)	Fine rubble of hematitic, red-weathering chert having a somewhat earthy texture and containing impressions of *Monotis*.
		Multishelled, heavy grooved-spine spumellarian. ?*Khalerosphaera* spine tip. Nassellarian fragment. Three-spined form with stubby, slightly twisted spine. [91Tr15CX; USGS DR 1596]	Probably Triassic	Rubble of thin-bedded, medium-gray chert, variable to light-weathering, adjacent to chert sampled as 91Tr15C.
		Emiluvia sp. *Staurodoras* sp. *Eptingium* sp. Stout twisted spines not attached to main part of test. [91Tr15E; USGS DR 1597]	Triassic (probably Ladinian)	Earthy-textured chert associated with dark-gray-weathering, platy, tuffaceous(?) rock; slightly northwest of 91Tr15C and 15CX.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
36 JPip	**Howard Pass C-3** 68°36.2'/ 157°34.1'	*Capnuchosphaera* spp. spines. *Castrum perornatum* Blome. Narrow-rimmed cortical ring assignable to *Acanthocircus* sp. *Khalerosphaera* blade fragment. Poorly preserved nassellarian fragments. [91Tr33A; USGS DR 1604]	Late Triassic (late Carnian to late middle Norian).	Rubble of dark-brownish-gray chert, locally glassy luster, weathers medium-greeenish-gray with earthy rinds.
38 JTRo	**Howard Pass C-3** 68°36.3'/ 157°31.1'	*Khalerosphaera* spine tip. *Capnuchosphaera* spine tip. Fragments of either *Acanthocircus* or *Pseudoheliodiscus.* Abundant twisted spines. [91Tr26C; USGS DR 1599]	Triassic (Norian)	Rubble of black, thin-bedded chert associated with cherty paper shale.
39 JPip	**Howard Pass C-3** 68°36'25"/ 157°28'20"	Poorly preserved and recrystallized forms including Latentifistulid-like form (casts only). [92ARm44A; USGS DR 1490]	?Permian	White-weathering, black chert with radiolarians.
42 JTRo	**Howard Pass C-3** 68°35.5'/ 157°29.2'	All radiolarians fragmentary in this residue. Rare tightly twisted spines that resemble those belonging to *Xenorum.* Bipolar forms. Fragment of a nassellarian. Tiny spine tip of *Khalerosphaera.* [91Tr29B; USGS DR 1601]	Triassic (probably Late Triassic)	Buff to orange stream cuts of medium-light-gray-weathering, dark-brownish-gray chert, in 5- to 10-cm-thick beds, underlain by mudstone.
43 JPe	**Howard Pass C-3** 68°35,6'/ 157°36.5'	*Capnuchosphaera* spp. *Corum perfectum* Blome. Fragments of twisted spines. Blades of *Khalerosphaera.* Delicate *Pseudoheliodiscus* with thin rim. [91Tr38C; USGS DR 1612]	Triassic (early to middle Norian)	Relatively thick-bedded, contorted chert, associated with *Monotis*-bearing limestone.
45 JPip	**Howard Pass C-3** 68°35.3'/ 157°37.3	Poor sample. Ring fragments of *Acanthocircus* or *Pseudoheliodiscus.* Possible *Capnuchosphaera* spine. Bladed spine tip of *Khalerosphaera.* [91Tr37A; USGS DR 1608]	Late Triassic (possibly Norian)	Medium-green, medium- to thick-bedded chert; sample from highest part of exposure.
		Robust bladed spines with spinules, some light torsion (see sample 91Tr36A). Ladder ray (?*Pseudotormentus*). Partial *Pseudoalbaillella* sp. possessing a short skirt (perhaps a "*scalprata*" morphotype). *Follicucullus*, more swollen than *F. scholasticus* m. II Ishiga but less swollen than *F. charveti* Caridroit and De Wever. [91Tr37B; USGS DR 1609]	Late Permian. Although this mix is not documented, *Follicuculus* is Guadalupian and this morphotype of *Pseudoalbaillella* may be this young.	Red-weathering, crumpled chert, containing local jasperoid lumps; sample from middle of chert exposure at this locality.
46 JPii	**Howard Pass C-3** 68°35.1'/ 157°37.5'	Several kinds of *Latentifistula* spp. Apical horn of a *Pseudoalbaillella.* Irregular mesh on lattice/ladder ray. Extremely long-bladed spines on etched surfaces. [91Tr36A; USGS DR 1607]	Permian (undifferentiated)	Strongly deformed, thin-bedded, red-weathering chert.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
53 JPip	**Howard Pass C-3** 68°32'/ 157°29'	Reddish chert residue containing poorly preserved forms only. Bladed spines exhibiting spinules. Possible *Ormistonella*-like fragments. Arm fragments generically called "ladders." Possible apical tip of *Pseudoalbaillella* sp. [91Tr43B; USGS DR 1615]	Permian (possibly mid-Permian)	Medium-greenish-gray- and red-weathering chert, locally nodular.
57 PMap	**Howard Pass C-3** 68°31.8'/ 157°28.7'	Tetrahedral or at least inflated *Scharfenbergia* morphotypes. Fragment of an "*impella*" ray. Bladed spine fragments. Heavy grooved spines with some torsion, cf. *Paleoxiphostylus*, some attached to fragments of central part of test and at least one suggesting four-armed forms may be present. [91Tr42C; USGS DR 1614]	Mississippian (probably Meramecian or Chesterian).	Rubble of light-weathering, medium-gray chert.
58 JPe	**Howard Pass C-3** 68°31.3'/ 157°30'	Mostly poorly preserved spumellarians, casts only. Fragments of long primary spines. One latticed, broken ray (arm). Possible fragment that may be the apical tip of *Pseudoalbaillella*. [91Tr40B; USGS DR 1613]	Paleozoic (possibly Permian)	Sample from nodular-bedded, medium-greenish-gray chert (locally red-weathering) that overlies unit Mlb; lithology resembles that of unit PPs. Conodonts (table 1) from upper part of unit Mlb at this locality are of probable Mississippian age.
62 JPe	**Howard Pass C-3** 68°30.9'/ 157°36.8'	Flattened nassellarian casts (possibly *Corum* Blome). *Capnuchosphaera* spp. spine fragments. Narrow-rim *Pseudoheliodiscus* fragment. [91Tr3A; USGS DR 1592]	Late Triassic (early to late middle Norian).	Medium-gray, dark- to greenish-gray chert in even, 5- to 10-cm-thick beds, exposed along stream cut; sample 91Tr3A from slightly northwest of 91Tr2A.
	68° 30.8'/ 157° 36.0'	Spumellarians that have strong, grooved spines. Poorly preserved casts of nassellarian. [91Tr2A; USGS DR 1591]	Mesozoic, probably Triassic (Ladinian or younger).	
63 JPii	**Howard Pass C-3** 68°30.75'/ 157°36.1'	Poorly preserved sample contains scraps of nassellarians. Bladed spines with tips that resemble those of *Khalerosphaera*. *Pseudoheliodiscus* sp. with narrow rim (indicating that it is not *P. sandspitensis*). Cortical shell fragments that have twisted spines. [91Tr1B; USGS DR 1590]	Late Triassic (Norian, undifferentiated)	Dark-olive-gray chert in distorted, 5- to 25-cm-thick layers, bleached greenish-gray in part.
65 KMp	**Howard Pass C-3** 68°30.1'/ 157°37.0'	*Scharfenbergia* spp. strongly tetrahedral and flatter morphologies. Bipolar forms, possibly *Belowea* or *Paleoxiphostylus* ?*Callela* sp. An "*impella*"-type ray. [91Tr14A; USGS DR 1593]	Possibly Late Mississippian	Medium-bedded, medium-gray, light-greenish-gray- to white-weathering chert.
		Scharfenbergia spp., poorly preserved "*impella*" ray fragments. [91Tr14B; USGS DR 1594]	Possibly Late Mississippian	Hematite-stained, dark-gray to black chert, locally light-weathering; sample from larger, higher ridge a few hundred feet south of 91Tr14A.
76 PMap	**Howard Pass B-5** 68°29'2.4"/ 158°25'58"	Poorly preserved forms including Forms assignable to *Scharfenbergia impella* group. Rare sponge spicules. [92ADo101B; USGS DR 1470]	Mississippian, undifferentiated	Grayish-green, radiolarian-rich chert.

Table 2. Radiolarian data (previously unpublished) from the west-central part of the Howard Pass quadrangle, Alaska—Continued.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
77 PMap (or JPip)	**Howard Pass B-5** 68°29'2.4"/ 158°25'50"	Poorly preserved forms including *Scharfenbergia impella*-like forms (too recrystallized to positively identify). Also broken bladed spines. Common sponge spicules. [92ADo100B; USGS DR 1469]	?Mississippian, possibly younger	Red siliceous argillite, stratigraphically higher than 92ADo101B (loc. 76). Stratigraphic unit uncertain; sample taken from rocks that appear transitional between unit PMap and overlying unit J Pip.
78 JPip	**Howard Pass B-5** 68°28'55"/ 158°25'50"	Poorly preserved assemblage including ?*Betraccium* sp. (one broken specimen) *Capnuchosphaera* sp. (broken tumidaspines) ?*Khalerosphaera* sp. (broken spines) *Pseudoheliodiscus* sp. (cortical ring fragments). [92ADo99B; USGS DR 1468]	Late Triassic (middle or late Norian)	Bedded, complexly folded, gray chert; sample taken just below zone of red chert.
79 JPip	**Howard Pass B-5** 68°28'55"/ 158°25'37"	Poorly preserved assemblage including *Capnuchosphaera* sp. (isolated tumidaspines) ?*Laxtorum* sp. *Livarella* sp. *Pseudoheliodiscus* sp. cf. *P. finchi* Pessagno *Saitoum* sp. [92ADo98B; USGS DR 1467]	Late Triassic (late middle to early late Norian; *Pantanellium silberlingi* Subzone of the *Betraccium deweveri* Zone, Blome, 1984, and Blome and others, 1988).	Sample from rubble of maroon to grey-green bedded chert, containing abundant radiolarians, underlying unit Kop. The association of *Livarella* sp. with *Capnuchosphaera* sp. suggests that *Livarella* may extend down into the middle Norian, at least in North American rock sequences.
80 JPip	**Howard Pass B-5** 68°28'55"/ 158°25'19"	Poorly preserved assemblage including *Acanthocircus* sp. (cortical ring fragments) *Canoptum* sp. cf. *C. unicum* Pessagno and Whalen *Canoptum* sp. *Droltus* sp. *Pantanellium* cf. *P. kungaense* Pessagno and Blome *Pantanellium* sp. [92ADo96B; USGS DR 1466]	Early Jurassic (Hettangian or Sinemurian).	Green-gray bedded chert; uppermost part of unit J Pip, at contact with unit Kop.
81 JPii	**Howard Pass B-5** 68°27'3.6"/ 158°36'7.2"	Radiolarians poorly preserved; most exhibit little or no external meshwork or pore structure. *Canoptum* sp. cf. *C. dixoni* (Pessagno and Poisson) *Canoptum* sp. ?*Canutus* sp. ?*Katroma* sp. *Orbiculiforma* sp. aff. *O. multifora* Pessagno and Poisson *Orbiculiforma* sp. [91ANs23A; USGS DR 1349]	Early Jurassic (probably Pliensbachian or Toarcian).	Laminated radiolarian chert in apparent fault contact with graywacke of the Okpikruak Formation. Although the fauna is poorly preserved, the co-occurrence of conoptids having 12-14 post-abdominal chambers, such as *Canoptum dixoni*, as well as abundant *Orbiculiforma* sp., indicate a definite Early Jurassic age, and a probable Pliensbachian age.
82 JPii	**Howard Pass B-5** 68°26'42"/ 158°36'50"	Radiolarians poorly preserved, most lacking preserved external meshwork or visible pore structure. ?*Bagotum* sp. *Canutus* sp. cf. *C. hainaensis* Pessagno and Whalen *Hsuum* aff. *H. belliatum* Pessagno and Whalen ?*Parvicingula* sp. *Saitoum* sp. [91ANs23B; USGS DR 1350]	Early Jurassic (Pliensbachian or Toarcian).	Uppermost chert at this locality, in fault(?) contact with Okpikruak Formation; sample includes both red and green-gray chert. Sample 91ANs23B may be slightly younger than 91ANs23A, as the former contains forms possessing a pronounced horn and robust circumferential ridges assignable to ?*Parvicingula* sp. The poor preservation makes an accurate specific assignment impossible.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
83 JPii	**Howard Pass B-5** 68°26'35"/ 158°37'20"	Radiolarians recrystallized, poorly preserved, all lacking preserved external meshwork or visible pore structure. No nassellarians or cone-shaped casts visible in the coarse or fine dry acid residue. Several large, broken entactiniids preserved that are similar in geometry and spine structure to *Parentactinia itsukaichiensis* Sashida and Tonishi. ?*Pseudoalbaillella* sp. [91ANs23C; USGS DR 1351]	?Paleozoic	Chert south of samples 91ANs23A and 23B. The poor preservation of all forms makes it impossible to assign an accurate age, but the absence of nassellarians and presence of abundant entactiniids suggest a possible pre-Mesozoic (Paleozoic) age.
84 IPMap	**Howard Pass B-5** 68°26'28"/ 158°32'17"	Poorly preserved forms including ?*Albaillella* (?) *undulata* (cast) ?*Albailella* sp. (fragments only) Rare and corroded isolated bladed spines. [92ARm101A; USGS DR 1494]	?Mississippian	Chert, chiefly red, that contains subordinate, irregular greenish layers.
85 JPip	**Howard Pass B-5** 68°25'34"/ 158°37'37"	All radiolarians recrystallized, poorly preserved, lacking preserved external meshwork or visible pore structure. ?nassellarians (several cone-shaped casts that have distinct ridges that may be circumferential ridges). [91ANs24B; USGS DR 1353]	?Mesozoic	Red and green chert that contains visible radiolarians.
90 JPii	**Howard Pass B-5** 68°23'35"/ 158°50'13"	Poorly preserved assemblage including *Capnodoce* sp. (isolated spine) *Capnuchosphaera* sp. (isolated tumidaspines) *Syringocapsa turgida* *Triassocampe* sp. [92ADo29; USGS DR 1457]	Late Triassic (late Carnian to late middle Norian; *Capnodoce* Zone of Blome, 1984, and Blome and others, 1988).	Medium-gray and grayish-green, thin-bedded chert; locally weathers light cream-colored. Sample from white and black banded chert; white layers contain abundant radiolarians.
93 JPii	**Howard Pass B-5** 68°22'40"/ 158°49'50"	Poorly preserved forms including *Albaillella* sp. cf. *A. levis* *Deflandrella* (?) *manica* (arm fragments) ?*Ishigaum* sp. (cast). [92ABs54; USGS DR 1495]	middle Permian (probably Guadalupian).	Sample from interval of whitish-gray-weathering chert; underlain and overlain by black chert.
94 JPip	**Howard Pass B-5** 68°22'23"/ 158°47'2.4"	Poorly preserved forms including *Capnuchosphaera* sp. (individual primary spines and broken shells) *Pseudoheliodiscus* sp. (small fragments of cortical outer ring). [92ADo83B; USGS DR 1463]	Late Triassic (Carnian or Norian)	Medium-gray and grayish-green chert, near rubble of red and brown argillite.
95 JPip	**Howard Pass B-5** 68°22'15"/ 158°47'24"	Poorly preserved assemblage including *Betraccium* sp. *Capnuchosphaera* sp. (broken tumidaspines) *Livarella* sp. *Pantanellium* sp. [92ADo83E$_1$; USGS DR 1464]	Late Triassic (latest middle to early late Norian; *Pantanellium silberlingi* Subzone of the *Betraccium deweveri* Zone of Blome, 1984; also see Blome and others, 1988).	Red chert, about 1,000 ft southwest of 92ADo83B. The association of *Livarella* sp. with *Capnuchosphaera* sp. suggests that *Livarella* may extend down into the middle Norian, at least in North American rock sequences.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
95 JPip [cont.]	**Howard Pass B-5** 68°22'16"/ 158°47'24"	Poorly preserved assemblage including Cortical ring fragments assigned to either *Acanthocircus* or *Pseudoheliodiscus* sp. (ring fragments missing secondary spines) ?*Corum* sp. (poorly preserved forms with little ornamentation). [92ADo83E$_2$; USGS DR 1465]	Probably Late Triassic	Green chert, about 75 ft south of 92ADo83E$_1$.
96 JDbc	**Howard Pass B-5** 68°22'55"/ 158°38'20"	Poorly preserved and unidentifiable recrystallized casts of nassellarians. [92ARm25A; USGS DR 1487]	Triassic or younger	Radiolarian chert that may be part of a tectonic melange or major fault zone.
102 PMap	**Howard Pass B-4** 68°22'41"/ 158°08'40"	Poorly preserved forms including those questionably assigned to the *Scharfenbergia impella* group. Also poorly preserved undescribed spumellarians and rare spicules. [91AD13A; USGS DR 1513]	Probably Mississippian (Meramecian or younger).	Medium-gray to black, vitreous chert, weathering white to gray and (locally) reddish-brown; 10-15 percent radiolarians visible on most fresh surfaces. Thin section is pale to dark-brown chert that contains 10-40 percent radiolarians; quartz crystals within tests are generally finer grained than those in the matrix.
JPip		Only identifiable forms are spine fragments questionably assignable to ?*Capnuchosphaera* sp. [91AD13J; USGS DR 1514]	?Late Triassic	Tan-weathering, pale- to medium-green, vitreous chert; beds 2- to 10-cm thick. Pyrite locally abundant, radiolarians few to 15 percent. Chert associated with (apparently interbedded with) maroon, green, and black mudstone. Thin section is pale chert with minor, poorly preserved radiolarians (some tests replaced by zeolite?) and trace detrital quartz. Rocks represent interval of unit JPip too small to show on geologic map.
104 JDbc	**Howard Pass B-4** 68°22'01"/ 158°13'05"	All radiolarians recrystallized, poorly preserved as casts and molds only. Cone-shaped ?nassellarians. ?*Pseudostylosphaera* sp. (recrystallized, ellipsoidal cortical shell, nodose, with robust, twisted primary spines). [91ANs18A; USGS DR 1348]	?Middle or Late Triassic	Red interpillow chert in massive, amygdaloidal basalt.
107 JPe	**Howard Pass B-4** 68°21'18"/ 158°00'58"	Poorly preserved forms including Broken *Eptingium*-like inflated spines *Triassocampe* sp. (casts). [92ADo313; USGS DR 1486]	Triassic (questionable Middle Triassic)	Gray to grayish-green chert.
108 JDbc	**Howard Pass B-4** 68°21'14"/ 158°17'20"	All radiolarians recrystallized and poorly preserved as casts and molds. Spherical to ovoid, flattened casts of spumellarians, occasional isolated, broken spines. ?*Bagotum* sp. ?*Pantanellium* sp. (poorly preserved casts that have bipolar primary spines). [91ANs14A; USGS DR 1347]	?Early Jurassic	Gray chert, associated with sheared, amygdaloidal pillow basalt.
109 JDbc	**Howard Pass B-4** 68°21'10"/ 158°17'10"	Few, sparse nassellarians. [86SK238A; USGS MR 7266]	Triassic	Chert associated with red-weathering basalt, in fault contact with vesicular basalt and limestone. Sample identified by B. Murchey, USGS.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
110 JDbc	**Howard Pass B-4** 68°21'05"/ 158°16'50"	Poorly preserved spumellarians, recrystallized, several pyritized. ?capnuchosphaerid primary spine (broken and poorly preserved; these distinct primary spines that belong in the radiolarian family Capnuchosphaeridae are hollow in their proximal parts, triradiate and sometimes twisting in their medial parts, and are solid and circular in axial section in their distal parts). ?conodont fragment (recrystallized and poorly preserved). [91ANs13A; USGS DR 1346]	?Triassic	Sample from 4-cm-thick layer of gray chert in section of brown-weathering, sheared basalt.
115 JPe (or PMk)	**Howard Pass B-4** 68°19'52"/ 158°16'23"	*Scharfenbergia tailleurense* group Holdsworth and Murchey. [86SK240B; USGS MR 7269]	Late Mississippian–Early Pennsylvanian (Chesterian-Morrowan).	Gray and buff chert, interbedded with siliceous argillite; at base of exposed section. Lithology and fauna appear transitional between those of units PMk and JPe. The robust group *Scharfenbergia tailleurense* commonly occurs near or at the boundary between the Lisburne and Etivluk groups. Sample identified by B. Murchey, USGS.
117 JTro	**Howard Pass B-4** 68°19'15"/ 158°19'10"	Few, sparse nassellarians. [86SK239A; USGS MR 7268]	Triassic	Gray chert. Sample identified by B. Murchey, USGS. Previously published fossil data from approximately this locality (table 4).
127 JTro	**Howard Pass B-3** 68°28'30"/ 157°44'46"	Poorly preserved forms including *Acanthocircus* sp. cf. *A. hexagonus* (Yao) *Capnuchosphaera* sp. (tumidaspine fragments only). [92ADo214B; USGS DR 1475]	Late Triassic (early late Carnian to late middle Norian).	Medium- to thick-bedded, medium-gray chert with light-weathering partings.
128 PMap	**Howard Pass B-3** 68°29'2.4"/ 157°26'06"	Poorly preserved assemblage including ?*Scharfenbergia* spp. *Albaillella* cf. *A. cartalla*. Rare sponge spicules. [92ADo67B; USGS DR 1461]	Mississippian (pre-Chesterian, probably Meramecian).	Thin-bedded, grayish-green to gray radiolarian chert, interbedded with olive to grayish-green siliceous argillite.
129 PMap	**Howard Pass B-3** 68°26'13"/ 157°40'45"	No identifiable forms except for poorly preserved broken arms possibly assignable to the *Scharfenbergia impella* group. Abundant sponge spicules. [92ADo202B; USGS DR 1474]	?Paleozoic (?Mississippian)	Bright reddish-orange-weathering, light- to medium-gray to grayish-green chert; thin bedded with locally abundant radiolarians. Abundant vein quartz in radiolarian sample residue.
130 JTro	**Howard Pass B-3** 68°26'24"/ 157°33'00"	Poorly preserved forms with little external meshwork remaining including unidentifiable spumellarians and a nassellarian questionably identified as ?*Corum* sp. [91ADo48A; USGS DR 1453]	Possibly Late Triassic (Carnian/Norian).	Gray-weathering, brown to gray radiolarian chert in float (no outcrop); probably thin bedded. Overlies *Monotis*-bearing limestone member of Otuk.
134 KJmv	**Howard Pass B-3** 68°26'24"/ 157°26'10"	Poorly preserved assemblage including ?*Canutus* sp. Other recrystallized crushed and distorted nassellarians Rare spumellarian fragments. [92ADo81B; USGS DR 1462]	?Early Jurassic (?Sinemurian or ?Pliensbachian).	Dark chert float associated with volcanic and volcaniclastic rocks.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
135 JPip	**Howard Pass B-3** 68°25'44"/ 157°17'45"	Poorly preserved forms including *Capnuchosphaera* sp. (tumidaspine fragments) *Pseudoheliodiscus* sp. (fragment of cortical ring) Isolated twisted spines. [92ARm63A; USGS DR 1491]	Late Triassic (late Carnian?, Norian)	Tightly folded, light-gray to green and light-brown to cream-colored chert in beds 1-15 cm thick; structurally below mafic igneous rock.
136 JPip	**Howard Pass B-3** 68°25'48"/ 157°17'05"	Poorly preserved forms including ?*Canoptum* sp. (casts) *Capnuchosphaera* sp. (isolated tumidaspines) *Corum* sp. cf. *C. perfectum* (casts only) *Xenorum* sp. (fragments of cortical shell and primary spines). [92ABs125; USGS DR 1503]	Late Triassic (late Carnian to middle Norian; *Capnodoce* Zone of Blome, 1984, and Blome and others, 1988).	Light-greenish-gray-weathering, dark-gray, vitreous chert with conchoidal fracture, orange-brown iron stain, and locally abundant radiolarians; beds 1-10 cm thick (average ≈6 cm).
137 JDbc	**Howard Pass B-3** 68°24'40"/ 157°28'40"	Poorly preserved forms including Abundant casts of spumellarians with little external meshwork ?*Nazarovella* sp. (guttered rays) ?*Pseudoalbaillella* sp. (poorly preserved fragment). Rare sponge spicules. [92ABs85; USGS DR 1498]	?Permian	Light-reddish-gray and light-blue-green chert in float along with basalt.
138 JDbc	**Howard Pass B-3** 68°24'36"/ 157°27'05"	Poorly preserved assemblage containing abundant radiolarian fragments, isolated bladed spines, and a narrow, undescribed conical albaillellid of Mississippian aspect. [91ADo53B; USGS DR 1454]	pre-Permian (probably Mississippian)	Green chert forms films and masses between volcanic pillows; sample from a persistent chert bed about 3 ft thick that contains abundant radiolarians.
139 JDbc	**Howard Pass B-3** 68°24'22"/ 157°27'36"	Poorly to moderately preserved assemblage including *Emiluvia* (?) *cochleata* *Eptingium manfredi manfredi* *Pseudostylosphaera coccostyla* *Pseudostylosphaera hellenica* *Triassocampe* sp. [92ABs79B; USGS DR 1497]	Middle Triassic (Ladinian)	Bedded chert and thinly laminated limestone in outcrop, rubble, and float. Sample from olive-gray to dark-gray, pale yellow-orange-weathering chert that contains locally abundant radiolarians; beds 0.3-15 cm thick.
141 JDbc	**Howard Pass B-3** 68°23'56"/ 157°27'15"	Poorly preserved casts including ?*Acanthocircus* sp. or ?*Pseudoheliodiscus* sp. (cortical ring fragments) ?*Capnodoce* sp. (broken inflated primary spines) *Capnuchosphaera* sp. (tumidaspines only) ?*Corum* sp. *Pachus* sp. ?*Pseudostylosphaera* sp. (partial test). [92ARm73B; USGS DR 1492]	Late Triassic (late Carnian or early Norian).	Dark-greenish-gray chert containing radiolarians, beneath Memorial Creek volcanic rocks.
151 JPe	**Howard Pass B-3** 68°19'23"/ 157°45'22"	Poorly preserved forms including *Albaillella* (?) *asymmetrica* *Pseudoalbaillella* sp. aff. *P. longicornis* *Entactinia* cf. *E. itsukaichiensis* Small bladed spines in fine (>63 μm) residue. [92ARm41A; USGS DR 1489]	Mid-Permian (Leonardian or Guadalupian).	Chert containing abundant radiolarians.
152 JPe	**Howard Pass B-3** 68°19'23"/ 157°45'11"	Poorly preserved forms including ?*Pseudoalbaillella* sp. (broken and crushed fragments). [92ARm40A; USGS DR 1488]	?Permian (based on questionable occurrence of ?*Pseudoalbaillella* sp.).	Float of light gray chert above Kuna Formation.

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Locality No., map unit	Quadrangle, latitude/ longitude	Radiolarian fauna [field No.; USGS collection No.]	Age	Remarks
157 KMp	**Howard Pass C-5** 68°41'53"/ 158°27'50"	? *Latentifistula impella* (Ormiston and Lane) Group. Sponge spicules (abundant, but less abundant than radiolarians; include hexactine spicules [Hexactinellida] and ?anatriaene, strongyle, and large matted monaxon spicules [Demospongiae?]). Preservation = 2 on a scale of 1–5. [86Tr2A; USGS MR 7272]	Mississippian? Poorly preserved stauraxon radiolarians in this sample are more likely Paleozoic (Mississippian?) rather than Mesozoic forms.	Sample from chert closely associated with large slab (or boudin) of tasmanites-bearing rock; chert residue is medium gray. *L. impella* and abundant sponge spicules are common near time-transgressive facies boundary of Kuna Formation and Etivluk Group (for instance, transition zone between limestone and chert at Nigu Bluff, eastern Howard Pass quadrangle). Sample identified by B. Murchey, USGS.
		Capnodoce sp. Nassellarians. Twisted, bladed spines. A few hexactine sponge spicules. Preservation = 2 on a scale of 1–5. [86Tr2F; USGS MR 7275]	Late Triassic	Sample near base of uppermost chert interval at this locality; below (north) of Okpikruak Formation and above oil shale. Chert residue is white and coarse-grained. Sample identified by B. Murchey, USGS.
		Capnodoce or Capnuchosphaera sp. Nassellarians. Preservation = 2 on a scale of 1–5. [86Tr2G; USGS MR 7295]	Late Triassic	Top of uppermost chert interval at this locality; chert residue is black. Sample identified by B. Murchey, USGS.
159 JPip	**Howard Pass B-4** 68°27'0"/ 158°18'18"	Theoperid radiolarians. Conodonts. Poor foraminifers. [79ANw8A; USGS MR 1116]	Triassic (Late?)	Bedded gray chert, associated with black siltstone and dark-gray graywacke. Sample identified by D.L. Jones and B. Murchey, USGS.
189 JPii	**Howard Pass C-3** 68°40'1.2"/ 157°34'8.4"	Poorly preserved "complex" *Paronaell*a sp. Large spherical spumellariina, having three thick but very short, blunt primary spines. This fauna is probably *Pseudoalbaillella* assemblage (Holdsworth and Jones, 1980). [64Tr209R1; USGS MR 3151]	Pennsylvanian or Early Permian; equivalent to or younger than the youngest radiolarian faunas at Nigu Bluff (Murchey and others, 1981).	Red- and green-weathering chert; associated with tasmanite, fine-grained clastic rocks, and mafic rocks. Sample identified by B. Murchey and C.D. Blome, USGS.
		Latenodiotidae fam. nov. ad. int. Nazarov Subfamily Latenofistulinae?: fragments Subfamily Latenodiotinae?: poor specimen. [64Tr209R2; USGS MR 3152]	Late Pennsylvanian (?) or Permian; this fauna is younger than MR 3151, and younger than any known faunas at Nigu Bluff.	Red weathering chert. Sample identified by B. Murchey and C.D. Blome, USGS.