

Table 4. Paleontological data (published since 1980) from the west-central part of the Howard Pass quadrangle, Alaska—Continued.

[Letters in field number refer to collector: AD, J.A. Dumoulin; ADo, J.H. Dover; AHe, Carl Huie; AK, J.S. Kelley; AMH, M.L. Miller; AMM, M. Mullens; ANk, W.J. Nokleberg; ANs, S.W. Nelson; Ha, E. Harris; Mu, C.G. Mull; JS (and STA), J.M. Schmidt, and Tr, I.L. Tailleux. CAI, conodont color alteration index. *, latitude/longitude herein corrected from previously published version. No., number; loc. locality; indet., indeterminate]

Locality No., map unit	Quadrangle, latitude/ longitude	Fossils [field No.; USGS collection No.]	Age [CAI]	Reference, remarks (see "References cited" following section on biostratigraphic data)
14 Mu	Howard Pass C-5 68°33'43"/ 158°51'45"	Conodonts [92AD57E; 32451-PC]	early Early Mississippian; middle to early late Kinderhookian (Upper <i>Si. duplicata</i> Zone to lower part <i>Si. isosticha</i> -Upper <i>Si. crenulata</i> Zone). [2 or 3]	Dumoulin and Harris, 1997, table 1, loc. 15.
29 Mlri	Howard Pass C-3 68°35'55"/ 157°41'00"	Conodonts [91AD11A, G; 31745-PC, 31746-PC]	No older than late Early Mississippian (no older than middle Osagean); both samples contain redeposited conodonts of early Early Mississippian (Kinderhookian) age. [2-2.5]	Dumoulin and others, 1993, table 1, loc. 19. Sample from 80-m-thick measured section of unit Mlri; 11A, 70 m above base of section; 11G, 80 m above base of section. Table 1 contains additional conodont data from this locality.
30 IPMap	Howard Pass C-3 68°37'05"/ 157°36'00"	Conodonts [91Tr17; 31721-PC]	Mississippian [1.5-2]	Dumoulin and others, 1993, table 1, loc. 15. Sample from Bion barite deposit of Kelley and others (1993), from about 25 m below chert containing Late Mississippian or Early Pennsylvanian radiolarians.
32 IPMap	Howard Pass C-3 68°37'30"/ 157°33'14"*	Conodonts [91Tr30; 31767-PC]	late Early Mississippian (Osagean, but not earliest) [1.5]	Dumoulin and others, 1993, table 1, loc. 15.
40 IPMap	Howard Pass C-3 68°36'10"/ 157°29'35"	Conodonts [91Tr23; 31720-PC]	middle Mississippian (latest Osagean to Meramecian; probably middle Meramecian). [1.5-2]	Dumoulin and others, 1993, table 1, loc. 16. Sample from a layer of calcitized radiolarite in the Stack barite deposit of Kelley and others (1993).
47 Mlri	Howard Pass C-3 68°33'58"/ 157°35'10"	Conodonts [90AD61Z; 30939-PC]	No older than late Early Mississippian (no older than early Osagean); contains redeposited conodonts of early Early Mississippian (Kinderhookian) age. [3-3.5]	Dumoulin and others, 1993, table 1, loc. 20. A few specimens have a surficial gray patina suggesting rapid heating; sample taken 5 m above a mafic sill.
48 IPMap	Howard Pass C-3 68°33'43"/ 157°30'22"*	Conodonts [91Tr39; 31722-PC]	late Early Mississippian (Osagean; Upper <i>typicus</i> Zone through most of <i>anchoralis-latus</i> Zone). [1.5-2]	Dumoulin and others, 1993, table 1, loc. 18. From 70-m-thick measured section 0.8 km east of the Abby Creek barite deposit of Kelley and others (1993). Sample from a baritic limestone bed 34 m above base of section.
IPMap/JIPip		Radiolarians [91AK22C] [91AK22B]	Late Mississippian (Meramecian or Chesterian) Early or Middle Pennsylvanian (Morrowan or Atokan)	Kelley and others, 1993, fig. 5. Sample 91AK22C taken several meters below 91AK22B and about 30 m above 91Tr39; both radiolarian samples from chert that is lithologically transitional between units IPMap/JIPip.
49 Mlri	Howard Pass C-3 68°32'55"/ 157°30'20"	Conodonts [90AD67G; 30944-PC]	No older than late Early Mississippian (no older than middle Osagean); contains redeposited conodonts of early Early Mississippian (Kinderhookian) age. [2]	Dumoulin and others, 1993, table 1, loc. 23.

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50 Mlri	Howard Pass C-3 68°33'00"/ 157°29'30"	Conodonts [90AD66A; 30943-PC]	late Early Mississippian (early Osagean; <i>typicus</i> Zone) [3-4]	Dumoulin and others, 1993, table 1, loc. 22. About 25 percent of specimens have a surficial gray patina suggesting nearby hydrothermal and (or) igneous activity.
51 Mlri	Howard Pass C-3 68°32'58"/ 157°29'10"	Conodonts [90AD64F; 30940-PC]	No older than late Early Mississippian (no older than middle Osagean, middle <i>anchoralis-latus</i> Zone); contains redeposited conodonts of early Early Mississippian (Kinderhookian) age. [2.5-3]	Dumoulin and others, 1993, table 1, loc. 22. Sample taken 16.5 m below a mafic sill.
54 Mlri	Howard Pass C-3 68°32'00"/ 157°34'55"	Conodonts [91AD6F, U; 31741-PC, 31742-PC]	No older than late Early Mississippian (no older than middle Osagean); 6F contains redeposited conodonts of early Early Mississippian (Kinderhookian) age. [1.5-2]	Dumoulin and others, 1993, table 1, loc. 21. From 67-m-thick measured section within unit Mlri; 6F, 5.5 m above base of section and about 0.5 m above mafic sill; 6U, 61 m above base of section.
55 Mlri	Howard Pass C-3 68°32'03"/ 157°34'15"	Conodonts [91AD2B; 31740-PC]	late Early Mississippian (lower 2/3 of Osagean; <i>typicus</i> Zone-most of <i>anchoralis-latus</i> Zone). [1.5]	Dumoulin and others, 1993, table 1, loc. 21. From top of Mlri unit, about 0.25 m below contact with overlying Innaitchiak Chert. The lowermost beds of the Innaitchiak here consist of white- to light-gray-weathering, light-green to gray chert that produced very poorly preserved radiolarians (91JS28E; USGS DR 1528) of possible Late Paleozoic age.
97 JDbc	Howard Pass B-5 68°22'52"/ 158°38'35"	Brachiopods [78ANK35]	Early Permian	Nelson and Nelson, 1982, table 1, loc. 4. Fossils are probably in tectonic inclusions; locality described as melange by collector.
99 PDlc	Howard Pass B-5 68°24'18"/ 158°27'11"	Conodonts [79ANs25C; 10018-SD]	early Late Devonian (Frasnian) [2.5]	Nelson and Nelson, 1982, table 1, loc. 3.
100 JPip	Howard Pass B-4 68°24'50"/ 158°17'10"	Radiolarians [79ANs2E]	Pennsylvanian (Morrowan) to Permian (Guadalupian)	Nelson and Nelson, 1982, table 1, loc. 1.
101 Mi	Howard Pass B-4 68°23'/ 157°55.8'	Conodonts [84STA04; 29639-PC]	early Early Mississippian (middle to late Kinderhookian). [3.5]	Mull and others, 1997, table 1. Story Creek Zn-Pb prospect.
105 Mlri	Howard Pass B-4 68°21'35"/ 158°08'50"*	Conodonts [91JS35D; 31753-PC]	No older than early Late Mississippian (no older than late Meramecian); contains redeposited conodonts of Early Mississippian (late Kinderhookian and Osagean) age. [3.5]	Dumoulin and others, 1993, table 1, loc. 25. Mafic sill at least 7 m thick occurs 5 m above sample site.
106 Mi	Howard Pass B-4 68°22'05"/ 158°04'52"*	Brachiopods [93Mu78-1]	early Early Mississippian (late Kinderhookian; <i>Calvustrigis rutherfordi</i> Zone).	Mull and others, 1997, table 1.

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111 JDbc	Howard Pass B-4 68°21' / 158°16'15"	Corals, stromatoporoids [79ANs41E]	early Late Devonian (Frasnian)	Nelson and Nelson, 1982, table 1, loc. 6. Sample 92AD25E (table 1) from approximately this locality contains conodonts of middle Frasnian age.
112 JDbc	Howard Pass B-4 68°20'56" / 158°16'00"	Conodonts [79ANs41C; 10091-SD]	Late Devonian [7]	Nelson and Nelson, 1982, table 1, loc. 7. Sample 92AD25H (table 1) from approximately this locality contains conodonts of Frasnian age.
113 JDbc	Howard Pass B-4 68°20'42" / 158°17'	Conodonts [78ANs205B]	Late Devonian (middle Famennian)–late Early Mississippian (middle Osagean). [3.5-4]	Nelson and Nelson, 1982, table 1, loc. 9. Collected from limestone within Copter Peak basalt unit of Siniktanneyak mafic complex.
114 JDbc	Howard Pass B-4 68°20' / 158°19'23"	Corals, brachiopods [78AMM35C]	Middle-Late Devonian	Nelson and Nelson, 1982, table 1, loc. 11. Collected from limestone within Copter Peak basalt unit of Siniktanneyak mafic complex.
		Conodonts [78AMM35D]	Devonian-Triassic [3]	
116 Mk	Howard Pass B-4 68°19'44" / 158°16'16"*	Brachiopods, echinoderms, sponge(?) [78AMH194A]	Middle Devonian–Early Mississippian	Nelson and Nelson, 1982, table 1, loc. 10.
		Conodonts [93Mu80; 32213-PC]	early Early Mississippian (Kinderhookian) [3 or 4]	Mull and others, 1997, table 1. Limestone and shale member of Kayak Shale (Mull and others, 1997).
117 JFo	Howard Pass B-4 68°19'20" / 158°19'05"	Pelecypods, radiolarians [79ANs31A]	Late Triassic (Norian)	Nelson and Nelson, 1982, table 1, loc. 12. Sample 86SK239A (table 2) from approximately this locality contains radiolarians of Triassic age.
		Conodonts [79ANs31B]	Middle Triassic (Anisian and (or) Ladinian)	
118 Mk	Howard Pass B-4 68°18'58" / 158°18'58"	Brachiopods, corals, echinoderms [78ANs135B]	Late Devonian–Early Mississippian	Nelson and Nelson, 1982, table 1, loc. 13.
119 Mk	Howard Pass B-4 68°18.7' / 158°05.8'	Conodonts [93Mu73; 32217-PC]	Devonian to Early Mississippian; probably early Early Mississippian (Kinderhookian). [3 or 4]	Mull and others, 1997, table 1. Shale member of the Kayak Shale (Mull and others, 1997).
120 Mikv	Howard Pass B-4 68°19' / 158°04.5'	Conodonts [91JS36Z; 31754-PC]	early Early Mississippian (Kinderhookian) [3-3.5]	Dumoulin and Harris, 1997, table 1, loc. 3, and Mull and others, 1997, table 1. Limestone and shale member of the Kayak Shale (Mull and others, 1997); sample from limestone that stratigraphically overlies about 10 m of volcanoclastic rocks (in Kayak Shale) and underlies spiculitic chert (Kuna Formation).

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122 Mikv	Howard Pass B-4 68°17.7' / 157°58.8'	Conodonts [91JS37G; 31755-PC]	early Early Mississippian (middle to late Kinderhookian). [3.5-4]	Dumoulin and Harris, 1997, table 1, loc. 4, and Mull and others, 1997, table 1. Limestone and shale member of the Kayak Shale (Mull and others, 1997).
123 Mik	Howard Pass B-4 68°20'10" / 157°52'58"	Conodonts [92ADo248B; 32207-PC]	early Early Mississippian (probably Kinderhookian) [3 or 4]	Dumoulin and Harris, 1997, table 1, loc. 9, and Mull and others, 1997, table 1. Sandstone member of the Kayak Shale (Mull and others, 1997).
124 Mik	Howard Pass B-4 68°20' / 157°52'30"*	Conodonts [92ADo316B; 32208-PC]	early Early Mississippian (probably Kinderhookian) [3 or 4]	Dumoulin and Harris, 1997, table 1, loc. 9, and Mull and others, 1997, table 1. Sandstone member of the Kayak Shale (Mull and others, 1997); probably stratigraphically lower than 92ADo248B (loc. 123).
125 Mik	Howard Pass B-4 68°19'40" / 157°52'35"	Conodonts [91JS38A; 31756-PC]	early Early Mississippian (Kinderhookian) [3.5-4]	Dumoulin and Harris, 1997, table 1, loc. 5. Limestone and shale member of the Kayak Shale (Mull and others, 1997). See table 3 for megafossil data from this locality.
IPMk		[91JS38B; 31757-PC]	Early Mississippian [CAI indeterminate; conodonts covered with amorphous organic matter]	Dumoulin and others, 1993, table 1, loc. 8. Stratigraphically overlies 38A.
126 Mik	Howard Pass B-4 68°19' / 157°51'10"*	Conodonts [92ADo239B2; 32209-PC]	early Early Mississippian (Kinderhookian) [≈3.5]	Dumoulin and Harris, 1997, table 1, loc. 8, and Mull and others, 1997, table 1. Shale member of the Kayak Shale (Mull and others, 1997).
131 Mlr	Howard Pass B-3 68°27'08" / 157°31'02"	Conodonts [92AD46A; 32446-PC]	early Early Mississippian (middle to late—but not latest—Kinderhookian). [1.5]	Dumoulin and others, 1993, table 1, loc. 14. Sample 92AD46A is from strata that structurally underlie 92ADo78 and 79; 46A is 0.5 m below base of Kuna Formation.
132 Mik	Howard Pass B-3 68°26'50" / 157°31'00"	Conodonts [92ADo79A; 32216-PC]	early Early Mississippian (middle to late Kinderhookian). [2]	Dumoulin and Harris, 1997, table 1, loc. 14. Sample 92ADo79A is from ≈75 m stratigraphically above 92ADo78B (loc. 133).
133 Mik	Howard Pass B-3 68°26'48" / 157°30'35"*	Conodonts [92ADo78B; 33320-PC]	early Early Mississippian; early to middle Kinderhookian (<i>Si. sulcata</i> Zone into lowest part of the Lower <i>Si. crenulata</i> Zone). [2]	Dumoulin and Harris, 1997, table 1, loc. 14.
140 JDbc	Howard Pass B-3 68°24'00" / 157°27'10"	Conodonts [92AD37D; 32443-PC]	early Early Mississippian (middle to late Kinderhookian). [3]	Dumoulin and Harris, 1997, table 1, loc. 16. Sample from carbonate thrust beneath (and locally intercalated with?) basalt of unit JDbc.
142 Mk	Howard Pass B-3 68°22'55" / 157°40'50"	Conodonts [91ADo70E; 31747-PC]	early Early Mississippian (middle to late Kinderhookian). [≈3]	Dumoulin and Harris, 1997, table 1, loc. 6, and Mull and others, 1997, table 1. Limestone and shale member of the Kayak Shale (Mull and others, 1997). Sample 91ADo70E is from strata about 20 m structurally (and stratigraphically?) above 91ADo70C (loc. 143).

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143 Mk	Howard Pass B-3 68°22'52"/ 157°40'50"	Conodonts [91ADo70C; 31748-PC]	early Early Mississippian (middle to late Kinderhookian). [≈3]	Dumoulin and Harris, 1997, table 1, loc. 6, and Mull and others, 1997, table 1. Limestone and shale member of the Kayak Shale (Mull and others, 1997).
144 Mlr	Howard Pass B-3 68°23'30"/ 157°39'15"	Conodonts [91AD9F; 31743-PC]	early Early Mississippian (Kinderhookian) [2-2.5]	Dumoulin and Harris, 1997, table 1, loc. 1.
145 Mik	Howard Pass B-3 68°22'30"/ 157°37'16"*	Conodonts [92Mu22; 32210-PC]	early Early Mississippian (Kinderhookian) [3.5]	Mull and others, 1997, table 1. Limestone and shale member of the Kayak Shale (Mull and others, 1997).
148 Mlr	Howard Pass B-3 68°19'36"/ 157°45'15"	Conodonts [92AD55-0; 32449-PC]	early Early Mississippian (Kinderhookian) [4]	Dumoulin and Harris, 1997, table 1, loc. 2. About 1 km southwest of type section of the Kuna Formation. Sample 55-0 is from near or at top of Rough Mountain Creek unit.
Mk		[92AD55-22; 32450-PC]	early Early Mississippian (Kinderhookian) [4]	Sample 55-22 is from the limestone and shale member of the Kayak Shale, about 12 m below contact with Rough Mountain Creek unit.
149 Mlr	Howard Pass B-3 68°19'38"/ 157°45'05"	Conodonts [92AD73G; 32462-PC]	early Early Mississippian (Kinderhookian) [4]	Dumoulin and Harris, 1997, table 1, loc. 2. Structural repeat of section at 92AD55 located 0.2 km to northeast; sample from about 6 m below top of Rough Mountain Creek unit.
150 Mlr	Howard Pass B-3 68°19'30"/ 157°44'55"	Conodonts [92AD72-5; 32461-PC]	early Early Mississippian (Kinderhookian) [4]	Dumoulin and Harris, 1997, table 1, loc. 2. From chert-rich outcrop about 5 m below top of Rough Mountain Creek unit.
153 Mk	Howard Pass B-3 68°20.5'/ 157°13'	Conodonts [93JS03E]	Late Devonian-Mississippian [4]	Dumoulin and Harris, 1997, table 1, loc. 13, and Mull and others, 1997, table 1. These authors assign rocks at this locality to the lower part of Isikut unit, several meters above contact with underlying Kanayut Conglomerate.
154 Mk	Howard Pass B-3 68°20'24"/ 157°13' 23"*	Brachiopods [93Ha109]	early Early Mississippian (late Kinderhookian; <i>Calvustrigis rutherfordi</i> Zone).	Mull and others, 1997, table 1. These authors assign rocks at this locality to the Isikut unit.
155 Mlr	Howard Pass B-3 68°15'29"/ 157°20'17"*	Conodonts [93Mu63-1; 32202-PC]	early Early Mississippian (Kinderhookian) [3.5]	Mull and others, 1997, table 1. From an interval of Rough Mountain Creek unit too small to show on geologic map.
Mi	Howard Pass B-3 68°15'25"/ 157°20'20"*	Conodonts [93Mu63-2; 32200-PC]	early Early Mississippian (Kinderhookian) [3.5]	Mull and others, 1997, table 1. These authors assign rocks at this locality to the limestone and shale member of Kayak Shale.

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155 Mi [cont.]	Howard Pass B-3 68°15'22"/ 157°20'17"	Conodonts, brachiopods [93Ha136; 32194-PC]	Conodonts indicate early Early Mississippian (middle to late Kinderhookian); brachiopods indicate Carboniferous. [3.5-4]	Mull and others, 1997, table 1.
156 Mi	Howard Pass B-3 68°15'07"/ 157°20'10"	Conodonts, brachiopods [93Mu63; 32201-PC]	Brachiopods indicate early Early Mississippian (late Kinderhookian; <i>Calvustrigis rutherfordi</i> Zone); conodonts indicate middle to late Kinderhookian. [3.5]	Mull and others, 1997, table 1. These authors assign rocks at this locality to the limestone and shale member of Kayak Shale.
158 JPii	Howard Pass C-3 68°36.5' / 157°20.0'	Radiolarians [78Tr232A; MR 5346]	Late Triassic	Murchey and others, 1988, table 32.3. Sample location approximate; based on latitude and longitude in Murchey and others (1988).
160 IPMap	Howard Pass B-4 68°23.92' / 158°05'	Radiolarians [77AHe56; MR 0035]	Early(?) Mississippian	Murchey and others, 1988, table 32.3. Sample location approximate; based on latitude and longitude in Murchey and others (1988).