DEPARTMENT OF THE INTERIOR

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Triassic and Early Jurassic radiolarian faunas, Brooks Range, Alaska

by

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INTRODUCTION

The appended faunal lists record the Triassic and Lower Jurassic radiolarian faunas recovered during U.S. Geological Survey investigations of the Otuk Formation on the north side of the Brooks Range. Numerous samples of radiolarian-bearing chert and silicified limestone were collected by geologists in the National Petroleum Reserve in Alaska (NPRA), while others were collected as part of biostratigraphic or mapping projects along the Brooks Range.

Radiolarian faunas and locality information for the measured sections are given in Table 1. Miscellaneous samples, their radiolarian faunas, and locality information are provided in Table 2. Table 3 lists radiolarian distributions for the various members of the Otuk Formation.

For an in-depth discussion of these samples as well as detailed lithostratigraphic information, refer to a chapter by Blome and others in the USGS Professional Paper (no. 1240, Part B; in press) which describes the geology of the Otuk Formation in and around the National Petroleum Reserves in Alaska.

CORRELATION OF RADIOLARIAN FAUNAS WITH LITHOSTRATIGRAPHIC SECTIONS

The Noyalik Peak section ranges in age from late Karnian to late Norian (Table 1). The stratigraphically lowest beds, exposed at beach level, contain both Capnuchosphaera De Wever and Sarla Pessagno. The uppermost beds containing identifiable radiolarians are in the chert and shale unit above Monotis marker beds and contain upper Norian Laxtorum Blome and Ferresium Blome.

The Otuk Formation cropping out along Ayugatak Creek ranges in age from Karnian (or older) to late Norian (or younger; Table 1). The lowest 85 ft of the section contains very little chert. Our lowest chert sample comes from beds just above Daonella-bearing float and contains Pseudostylosphaera Kozur and Mostler. The beds just below the Monotis marker beds contain both Pseudoheliodiscus Kozur and Mostler and Syringocapsa Foreman.

At Punupkahkroak Mountain, the radiolarians range in age from Ladinian or early Karnian to late Early Jurassic (Pliensbachian or Toarcian). These samples span the greatest age range of all the sections studied. The oldest fauna contains Pseudostylosphaera japonica (Nakaseko and Nishimura) 1979, Eptingium manfredi Dumitrica, 1977a, Triassocampe spp. and Tripocyclia sp., all of which occur in late Ladinian or early Karnian assemblages elsewhere. Taxa belonging to Pseudostylosphaera become more abundant in Karnian assemblages. A sample taken from the highest stratigraphic level in the traverse contains Bagotum spp., and Canutus izeensis Pessagno and Whalen, 1982. Bagotum is not known from strata older than Sinemurian in Alaska.

At the Otuk Creek section, the presence of taxa belonging to Yeharaia Nakaseko and Nishimura, Triassocampe Dumitrica, Kozur and Mostler, as well as Pseudostylosphaera nazarovi (Nakaseko and Nishimura) 1979, in the upper part of the shale member indicates an late Karnian or early Norian age. Late Karnian to mid Norian radiolarian taxa, such as Capnodoce triassica Pessagno, 1979, Corum regium Blome, 1984, Xenorum largum Blome, 1984, and others occur in the lower part of the chert member. The co-occurrence of Capnuchosphaera lenticulata Pessagno, 1979, and C. sp. cf. C. mexicana Pessagno, 1979, in the

uppermost beds of the chert member indicates that these strata are as young as early late Norian (Table 1). In other measured sections, the radiolarian assemblages in the lower part of the chert member are of late Ladinian to early Karnian age (or older at Tiglukpuk Creek, according to Bodnar, 1984). At Otuk Creek, the radiolarians are significantly younger and may indicate that the section is partly repeated by a fault at this horizon.

The Akmalik Creek section ranges in age from Ladinian (?early Karnian) to Early Jurassic (late Sinemurian) (Table 1). Characteristic Ladinian forms, such as Tripocyclia(?) japonica (Nakaseko and Nishimura) 1979, and Triassocampe(?) scalaris Dumitrica, Kozur and Mostler, 1980, are present at a low stratigraphic position in the chert member. The youngest beds contain typical Lower Jurassic taxa such as Canutus rockfishensis Pessagno and Whalen, 1982, and Droltus laseekensis Pessagno and Whalen, 1982.

At Monotis Creek, radiolarians make it possible to date an exposure of the Otuk Formation that was tenuously dated by sparse megafossils. Seven radiolarian samples from the chert member indicate an orderly progression from late Ladinian into the early middle Norian at its top. The radiolarian data also suggests that the pecten Monotis at the base of the chert member was misidentified and probably is Daonella (Table 1). Radiolarians collected from the top of the limestone member include Pseudoheliodiscus sandspitensis Blome, 1984, Capnodoce crystallina Pessagno, 1979, and Capnuchosphaera triassica De Wever, 1979, all of which indicate a latest middle to early late Norian age. Some of these same taxa have been found in late middle Norian strata (Rail Cabin Mudstone; cf. Blome, 1984) in east-central Oregon.

Radiolarians from samples collected at the Tiglukpuk Creek section range in age from possibly Ladinian to late middle Norian. The lowest sample from the chert member contains Pseudostylosphaera japonica (Nakaseko and Nishimura) 1979, and Triassocampe sp. A. A chert sample from near the top of the limestone member contains Capnuchosphaera lenticulata Pessagno, 1979, and C. mexicana Pessagno, 1979, forms known only from the late middle to early late Norian of western North America.

For a discussion of the radiolarian zones used to date the Triassic samples from both the measured lithostratigraphic sections (Table 1) and miscellaneous samples (Table 2), refer to Blome (1984) and the chapter by Blome and others in the USGS Professional Paper (no. 1240; in press) on the geology of the NPRA. Refer to Pessagno and Blome (1980) and Pessagno and Whalen (1984) for references on Lower Jurassic spumellarians and nassellarians respectively.

Table 1.—Radiolaria and megafossils from seven measured sections, northern Alaska. The faunas for each section are listed from oldest to youngest regardless of the order of the field numbers. Collectors: Amy = B. Murchey; CM = W. Chamberlain; Wr = R. Witmer; AKr = K. Reed. PPR = Denotes radiolarian fauna too poorly preserved for even generic assignment.

Field number	Radiolarian fauna	Megafossils	Age (Based on radiolarians)
		Noyalik Peak, lat 68°45'20", long 166°11'30"	
82Akr-10	Capnuchosphaera sp. Capnuchosphaera contorta Kozur and Mostler?, 1979 Sarla sp. Sarla plena Blome, 1983 Pachus sp.	Halobia zitteli, H. sp. (N. J. Silberling in I. L. Tailleur, written commun., 1982)	Late Karnian to middle Norian
82Akr-12	Barren		
82Akr-14	Capnuchosphaera sp.	Monotis scutiformis (middle Norian)	Late Karnian to early late Norian
82AKr-15	Barren	Monotis sp. indet.	
82Akr-18	?Laxtorum sp. Pseudoheliodiscus sp.	Monotis cf. M. subcircularis M. cf. M. ochotica (late Norian)	Late middle or late Norian
82Akr-22	Laxtorum atliense Blome, 1984 Laxtorum (?) kulense Blome, 1984 Livarella densiporata Kozur and Mostler, 1981 Ferresium sp. Pseudoheliodiscus sp.		Late Norian

	Ayugatak Creek, lat 68°46', long 165°48'	
82Akr-46	Pseudostylosphaera japonica (Nakaseko and Nishimura) 1979	Karnian
82Akr-47	PPR	
82Akr-48	PPR	
82Akr-49	?Pseudostylosphaera sp. ?Eptingium sp. Heavily ribbed primary spines	Karnian
82Akr-52	Sarla sp. ?Capnodoce sp. Betraccium(?) incohatum Blome, 1984	Late Karnian or early Norian
82Akr-53	Pseudoheliodiscus sandspitensis Blome, 1984 Syringocapsa sp.	Early late or late Norian
	Punupkahkroak Mountain, lat 68°06', long 163°21'	
79CM-13	Pseudostylosphaera japonica (Nakaseko and Nishimura) 1979 Eptingium manfredi Dumitrica, 1977 Triassocampe sp. aff. T. scalaris Dumitrica, Kozur and Mostler, 1980. Triassocampe sp. (undescribed)	Ladinian to early Karnian
79CM-12	Pseudostylosphaera helicata (Nakaseko and Nishimura) 1979 Pseudostylosphaera hellenica De Wever?, 1979 Pachus sp. Triassocampe sp. Yeharaia japonica Nakaseko and Nishimura, 1979	Late Karnian
79CM-11	Capnodoce anapetes De Wever, 1979 Capnuchosphaera triassica De Wever, 1979 C. tricornis De Wever, 1979 Sarla sp.	Late Karnian or early Norian

	Xipha pessagnoi (Nakaseko and Nishimura), 1979		
79CM-10	Acanthocircus harrisonensis Blome, 1984 Betraccium incohatum Blome?, 1984 Canoptum laxum Blome, 1984 Capnuchosphaera lenticulata Pessagno, 1979		Early or middle Norian
79CM-9	Capnodoce anapetes De Wever, 1979 C. traversi Pessagno, 1979 Canoptum(?) browni Blome, 1984 Capnuchosphaera colemani Blome, 1983 C. mexicana Pessagno, 1979 C. smithorum Blome, 1983 Corum regium Blome, 1984		Middle Norian
79CM-8	Capnuchosphaera lenticulata Pessagno, 1979 Capnuchosphaera sp. C. sp. aff. C. lenticulata Pessagno, 1979 C. triassica De Wever, 1979 Acanthocircus sp. Sarla plena Blome, 1983		Middle Norian
79CM-7	Barren		
79CM-6	Betraccium deweveri Pessagno and Blome, 1980 B. sp. aff. B. deweveri Pessagno and Blome, 1980 B. yakounense Pessagno and Blome, 1980 Ferresium laseekense Blome, 1984 Laxtorum hindei Blome, 1984 Pseudoheliodiscus sandspitensis Blome, 1984	Monotis (sp. not given) noted at level of 79CM-6 and 7	Late Norian
79CM-5	Betraccium deweveri Pessagno and Blome, 1980 B. yakounense Pessagno and Blome, 1980 Cantalum alium Blome, 1984 C. globosum Blome, 1984 Canoptum sp. Ferresium laseekense Blome, 1984 Pantanellium fosteri Pessagno and Blome, 1980		Late Norian

79CM-4	Canoptum sp. aff. C. poissoni Pessagno, 1979 Droltus sp. aff. D. hecatensis Pessagno and Whalen, 1982 Pantanellium kluense Pessagno and Blome, 1980 P. tanuense Pessagno and Blome, 1980 Pseudoheliodiscus sp. (undescribed)	Early Jurassic (Hettangian)
79CM-3	Canoptum sp. Pseudoheliodiscus sp. (undescribed) Veghicyclia sp.	Late Triassic (late Norian) to Early Jurassic
79CM-2	Canoptum sp. aff. C. merum Pessagno and Whalen, 1982 Droltus hecatensis Pessagno and Whalen, 1982 Pantanellium browni Pessagno and Blome, 1980 Relanus reefensis Pessagno and Whalen, 1982	Early Jurassic (Hettangian)
79CM-1	Canoptum dixoni Pessagno and Whalen, 1982 Pantanellium browni Pessagno and Blome, 1980 P. tanuense Pessagno and Blome, 1980 Pseudoheliodiscus sp. aff. P. yaoi Pessagno and Poisson, 1979 Relanus reefensis Pessagno and Whalen, 1982	Early Jurassic (Hettangian-Sinemurian)
79CM-0	Bagotum sp. aff. B. maudense Pessagno and Whalen, 1982 Bagotum sp. Canutus izeensis Pessagno and Whalen, 1982 ?Parvicingula sp.	Early Jurassic (late Pliensbachian or Toarcian)

Otuk Creek, lat 68°35', long 155°46'

Megafossils below -1.60
Halobia sp. indet.
H. cordillerana
H. cf. H. cordillerana (latest Karnian)
H. zitteli or superba

79Wr-1.60	Capnuchosphaera sp. aff. C. theloides De Wever, 1979 Xenorum sp. cf. X. largum Blome, 1984 Paronaella sp. Pseudostylosphaera nazarovi (Kozur and Mostler) 1979 Yeharaia sp. cf. Y. annulata Nakaseko and Nishimura, 1979 ?Canesium lentum Blome, 1984 ?Corum sp. cf. C. regium Blome, 1984 ?Xipha sp. Triasssocampe deweveri (Nakaseko and Nishimura) 1979		Late Karnian or early Norian
79Wr-1.58	Paronaella sp. Pseudostylosphaera nazarovi (Kozur and Mostler) 1979 Yeharaia sp. cf. Y. annulata Nakaseko and Nishimura, 1979 Orbiculiforma sp. ?Canesium lentum Blome, 1984 Triassocampe deweveri (Nakaseko and Nishimura) 1979	Halobia cf. H. dilitata and cf. cordillerana (low or middle Norian; Swain, 1981)	Late Karnian or early Norian
79Wr-1.54	?Pseudostylosphaera nazarovi (Kozur and Mostler) 1979 ?Yeharaia sp. cf. Y. annulata Nakaseko and Nishimura, 1979 ?Xipha sp. Triassocampe deweveri (Nakaseko and Nishimura) 1979 Capnodoce anapetes De Wever, 1979 C. traversi Pessagno, 1979 ?C. vetusta Pessagno, 1979 Syringocapsa sp.	Halobia cf. H. lineata and cf. halorica from interval between -1.54 and -1.58 (low or mid Norian; Swain, 1981)	Late Karnian to late middle Norian
79Wr-1.40	?Yeharaia sp. cf. Y. annulata Nakaseko and Nishimura, 1979 Canesium lentum Blome, 1984 Corum sp. cf. C. regium Blome, 1984 Triassocampe deweveri (Nakaseko and Nishimura) 1979 Capnodoce anapetes De Wever, 1979	Halobia cf. H. lineata (lower or mid Norian; Swain, 1981)	Late Karnian to late middle Norian

	C. traversi Pessagno, 1979 C. vetusta Pessagno, 1979 ?Corum sp. Latium sp. cf. L. paucum Blome, 1984		
79WR-1.39	?Canesium lentum Blome, 1984 Corum sp. cf. C. regium Blome, 1984 Capnodoce traversi Pessagno, 1979 Capnuchosphaera sp. Acanthocircus elegans (Kozur and Mostler) 1972 ?Corum perfectum Blome, 1984		Early or middle Norian
79Wr-1.14	Canesium lentum Blome, 1984 Corum sp. cf. C. regium Blome, 1984 Triassocampe deweveri (Nakaseko and Nishimura) 1979 Capnodoce traversi Pessagno, 1979 Syringocapsa sp. Capnuchosphaera sp. cf. C. schenki Blome, 1983 C. sp aff. C. triassica De Wever, 1979 ?Corum sp. Latium sp. cf. L. paucum Blome, 1984 Acanthocircus elegans (Kozur and Mostler) 1972 ?Corum perfectum Blome, 1984		Early or middle Norian
79Wr-1.13	Paronaella sp. Corum sp. cf. C. regium Blome, 1984 Capnuchosphaera sp. cf. C. schenki Blome, 1983 C. triassica De Wever, 1979 C. sp. cf. triassica De Wever, 1979. ?Corum sp. Latium sp. cf. L. paucum Blome, 1984 Acanthocircus elegans (Kozur and Mostler) 1972 Corum perfectum Blome, 1984 Capnuchosphaera sp. cf. C. silviesensis Blome, 1983 C. tricornis De Wever, 1979		Early or middle Norian
79Wr-1.12	?Corum sp. cf. C. regium Blome, 1984 Capnodoce sp.	Halobia cf. H. halorica (Swain, 1981)	Late middle Norian

	Syringocapsa sp. Capnuchosphaera sp. cf. C. schenki Blome, 1983 ?Corum sp. Latium sp. cf. L. paucum Blome, 1984 Acanthocircus sp. Corum perfectum Blome, 1984 ?Capnuchosphaera sp. cf. C. silviesensis Blome, 1983 Capnuchosphaera sp. cf. C. sockensis Blome, 1983 Sarla sp. Capnuchosphaera lenticulata Pessagno, 1979 C. mexicana Pessagno, 1979 C. sp. aff. C. mexicana Pessagno, 1979 Pantanellium tozeri Pessagno, 1979 Plafkerium hindei Pessagno, 1979 Sarla natividensis Pessagno, 1979	
79Wr-1.11	Syringocapsa sp. Capnuchosphaera sp. cf. C. schenki Blome, 1983 Acanthocircus sp. Capnuchosphaera sp. cf. C. sockensis Blome, 1983 Sarla sp. Capnuchosphaera lenticulata Pessagno, 1979 C. mexicana Pessagno, 1979 C. sp. aff. C. mexicana Pessagno, 1979 Pantanellium tozeri Pessagno, 1979 Plafkerium hindei Pessagno, 1979 Sarla natividadensis Pessagno, 1979	Late middle or early late Norian
79Wr-1.10	Capnodoce traversi, Pessagno, 1979 C. vetusta Pessagno, 1979 Capnuchosphaera sp. Corum sp. Capnuchosphaera sp. cf. C. silviesensis Blome, 1983 C. sp. cf. C. sockensis Blome, 1983 ?Pachus sp. Sarla sp. Capnuchosphaera lenticulata Pessagno, 1979 C. sp. aff. C. mexicana Pessagno, 1979	Late middle to early late Norian

Pantanellium tozeri Pessagno, 1979
Plafkerium hindei Pessagno, 1979
Sarla natividadensis Pessagno, 1979

Above sample -1.11, in descending order, from Mull and others, 1982:
Monotis cf. M. subcircularis
Monotis sp. indet.
"Halobia cf. H. fallax" of Silberling (1963), Monotis sp. indet.
Monotis (Eomonotis) pinensis, "H. cf. H. fallax" of Silberling (1963)
Halobia sp. indet., Monotis sp. indet., H. fallax Mojsisovics
H. cf. H. lineata

(oldest megafossils in succession = late mid Norian)
Monotis (Eomonotis) sp. indet., Halobia cf. H. fallax Mojsisovics, Halobia sp. indet., "H. cf. H. fallax" of Silberling (1963), H. cf. H. plicosa
(middle Norian)

Akmalik Creek, lat 68°35', long 155°46'

83Aky-2S	48.2 m	Tripocyclia(?) japonica Nakaseko and Nishimura, 1979 Triassocampe(?) scalaris Dumitrica, Kozur, and Mostler, 1980 Triassocampe sp.	Ladinian; ?early Karnian
83Aky-2S	39.4 m	Emiluvia(?) cochleata Nakaseko and Nishimura, 1979 Pseudostylosphaera compacta (Nakaseko and Nishimura) 1979 Triassocampe sp.	Karnian
83Aky-2S	37.4 m	Pseudostylosphaera hellenica (De Wever) 1979 P. helicata Nakaseko and Nishimura, 1979 P. nazarovi Kozur and Mostler, 1979	Karnian

83Aky-2S	32.0 m	Xenorum largum Blome?, 1984		Late Karnian to late middle Norian
83Aky-2S	22.7 m	Triassocampe immaturum Blome, 1984 Capnodoce sp.		Late Karnian to late middle Norian
83Aky-2S	19.6 m	Renzium webergorum Blome, 1983 Capnodoce anapetes De Wever, 1979 Capnuchosphaera(?) colemani Blome, 1984		Late Karnian to late middle Norian
83Aky-2S	14.9 m	Xipha striata Blome?, 1984 Capnuchosphaera sp. Corum sp.		Late Karnian or early late Norian
83Aky-2S	12.5 m	Capnuchosphaera sp. Capnuchosphaera smithorum Blome?, 1983		Late Karnian to early late Norian
83Aky-2S	11.3 m	PPR		
83Aky-2S	8.1 m	PPR	Monotis	Late Triassic (Norian)
83Aky-2S	7.7 m	PPR		
83Aky-2S	6.5 m	?Pseudoheliodiscus sp.	Monotis	Late Triassic (Norian)
83Aky-2S	3.5 m	Livarella densiporata Kozur and Mostler, 1981 Pseudoheliodiscus sp.		Late Norian
83Aky-2S	0.2 m	Canoptum dixoni Pessagno and Whalen, 1982 Droltus laseekensis Pessagno and Whalen, 1982 Canutus rockfishensis Pessagno and Whalen, 1982 Livarella densiporata Kozur and Mostler, 1981		Early Jurassic (Hettangian to late Sinemurian)

Monotis Creek, lat 68°22.5', long 152°56'

80Amy 03 27		twisted spine and ?Triassocampe sp.	Halobia sp.	?Karnian
80Amy 03 22		Numerous twisted spines ?Triassocampe sp.		Middle Ladinian to early Karnian

	Eptingium manfredi Dumitrica, 1977 Pseudostylosphaera tenue (Nakaseko and Nishimura) 1979		
80Amy 03 19	Broken entactiinids and Eptingium-related forms (mounted SEM s-72)		Triassic
80Amy 03 15	Pseudostylosphaera japonica (Nakaseko and Nishimura) 1979 Pseudostylosphaera sp. ?Yeharaia japonica Nakaseko and Nishimura, 1979 Staurocontium minoense Nakaseko and Nishimura, 1979		Karnian
80Amy 03 12	Triassocampe deweveri (Nakaseko and Nishimura) 1979 ?Tripocyclia japonica Nakaseko and Nishimura, 1979 ?Eptingium sp.	*Entomonotis subcircularis (Patton and Tailleur, 1964) (late Norian if correctly identified, see asterik below)	Late Ladinian or early Karnian
80Amy 03 8	PPR		
80Amy 03D	Capnuchosphaera tricornis De Wever, 1979	Halobia	Late Karnian to middle Norian
80Amy 03C	Capnodoce miniscula Blome, 1983		Late Karnian to middle Norian
80Amy 03 B	Capnodoce crystallina Pessagno, 1979 C. vetusta Pessagno?, 1979 Pseudoheliodiscus Capnuchosphaera triassica De Wever, 1979 C. (?) colemani Blome, 1983 Pseudoheliodiscus sandspitensis Blome, 1984	Entomonotis subcircularis "abundant" in levels of samples 03C and D (I. L. Tailleur in note and Patton and Tailleur, 1964; the age of the radiolarians indicate that these may be true Monotis)	Late middle or early late Norian probably the younger part of this range

* Subsequent reidentification by Norm Silberling (footnote, p. 437, Patton and Tailleur, 1964) indicate Daonaella frami and D. cf. D. degeeri of Ladinian age.

Tiglukpuk Creek, lat 68°20', long 151°21'

80Amy 05 40	PPR		
80Amy 05 35	Triassocampe sp. Pseudostylosphaera japonica (Nakaseko and Nishimura?) 1979 ?Gorgansium sp.		Ladinian to middle Karnian
80Amy 05 30	PPR		
80Amy 05 20	Triassocampe deweveri (Nakaseko and Nishimura) 1979 Emiluvia(?) cochleata Nakaseko and Nishimura, 1979		?Karnian
80Amy 05B	twisted spine ?Canoptum sp.	Halobia sp.	Karnian or Norian
80Amy 05A	Canesium lentum Blome, 1984 Corum perfectum Blome, 1984 Syringocapsa turgida Blome, 1984 Capnuchosphaera deweveri Kozur and Mostler, 1979. C. mexicana Pessagno, 1979. C. lenticulata Pessagno, 1979. C. schenki Blome, 1984	Monotis subcircularis about 15 m above a normal fault)	Late middle Norian

Table 2.—Miscellaneous radiolarian samples from localities in and near National Petroleum Reserve in Alaska. Collectors: ACn = M. Churkin, Jr.; Cx = S. Curtis; Ek, EK = I. Ellersieck; Md = C. Mayfield; ABe = W. Brosge; AHe = J. Hoare; WR, (?W) = R. Witmer; ANK = W. Nokleberg; AKr = K. Reed; Amy = B. Murchey; RD = ?J. Reed, Jr.; Avy = ?Vickery. Taxa for each site listed in alphabetical order. Siksikpuk Formation as used in this table refers to strata originally assigned to that formation, but now probably part of the Otuk Formation as revised by Mull and others (1982).

Field Number	Latitude	Longitude	Radiolaria	Notes
78ACn-921	68°20'00"	151°50'00"	Age: Early Triassic (latest Spathian) or (Anisian)	Both the Spumellaria and Triassic Nassellariina are nondistinct and exhibit very few features. The radiolarians have been independently dated using conodonts. Many of the spumellarians have 2 to 5 or more simple rodlike primary spines and nodose cortical shells. Conodonts: Neogondolella sp. cf. N. regale Mosher (B. Wardlaw, written commun., 1980).
78ACn-431	68°12'16"	161°55'40"	Age: Middle Triassic (Ladinian)	Nearly all forms in these samples are undescribed.
78ACn-453	68°28'39"	161°44'40"	Gen. et sp. nov.	
78Cx-376	68°27'45"	160°22'42"	Eptingium manfredi Dumitrica	
78Cx-185B	68°28'12"	160°05'24"	Triassocampe sp.	
78EK-119B	68°22'00"	162°57'40"	Oertlispongus sp.	
78Md-33B	68°14'53"	159°06'00"	Poulpus curvispinus Dumitrica, Kozur and Mostler	Siksikpuk Fm., Key Creek seq.
78Md-61B	68°17'36"	159°36'00"	Triassistephandium laticornis Dumitrica	Otuk Fm., Etivluk Group
78Md-147C	68°22'42"	161°53'00"		Siksikpuk Fm., Key Creek seq.
78Tr-90B	68°26'00"	160°04'45"		
78Tr-235D	68°36.3'	156°34.2'		
78W-6	68°10'19"	163°11'30"		Siksikpuk Fm.
78ACn-852	68°53'00"	151°20'55"	Age: Late Triassic (Karnian; ?early Norian).	

78Md-164	68°16'50"	161°16'30"	Castrum perornatum Blome	Originally assigned as
			Gorgansium sp.	Kuna Fm., Key Creek seq.
78Tr-82B	68°29'35"	160°07'45"	Sarla sp.	

77EK-39	no data		Age: Late Triassic (late Karnian to early	Poor preservation prohibits
78EK-136A$_3$	68°18'36"	160°49'24"	late Norian)	more precise age determinations.
78Md-90A	68°29'00"	160°05'00	Capnuchosphaera sp.	Otuk Fm., Etivluk Group
78Md-191B	68°18'18 "	161°18'00"		Etivluk Group, Key Creek seq.
78W-28	68°03'47"	162°50'07"		
RD-227	68°03'47"	162°50'07"		Siksikpuk Fm. or Shublik Fm.

78ACn-851	68°53'00"	151°12'30"	Age: Late Triassic (late Karnian?; early	
78EK-50A$_2$	68°34'10"	159°59'30"	to late middle Norian)	
78EK-92	68°21'03"	160°11'54"	Acanthocircus sp.	
78EK-119E	68°22'05"	162°59'10"	Canoptum sp	
78EK-133D	68°24'42"	161°28'18"	Capnuchosphaera colemani Blome	
78ANK-095A	no data		C. contorta Blome	
78Tr-232A	68°36.5'	157°20'00"	C. sp. aff. C. schenki Blome	
79Avy-190	no data		Capnuchosphaera sp.	
78WR-1.20	no data		C. triassica De Wever	
			Capnodoce sp. aff. C. baldiensis Blome	
			Capnodoce sp.	
			Corum perfectum Blome	
			C. sp. aff. C. perfectum Blome	
			Corum sp.	
			Pseudohagiastrum sp.	
			Sarla sp.	
			Syringocapsa turgida Blome	
			Xipha turgida Nakaseko and Nishimura	

78ACn-911	68°50'15"	151°12'08"	Age: Late Triassic (middle Norian)	
78Md-160D	68°26'15"	160°57'20"	Capnuchosphaera contorta Blome	Bastille seq.,
72ABe-157	no data		C. lenticulata Pessagno	Etivluk Group
			C. mexicana Pessagno	
			C. sockensis Blome	
			C. triassica De Wever	

			Capnuchosphaera sp. Corum perfectum Blome C. speciosum Blome Latium sp. Syringocapsa sp. aff. S. turgida Blome	
78Tr-100	68°23'45"	160°14'20"	Age: Late Triassic (late Norian)	
78W-7	no data		Canoptum sp.	Siksikpuk or
78W-38780	68°04'42"	163°04'12"	?Cantalum sp.	Shublik Fm.
			Capnuchosphaera sp.	Siksikpuk Fm.
			Ferresium sp.	
			Laxtorum sp.	
			Pantanellium sp. aff. P. dawsoni Pessagno and Blome	
			?Plafkerium sp.	
			Pseudoheliodiscus sp.	
			Sarla sp.	
78ACn-722	68°27'06"	161°47'20"	Age: Late Triassic (Karnian or Norian)	
78ACn-723	68°27'04"	161°47'12"	?Capnuchosphaera sp.	
78Cx-89B	68°16'27"	160°08'30"	?Capnodoce sp.	
78EK-113d	68°20'18"	161°46'30"	Triassocampe sp.	
78Md-73B	68°29'25"	159°15'45"	Eptingium sp.	Ipnavik seq.
78Tr-35A	68°34'30"	159°37'24"	?Plafkerium sp.	Shublik or Siksikpuk Fm. The poor preservation precludes
78ACn-664	68°28'12"	161°50'42"	Age: Triassic (?Late Triassic)	
78EK-4F	?67°60'05"	?162°06'10"	Canesium sp.	
78EK-124C	68°23'54"	161°32'18"	?Capnuchosphaera sp.	
78W-38774	68°09'14"	162°58'54"	?Capnodoce sp.	Siksikpuk Fm.
Lisburne No. 1 Well	68°29'05"	155°41'33"	Plafkerium sp. ?Sarla sp. ?Triassocampe sp.	Fortress Mtn. Fm. The poor preservation prevents more precise age determinations.

78Tr-66A	68°31.6'	159°58.5'	Age: Mesozoic (?Triassic)	The faunas are too poorly preserved for more precise age determinations. 78Tr-66A and 241A are from the Blankenship member of the Otuk Formation, Brooks Range sequence. 78W-38775 is from rocks originally assigned to the Siksikpuk Formation.
78Tr-236D	68°28.28"	155°34.70'		
78Tr-241A	68°27'92"	155°40.8"		
78W-38775	68°09'03"	162°58'36"		
78Md-113B	68°09 45	160°18'30"	Age: Mesozoic (Triassic or Jurassic)	Key Ck. seq., Etivluk Group
78Md-152B	68°28'50"	161°18'00"		Bastille seq., Etivluk Group
78Tr-68B	68°31'18"	159°27'24"		Shublik or Siksikpuk Fm. (as originally assigned)
78Tr-235I_3	no data			The faunas are too poorly preserved for more precise age determinaton.
78ACn-872C	68°52'50"	151°20'50"	Age: Late Triassic (Norian) or early Jurassic. Gen. et sp. nov.	Radiolarian faunas poorly preserved
78Tr-235I_4	68°28'28"	156°34'50"	Age: Late Jurassic Parvicingula sp. Ristola hsui (Pessagno)	Originally assigned to the Blankenship member of the Otuk Formation
78ACn-631	no data		Age: Mesozoic. Unidentifiable nassellarians	
78ACn-731	68°27'03"	161°47'06"		
78Md-140	68°15'30"	161°40'00"		Ipnavik seq.
78Tr-233B	68°36.4'	156°33.4'		Lisburne Fm., Brooks Range seq.
78W-3	68°10'34"	163°11'00"		Siksikpuk or Shublik Fm.
78W-31	68°01'12"	164°37'24"		Unknown--Siksikpuk or Kagvik Fm.
78W-38783	68°09'40"	163°22'18"		Unknown--Siksikpuk or Shublik Fm.

Lisburne No. 1 Well cuttings			Age: Triassic (late Karnian to late middle Norian)	Forty-one samples from other depth intervals in the well were barren.
7425-7440 ft			?Triassocampe sp.	
11,095-11,100 ft			Capnuchosphaera sp. Canesium lentum Blome	
11,100-11,105 ft			Capnuchosphaera sp. Sarla sp. Capnodoce sp. aff. C. anapetes De Wever	
11,105-11,110 ft			Capnuchosphaera mexicana Pessagno Capnuchosphaera sp. ?Canoptum sp. Xipha sp.	
82AKr-75	68°08'	165°56'	Age: Triassic (Late Ladinian) Eptingium manfredi Dumitrica, Staurocontium granulosum Dumitrica, Kozur, and Mostler?, 1980 Poulpus sp.	Eeneegiksook Ck.
82AKr-72	as above		Age: Middle to late Karnian Gorgansium sp. Pseudostylosphaera japonica Nakaseko and Nishimura	
82AKr-70	68°08'	165°56'	undescribed spongy form	Agate Rock
82AKr-69	as above		Age: Late Norian or younger Acanthocircus sp., twisted spines	
82AKr-61	as above		Miliolid (porcellaneous benthic Foraminifera) undatable	
79Md-93	no data		Age: Late Norian Pseudoheliodiscus cf. P. sandspitensis Blome, Betraccium sp. aff. B. deweveri Pessagno and Blome	
79Md-146B	68°18'54"	163°19'33"	Age: ?Early Jurassic ?Canutus sp. or ?Droltus sp.	

79Md-160C	68°25'15"	160°57'20"	Age: Mesozoic Nassellarians
78Md-68C	68°29'10"	159°46'	Age: Late Karnian to late middle Norian Capnuchosphaera sp.
78Ek-92	68°21'03"	160°11'54"	Age: ?Early Jurassic Hagiastrid, ?Canutus sp.
79Md-75C	no data		Age: Mesozoic Nassellarians
78Md-30d	68°31'54"	179°17'00"	Age: Karnian ?Pseudostylosphaera sp., Triassocampe sp.
78Md-178B	68°14'28"	161°19'30"	Age: Karnian ?Staurodoras sp., Gorgansium sp. Pseudostylosphaera sp.
79Md-179d	no data		Age: Triassic ?Khalerosphaera sp.
79Tr-163D or B	no data		Age: Late Karnian to late middle Norian Castrum perornatum Blome, Capnodoce sp., Canoptum sp. aff. C. laxum Blome, Capnuchosphaera sp.
79Md-61E	68°18'06"	162°37'00"	Age: Karnian Gorgansium sp., Psuedostylosphaera tenue (Nakaseko and Nishimura), Triassocampe sp.
79Ek-291C	68°24'50"	156°52'10"	Age: Norian Latium longulum Blome, Capnuchosphaera sp.
79Ek-193d	68°24'30"	163°03'24"	Age: Probably Early Jurassic Pseudoheliodiscus spp., Paronaella sp., ?Canutus sp., ?Canoptum sp., Napora sp.
79Ek-194d	68°25'22"	163°31'00"	Age: Karnian Eptingium sp., Staurodoras variabilis Nakaseko and Nishimura, Pseudostylosphaera hellenica De Wever, Triassocampe sp.

79Md-109B	no data		Age: Early late or late Norian Pseudoheliodiscus sp., Sarla sp., Ferresium sp., Betraccium sp.
79Md-106D	68°25'15"	163°21'33"	Age: Early to late middle Norian Pseudoheliodiscus sp., Icrioma sp. cf. I. geometrica Blome, I. cf. I. praecipua Blome, Catoma sp.
79Ek-193C	68°29'00"	163°03'24"	Age: Probably Karnian Pseudostylosphaera compacta (Nakaseko and Nishimura)
78Ek-54	68°29'00	159°03'30:	Age: Late Ladinian or Karnian ?Pseudostylosphaera sp., ?Triassocampe sp.
79Md-164B	68°08'45"	162°29'00"	Age: Mesozoic Nassellarians only
79Ek-182C	68°18'15"	163°03'06"	Age: ?Early Jurassic ?Canutus sp.
79Cx-11B	68°05'42"	162°54'12"	Age: Late Karnian to late middle Norian Capnuchosphaera sp., Capnodoce sp., ?Poulpus, ?Corum, Sarla(?) externa Blome, Acanthocircus sp.
82Tr-04A	no data		Age: Ladinian or Karnian Eptingium sp., ?Pseudostylosphaera sp.
79Tr-88C1	68°11'17"	162°12'18"	Age: Probably Early Jurassic ?Canutus sp., ?Droltus sp.
79Md-204D	68°25'00"	155°34'00"	Age: Late Karnian to late middle Norian Capnuchosphaera deweveri Kozur and Mostler, C. schenki Blome, Corum perfectum Blome, Latium longulum Blome, Sarla prietoensis Pessagno Capnodoce sp.
75Cx-210D	68°15'30"	163°20'00"	Age: Probably Triassic ?Sarla sp., ?Pseudostylosphaera sp.
79Md-156C	68°21'28"	163°44'50"	Age: ? Karnian ?Corum sp., ?Pseudostylosphaera sp.

79Md-148C	68°18'00"	163°15'00"	Age: Probably Late Triassic ?Capnuchosphaera sp., ?Eptingium sp.
79Ek-204h	68°10'55"	163°19'10"	Age: Triassic ?Triassocampe sp., conodont fragment
79Md-65C	68°13'45"	162°49'55"	Age: Late Triassic ?Capnuchosphaera sp., ?Canoptum sp.
79Cx-209G3	68°28'09"	162°37'20"	Age: Mesozoic Poorly preserved nassellarians
79Md-15A	68°21'28"	163°44'50"	Age: Early Jurassic (Sinemurian/Pliensbachian) Canutus sp. aff. C. izeensis Pessagno and Whalen, Pantanellium sp., Canoptum dixoni Pessagno and Whalen
79Cx-203C	68°30'30"	162°12'36"	Age: Late Karnian to middle Norian Acanthocircus sp., Pachus firmus Blome, Capnuchosphaera sp.
77ACn-1421	no data		Age: Mesozoic Poorly preserved nassellarians
79Cx-73C	no data		Age: Early Jurassic Canutus sp. aff. C. hecatensis Pessagno and Whalen, ?Lupherium sp., Canoptum sp., Livarella sp.
79Tr-88C.1	68°11'17"	162°12'18"	Age: Probably Early Jurassic ?Droltus sp.
77ACn-611	no data		Age: Probably Late Triassic ?Pseudoheliodiscus sp., ?Sarla sp.
82Tr-04E	no data		Age: Early or Middle Jurassic ?Canutus sp., Paronaella sp., ?Emiluvia sp.
77ACn-362	68°33'25"	161°09'30"	Age: Probably Norian Canoptum spp., Livarella sp., ?Capnodoce sp.
79Ek-262e	68°15'48"	163°16'00"	Age: Ladinian or early Karnian Eptingium sp., Pseudostylosphaera sp.
79Cx-73G.1	68°23'33"	162°12'18"	Age: Possibly Late Triassic ?Capnodoce sp. aff. C. anapetes De Wever; Foraminifera

79Md-187B	68°32'08"	156°14'25"	Age: Late Karnian to late middle Norian Capnuchosphaera deweveri Kozur and Mostler, Capnuchosphaera spp., ?Pseudostylosphaera sp.
79Md-11F	68°03'24"	162°47'25"	Age: Late Karnian to middle Norian Capnuchosphaera sp.
79ABe-257	67°57'10"	145°41'40"	Age: Possibly Late Triassic ?Capnuchosphaera sp. fragment
79Md-11B	no data		Age: Early Jurassic (probably Sinemurian) Canutus rockfishensis Pessagno and Whalen?. Droltus sp. aff. D. lyellensis Pessagno and Whalen, ?Emiluvia sp.
79Cx-191B	no data		Age: Possibly Middle Jurassic ?Hsuum sp., ?Parvicingula sp.
79ABe-273	68°32'50"	143°25'30"	Age: Late Karnian to middle Norian Capnuchosphaera sp., C. deweveri Kozur and Mostler, Acanthocircus sp. aff. A. usitatus Blome
78Tr-2351$_4$	68°32'50"	156°34.9'	Age: Triassic Foraminifera, conodonts; poorly preserved Nassellarians
79Md-200E	68°31'24"	155°38'30"	Age: Early to late middle Norian Capnuchosphaera lenticulata Blome, Corum perfectum Blome, Capnodoce sp., Canoptum sp., Canesium sp. cf. C. lentum Blome
79Ek-100B	no data		Age: Late Karnian to late middle Norian Canesium lentum Blome, Capnuchosphaera sp., Capnodoce anapetes De Wever

Barren samples

78ACn-221	78ACn-461	78ACn-611	78ACn-663	78ACn-781	78ACn-861	78ACn-912	78ACn-1421
78EK-17D	78EK-5621	78EK-58	78EK-55B	78EK-139B	78AHe-040A	77Md-64	78Md-68C
78Md-84A	78Tr-68B$_2$	68Tr-78A	68Tr-78B	64Tr-207	78W-9	78Avy-382	

Table 3. Stratigraphic Distribution of Radiolarians from the Otuk Formation, northern Alaska. Measured Sections: A = Akmalik Creek; Ay = Ayugatak Creek; M = Monotis Creek; N = Noyalik Creek; O = Otuk Creek; P = Punupkahkroak Mountain; and T = Tiglukpuk Creek.

RADIOLARIAN TAXA	Chert Member	Limestone Member	Blankenship Member
Acanthocircus elegans	O O O		
A. harrisonensis	P		
Acanthocircus sp.	O	P	
Bagotum maudense			P
Bagotum sp.			P
Betraccium deweveri	Ay	P P	
B. incohatum	P		
B. yakounensis		P P	
Canesium lentum	O O O O O T		
Canoptum browni	P		
C. dixoni			P A
C. laxum	P		
C. merum			P
C. poissoni			P
Canoptum sp.		T	P
Cantalum alium			P
C. globosum			P
Canutus izeensis			P
C. rockfishensis			P
Capnodoce anapetes	O PO P		
C. crystallina	M		
C. miniscula	AM		
C. traversi	O O O P O		
C. vetusta	O O OM		
Capnodoce sp.	Ay O A		
Capnuchosphaera colemani	A P M		
C. contorta	N		
C. deweveri	T		
C. lenticulata	P OTOP		
C. mexicana	O OPT		
C. schenki	O O O OT		
C. silviesensis	O O O		
C. smithorum	P	A	
C. sockensis	O		
C. triassica	O P O O MP		
C. tricornis	P M O		
Capnuchosphaera sp.	O N A ONA	A	

RADIOLARIAN TAXA	Chert Member	Limestone Member	Blankenship Member
Corum perfectum	O O O O T		
C. regium	O O O O O P		
Corum sp.	O O O O OA		
Droltus hecatensis			P
D. laseekensis			A
Emiluvia cochleata	A T		
Eptingium manfredi	P M M		
Ferresium laseekensis		P	P
Ferresium sp.			N
Gorgansium sp.	T		
Latium paucum	O O O O		
Laxtorum atliense			N
L. hindei		P	
L. kulense			N
Laxtorum sp.			N
Livarella densiporata			NA A
Orbiculiforma sp.	O		
Pachus sp.	P N O		
Pantanellium browni			P
P. fosteri			P
P. kulense			P
P. tanuense			P P
P. tozeri	P P P		
Paronaella sp.	O O O		
?*Parvicingula* sp.			P
Plafkerium hindei	O O O		
Pseudoheliodiscus sandspitensis		M Ay P	
P. yaoi			P
Pseudoheliodiscus sp.		N	A P NA
Pseudostylosphaera compacta	A		
P. helicatum	P		

RADIOLARIAN TAXA	Chert Member	Limestone Member	Blankenship Member
P. hellenica	P A		
P. japonica	P M Ay A T		
P. nazarovi	O O A		
P. tenue	M		
Pseudostylosphaera sp.	M Ay		
Relanus reefensis			P P
Renzium webergorum	A		
Sarla natividadensis	O O O		
S. plena	N	P	
Sarla sp.	P Ay N O O O		
Staurocontium minoense	M		
Syringocapsa turgida	T	Ay	
Syringocapsa sp.	O O O O		
Triassocampe deweveri	O MO O O		
T. immaturum	A A		
T. scalaris	P		
Triassocampe sp.	O AP TM T		
?*Tripocyclia japonica*	O		
?*Tripocyclia* sp.	P M Ay		
Veghicyclia sp.			P
Xenorum largum	O A		
Xipha pessagnoi	P		
X. striata	A		
Xipha sp.	O O		
Yeharaia japonica	M		
Y. annulata	O O O O		