Appendix: Paleontological analysis, Copper River basin field sample , in Powell, Doug, and Amoco Oil Co., Geological report to the Ahtna Corporation, Copper River basin, Alaska, 1975

Momper, J.A., and Amoco Oil Co.

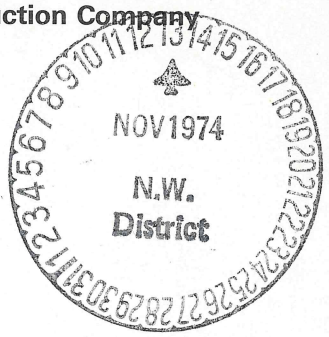
GMC DATA REPORT 455A

This GMC data report from the Amoco Heritage collection has been made available through funding from the FY2018 USGS National Geological and Geophysical Data Preservation Program, Grant Number G18AP00054. This project report is presented in its original format and has not been reviewed for technical content or for conformity to the editorial standards of DGGS. It should not be used or cited as reviewed data.

2019
State of Alaska
Department of Natural Resources
Division of Geological & Geophysical Surveys
GEOLOGIC MATERIALS CENTER

AMOCO

Amoco Production Company



Tulsa, Oklahoma
November 8, 1974

File: Technical Service 5962IR

Mr. P. H. Garrison
Denver Division

Attn: Terry Cooper

Subject: Paleontological Analysis, Copper River Basin Field Samples

The attached report by J. R. Derby and R. W. Scott summarizes the biostratigraphic and paleoecologic interpretations of the Copper River Basin samples collected during the 1974 field season. This report completes the subject Technical Service.

Processing of 1974 samples from the Alaska Peninsula has begun, and we anticipate completion of a preliminary report before the end of the year.

JAMES A. MOMPER

By G. A. Sanderson
G. A. Sanderson

GAS:ch
231 068

Attachment

cc: J. G. Verville
J. G. Nikkel
A. B. Shaw

Amoco Production Company

Tulsa, Oklahoma
November 6, 1974

File: Technical Service No. 5962IR
Localities: 7772 through 7788, inclusive

MEMORANDUM

Subject: Age Determination and Paleoecology of 1974 Copper River Basin Samples.

This memorandum constitutes the complete Technical Service report on the 1974 Copper River Basin megafossil samples. In the attached list of localities and faunas, most of the age determinations are by Derby, whereas the paleoecological interpretations are by Scott.

Age Determinations

Age determinations were made by reference to our own control and to published literature. Many samples contain Upper Jurassic faunas readily referable to our Alaska Peninsula Zonation (Figure 1). Several other samples contain ammonite faunas essentially identical in composition to ones described by Ralph Imlay of the U.S.G.S. (See U.S.G.S. Prof. Paper 801 for a listing of relevant works.)

Two problems exist in our age determinations of Jurassic faunas. The first problem is purely one of time-stratigraphic classification. The Upper Jurassic - Middle Jurassic boundary has been placed at the base of the Callovian by Imlay but at the top of the Callovian by Frebold and other workers. In the past we have followed the latter practice. For the purpose of this report we will continue to place the Callovian in the Middle Jurassic.

The second problem results from the fact that we do not have an established zonation for the Middle Jurassic. Rather we must depend upon our own few collections and upon the age determinations and ammonite zonation of the U.S.G.S. The species of Inoceramus which we call I. porrectus (possibly equivalent to the group of species which Imlay calls I. ambiguus, exumis, and porrectus) is common in Bajocian-age beds of the Fitz Creek Siltstone (C 1772F of 1973 collection), and is

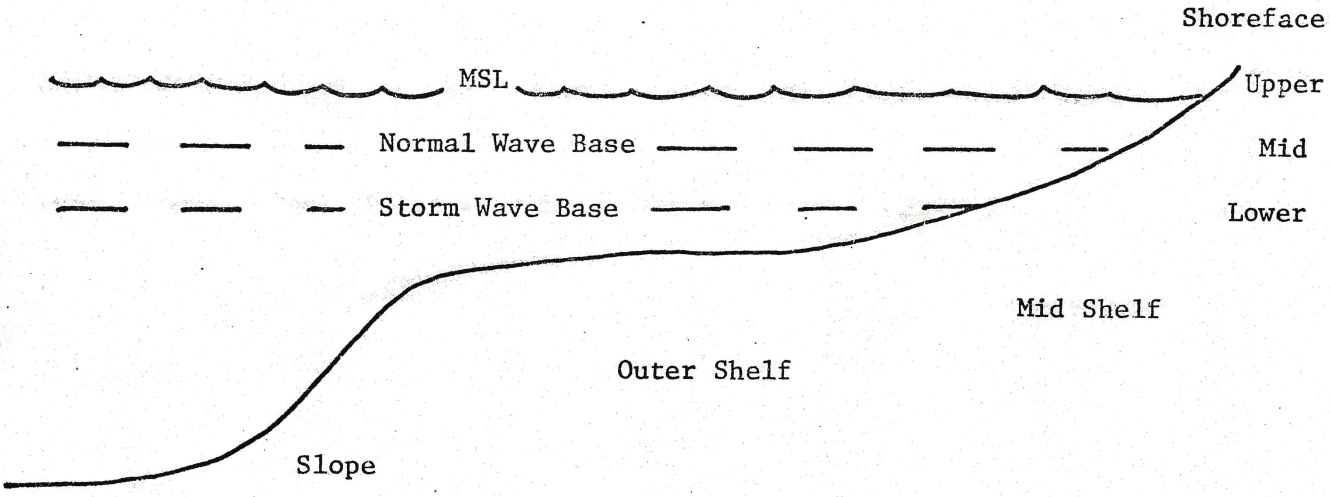
also common in the upper Bowser Fm. (Colln. C 1749 and C 1745) in beds that are either basal Callovian or Bathonian. [Contrast the stage assignments of the Bowser Fm. in Imlay 1973, U.S.G.S. Prof. Paper 801, with that of Detterman and Hartsock, 1966, U.S.G.S. Prof. Paper 512, and Imlay's earlier works.] Consequently I. porrectus ranges from the middle Bajocian into the Callovian and cannot provide very precise age determinations. In contrast, I. lucifer is restricted to the Bajocian. Correlations based on mollusks other than Inoceramus and ammonites are hampered by lack of reliable reference literature. As our work on the Middle Jurassic of the Alaska Peninsula progresses, we probably will be able to improve some of the correlations enclosed herein.

Paleoecological Interpretations

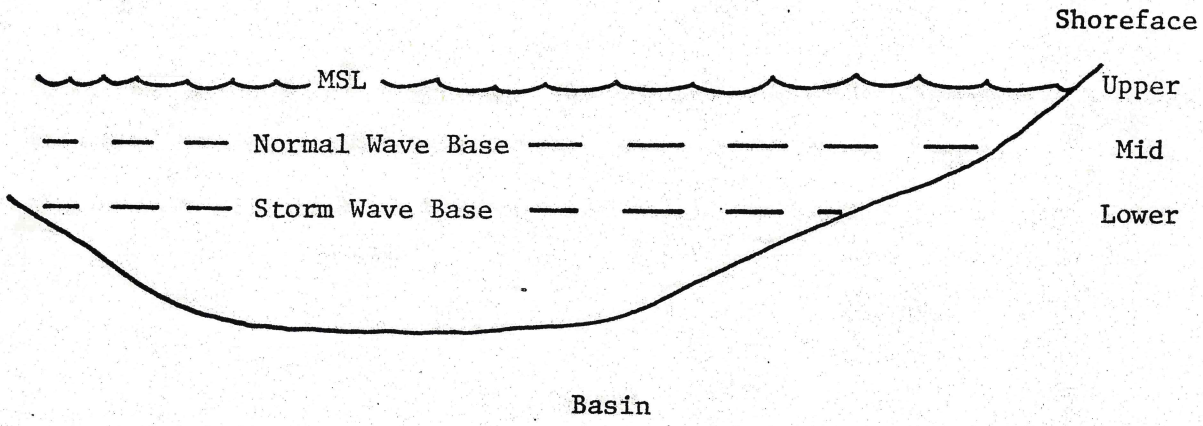
The paleoecological interpretations consist of two parts: the mode of origin of fossil assemblages and the depositional environments. Interpretations about the origin of the assemblages are based mainly upon patterns of dispersal, density, and orientation of the fossils as well as the texture and structures of the sediments. Degree of fragmentation and sorting of the fossils are secondary criteria. The modes of origin of assemblages follow categories defined by Scott (1970, Kan. Paleo. Cont., Art. 52). In-place assemblages consist of organisms preserved in living position; disturbed-neighborhood assemblages are those preserved in the same area or substrate where they lived, but have been re-oriented by gravity, burrowers, scavengers, or weak currents; transported assemblages display sedimentary structures indicative of current or wave deposition and generally have been removed from their habitat. Most of the Copper River Basin samples are transported fossil deposits based upon sedimentary parameters, the mode of occurrence of the fossils, and on the inferred life substrate.

Interpretations about depositional environments are based upon the form and function of bivalves, on the analogues with known Cretaceous (Scott, 1974, Lethaia, V. 7, p. 315-330) and Holocene communities, and on Jurassic models described by Wright (1975, J. Paleo., V. 48, p. 425-433). Feeding habits and substrate niche preferences are related to shoreline, energy conditions, substrate type, and depth. The relative proportions of infaunal suspension feeders, epifaunal suspension feeders, and vagrant detritus feeders were used to interpret the depositional environments. The shoreface to shelf model accounts for ecological features of most Copper River Basin samples. The shoreface model (Davies et al., 1971, AAPG Bull. 55, p. 550-565) includes the littoral zone to the depth of storm waves. Upper shoreface extends from high tide to the breaker zone; middle shoreface is from the breaker zone to depth of normal waves; and the lower shoreface extends from depth of normal waves to the base of most storm waves where it merges with the middle shelf zone. This model can be placed into two geographic settings: a continental margin or lagoon to epicontinental sea. The choice between these settings or alternate interpretations must be based upon the regional stratigraphic setting.

1. Continental Margin Interpretation



2. Epicontinental Sea - Lagoon



This completes Technical Service 5962IR.

James R. Derby

James R. Derby

Robert W. Scott

Robert W. Scott

JRD:RWS:rn
199 908

Attachment

DESCRIPTION OF SAMPLES

COPPER RIVER BASIN

Locality 7772. Little Oshetna River Section, Talkeetna Mtns. (A-1) Quad., Alaska. Lower Jurassic Talkeetna Fm. through Upper Jurassic Chinitna Fm.

Field No.	Sample No.	Identification	Count
CR-28F	2	21925 Pleuromya	1
		02186 Trigonia sp.	1
		21949 Astarte harrisonensis ?	1
		02200 Indet. Pelecypod	1
		03332 Indet. Rhynchonellid Brach.	1
CR-37F	7	21952 Syncyclonema 21952	1
		21668 Indet. Belemnite	1
		21964 Indet. Oyster	50
		21962 Cliona sp.	5
		21965 Meleagrinella sp.	2
CR-22F	16	21668 Indet. Belemnite	1
		21964 Indet. Oyster	1
		21649 Anomia sp.	2
		21963 Vaugonia	5
CR-20F	18	21668 Indet. Belemnite	5
		21925 Pleuromya 21925	2
		21928 Myophorella 21928	3
		21930 Cucullaea 21930	2
CR-17F	21	21668 Indet. Belemnite	3

Age: None of the faunas permit a positive determination of age. Most of the pelecypods listed are thought to be relatively long-ranging and more indicative of environment than of age. However, comparison with Canadian faunas of the Fernie Group and to other collections reported herein (Loc. 7777, 7780) would suggest that a Middle Jurassic Bajocian to Callovian age is probable for samples 2 to 18.

Paleoecology:

Sample

2: Transported or disturbed neighborhood deposit; 3 infaunal suspension feeding bivalves and 1 epifaunal suspension feeding brachiopod suggest shallow marine inner shelf or shoreface.

Locality 7772 (Contd.)

Sample

7: Transported deposit;
3 epifaunal suspension feeding bivalves, a boring sponge and a belemnite suggest deeper marine middle shelf or basin or lagoon center.

16: Transported deposit;
2 epifaunal suspension feeders, 1 infaunal suspension feeder, and a belemnite suggest a transition between the middle shelf to lagoon center and the inner shelf or shoreface.

18: Taphonomy unknown;
3 infaunal suspension feeders and 1 belemnite suggest shallow marine inner shelf or shoreface.

21: Belemnite indicates a marine environment.

Locality 7773. Little Nelchina River No. 2, (Idaho Creek) Section, Naknek Fm.

Field No.	Sample No.	Identification	Count
CR-45F	4	2880 Phylloceras ?	1
		2201 Indet. gastropods	2
		21668 Indet. belemnite	2
CR-47	5	20683 Buchia concentrica → rugosa	Coquina (>50)

Age: Sample CR-47F is Upper Jurassic, lower Buchia rugosa zone. The fauna in CR-45F yields no definitive age at this time, but it is probably about the same age as CR-47F.

Paleoecology:

Sample

4: Taphonomy unknown;
the poorly preserved faunule is marine and possibly shelf.

5: Transported deposit;
the dominant epifaunal suspension feeder, Buchia, may have been eroded from nearby shell beds possibly in the lower shoreface zone or lagoon margin.

Locality 7774. Yako Creek Section, Talkeetna Mts. (A-1) Quad., Naknek Fm.

Field No.	Sample No.	Identification	Count
CR-53F	2	20850 Meleagrinella	>100
		21631 Tancredia?	3
		21668 indet. belemnite	2
		03675 Astarte sp.	1

Age: This sample is a coquina with a fine-grained sandstone matrix, consisting largely of Meleagrinella shells and broken shells of larger mollusks. Although Meleagrinella 20850 is not one of our well established "guide fossils", in the Alaska Peninsula it has been found only in Upper Jurassic strata of the B. concentrica through B. mosquensis zones.

Paleoecology:
Transported deposit. The very abundant epifaunal suspension feeder, Meleagrinella 20850, suggests that a sandy mud lagoon or middle shelf substrate was nearby; the 2 infaunal suspension feeders suggest faunal mixing from the inner shelf or shoreface.

Locality 7775. Little Nelchina River No. 1 Section.

No megafossils.

Locality 7776. Lower Flat Creek Section, Naknek Formation.

Field No.	Sample No.	Identification	Count
CR-59F	3	20415 Buchia rugosa	Coquina (>100)
		21668 indet. belemnite (probably Cylindroteuthis)	6
		21973 Eocallista 21973	4

Age: This sample is largely a coquina of Buchia rugosa, hence it is Upper Jurassic. The associated fauna is typical of shallow-water, high-energy Upper Jurassic associations.

Paleoecology:
Transported deposit; the very abundant epifaunal suspension feeder, Buchia, suggests transportation from nearby shell beds either in the lower shoreface or lagoon margin, and mixing with the marine belemnite and the marine to brackish Eocallista 21973.

Locality 7777. Chitna Creek Section, Anchorage (D-3) Quad., Alaska, Tuxedni, Chinitna, and Naknek Formations.

Field No.	Sample No.	Identification	Count
CR-71F	2	21928 Myophorella 21928	1
		21925 Pleuromya 21925	2
		21926 Protocardia? 21926?	1
		21927 Pronoella cinnabarensis	2
		21948 Pseudomelania?	1
		21949 Astarte harrisonensis	1
CR-1023F	5	20837 Inoceramus cf. I. lucifer	5
		21974 Emileia constricta	1
		02912 Nuculana? sp.	4
		21954 Parallelodon cardioceratanum	1
		21668 Indet. belemnite	2
		03736 Indet. wood	5
		20880 Phylloceras sp.	1
		20881 Indet. ammonite	2
		02922 Indet. echinoids	25
		21973 Eocallista? 21973	4
CR-1020F	8	21928 Myophorella 21928	7
		20880 Phylloceras sp.	1
		21931 Bradfordia caribouensis	4
		20849 Entolium cf. 20849	2
		21975 Holcophylloceras costisparsum	7
		20837 Inoceramus lucifer	11
		21927 Pronoella cinnabarensis	8
		21926 Protocardia 21926	15
		02507 Corbula sp.	8
		21292 Oxytoma sp.	15
		21950 Pleurotomaria 21950	6
		21974 Emileia constricta	1
		21773 Astarte 21773	4
		21925 Pleuromya 21925	9
		21668 Indet. belemnite	2
		21929 Modiolus 21929	3
		20420 Inoceramus prisms	
		03736 Indet. wood	5
		20881 Indet. ammonites	8
		21970 Homomya 21970	2
		21971 Pleuromya simplex	3
		21976 Phylloceras cf. P. kunthi	1
		21977 Sonninia tuxedniensis	1
CR-1019F	9	21292 Oxytoma sp.	4
		21668 Indet. belemnite	8
		03736 Indet. wood	3
		02533 Acmaea sp.	1
		02200 Indet. pelecypod	8

Locality 7777 (Contd.)

Age: These exceptionally large faunas appear to be all about the same age, Middle Jurassic; however, only Samples 5 and 8 contain diagnostic species. These samples contain ammonites of middle Bajocian age which have been previously reported (Imlay, 1964, Prof. Paper 418-B) from the upper Red Glacier and Fitz Creek formations in the Cook Inlet region and the Tuxedni Group in the Talkeetna Mtns. The species of Inoceramus is the same as in our 1973 collection C1760.

Paleoecology:

Sample

2: Disturbed neighborhood deposit; the diversity of infaunal suspension feeders suggests an inner shelf to shoreface marine environment.

5: Transported deposit; this assemblage is mixed with taxa from several environments: (1) most taxa indicate marine conditions, but Eocallista? and wood suggest brackish and terrestrial conditions; (2) Nuculana suggests a nearby offshore muddy shelf substrate; (3) nestling-type Inoceramus cf. I. lucifer suggests a muddy shelf substrate; this mixed fauna may have been deposited in the shoreface intermediate to the littoral and the offshore shelf environments.

8: Transported deposit; this mixed fauna is the most diverse collection and contains both marine and nonmarine (wood) taxa; the diverse infaunal suspension feeders (7 taxa) suggest an inner shelf-shoreface environment; Modiolus and Oxytoma suggest a nearshore lagoon; Inoceramus lucifer and Entolium suggest a deeper, middle shelf environment; and Pleurotomaria is related to shallow water algal feeders; the mixed fauna may have been deposited upon the shoreface between the shallower water and deeper shelf environments.

9: Transported deposit; a marine shelf fauna with one algal feeder, Acmaea.

Locality 7778. Billy Creek (1974), "Lower Cretaceous" basal Matanuska Fm.

Field No.	Sample No.	Identification	Count
CR-114F	3	20415 Buchia rugosa	75
		21784 Tancredia 21784	7
CR-115F	4	20415 Buchia rugosa	60

Age: These two collections contain typical middle Upper Jurassic (Kimmeridgian) Buchia. Tancredia is commonly associated with B. rugosa in conglomeratic beds on the Alaska Peninsula.

Paleoecology:

Sample

3: Transported or disturbed neighborhood deposit; the dominant Buchia indicate a shell bed either on the lower shoreface or lagoon margin; Tancredia suggests proximity of the shoreface environment.

4: Transported deposit; the low diversity and dominance of Buchia indicates a shell bed either on lower shoreface or lagoon marine.

Locality 7779. White Hill Section, Anchorage (A-1) Quad., "Lower Cretaceous Nelchina Fm.".

Field No.	Sample No.	Identification	Count
CR-129F (250-275' below top of section)	3	20415 Buchia rugosa	6
		20881 Indet. ammonite (lytocerid)	1
CR-126F (80' below top of section)	5	20836 Inoceramus (Retroceramus) porrectus	12
		20881 Indet. ammonite	1
		21971 Pleuromya simplex	1
		21949 Astarte harrisonensis	1

Age: Not only are these samples not Cretaceous, the section appears to be inverted or faulted. Sample CR-129F is the lowest sample and is Upper Jurassic (Kimmeridgian). Sample CR-126F is the higher sample and is Middle Jurassic (Bajocian through Callovian). Sample CR-129F must be from the Naknek Fm., whereas Sample CR-126F is probably from the Tuxedni Group or Chinitna Fm., according to Imlay's (1973, U.S.G.S. Prof. Paper 801, Fig. 11) column for the Talkeetna Mtns.

Locality 7779 (Contd.)

Paleoecology:

Sample

3: Transported deposit; near a marine Buchia bed.

5: Transported deposit; perhaps on the lower shoreface or inner shelf between the infaunal suspension feeding muddy substrate community with Astarte and Pleuromya and the epifaunal nestler, Inoceramus porrectus.

Locality 7780. Cardioceras Creek, Talkeetna Mtns. (A-2) Quad., Upper(?) and Middle Jurassic, Tuxedni Fm.

Field No.	Sample No.	Identification	Count
CR-142F	3	21946 Cobbanites cf. talkeetnanus	2
		21951 Arctocephalites alticostatus	2
		21953 Nucula sp.	1
		21952 Syncyclonema 21952	16
		21949 Astarte harrisonensis?	1
		21927 Pronoella? sp.	1
		21292 Oxytoma sp.	1
		21668 Indet. belemnite	2
		02200 Indet. pelecypod	1

Age: This fauna appears to be the "Arctocephalites" fauna of late Middle Jurassic (Bathonian) age, which is known from the Tuxedni Fm. in the Talkeetna Mtns. (Imlay, 1962, U.S.G.S. Prof. Paper 374-C). Imlay (1973, U.S.G.S. Prof. Paper 801) now apparently considers the "Arctocephalites" to be definitely Bathonian in age, a departure from his earlier interpretations. This same fauna is known from U.S.G.S. Collection 2011 from the middle Bowser Fm. on the Iniskin Peninsula.

Paleoecology:

Sample

3: Transported? deposit; the epifaunal suspension feeders, Oxytoma and Syncyclonema, and the deposit feeder, Nucula, suggest a muddy middle shelf or basin center environment; Astarte and Pronoella are infaunal suspension feeders that may range from middle shelf to lower shoreface silts; the ammonites suggest marine conditions.

Locality 7781. Chesnina River Section, Valdez (D-1) Quad., Alaska. Upper Jurassic? unnamed units. (?Lower Naknek and/or Chinitna Fms.). Bag labeled "fossil scraps".

Field No.	Sample No.	Identification	Count
CR-178	7	02923 Indet. plants (ferns)	
		20881 Indet. ammonite	

Age: This material is inadequate to support a positive identification or age determination. However, the ammonite fragments resemble several genera of the Stephanocerataceae with high trifurcating ribs and excentric coiling that are common in the Middle Jurassic of Alaska.

Paleoecology:

Sample

7: Transported deposit; a restricted, nearshore environment is suggested by the absence of other taxa and the presence of ferns with ammonites.

Locality 7782. Snider Peak Section, Gulkana (A-2) Quad., Alaska. Lower Cretaceous, Kennicott Fm.

Field No.	Sample No.	Identification	Count
CR-187F	10	20881 Indet. ammonite (lytocerid)	3
		2200 Indet. pelecypod (Leptosolen?)	1

Age: This sample contains three specimens of a smashed and distorted ammonite, initially involute becoming evolute, with circular whorls and ornamented solely by fine growth lines. The specimens probably can be assigned to long-ranging family Lytoceratidae (Jurassic through Cretaceous).

Paleoecology:

Taphonomy unknown; the indeterminant fauna suggests marine conditions.

Locality 7783. Crooked Creek Section, Talkeetna Mtns. Quad. (A-1), Alaska. Upper? and Middle Jurassic, Tuxedni Fm.

Field No.	Sample No.	Identification	Count
CR-2002F	3	20837 Inoceramus cf. I. lucifer	6
		21955 Oxytoma aff. O. mclearni	
		21954 Parallelodon cardioceratanum	
		21462 ?Thracia sp. 21462	
		21956 Oppelia? sp.	
		02923 Indet. plant frags. (wood)	

Age: This is provisonally considered to be a Middle Jurassic Bajocian fauna, based on the presence of I. lucifer and O. mclearni.

Paleoecology:

Sample

3: Transported; the epifaunal suspension feeders, Oxytoma and Inoceramus, and infaunal suspension feeders, Parallelodon and Thracia, suggest lower shoreface to middle shelf muddy substrates.

Locality 7784. Joe Creek, Talkeetna Mtn. (B-1) Quad., Upper? and Middle Jurassic, Tuxedni Fm.

Field No.	Sample No.	Identification	Count
CR-1005F	1	21959 Astarte 21959	
		2200 Indet. pelecypods	
		2923 Indet. plants (wood)	

Age: Unknown. Astarte ranges from the Middle Jurassic to the Recent and A. 21959 is a "new taxon"; hence, we have no knowledge of its range.

Paleoecology:

Disturbed neighborhood or transported deposit; the low diversity, indeterminant fauna suggests nearshore restricted conditions.

Locality 7785. Lower Bubb Creek, Talkeetna Mtn. Quad., Upper Jurassic, Chinitna Fm.

Field No.	Sample No.	Identification	Count
CR-2008F	1	20836 *Inoceramus* (*Retroceramus*) *porrectus*	5
		21958 *Modiolus* 21958	1
CR-2005F	4	20836 *I.* (*R.*) *porrectus*	13
		21949 *Astarte harrisonensis*?	1
		21668 Indet. belemnites	3
		2200 Indet. pelecypod	2

Age: These samples are clearly Middle Jurassic in age, as used herein. *Inoceramus* (*Retroceramus*) *porrectus* ranges from the Bajocian into the early Callovian. Consequently, this fauna *may* be correctly placed in the Chinitna Formation. The particular indeterminate pelecypod present in this sample is also present in the 1973 Cook Inlet Samples C1739 and C1745.

Paleoecology:

Sample

1: Transported deposit; the *Inoceramus porrectus* suggests a muddy offshore environment and *Modiolus* suggests a nearshore lagoonal environment, perhaps mixed by depositional processes.

4: Transported deposit; muddy middle shelf to lower shoreface environment.

Locality 7786. Gunsight Creek Section, Anchorage (D-1) Quad., Upper Cretaceous, Matanuska Formation.

Field No.	Sample No.	Identification	Count
CR-2110F	2	21966 *Inoceramus* aff. *I. concentricus nipponicus*	9

Age: This collection consists solely of an *Inoceramus* which is new to us and not described in the North American literature. It most closely resembles a subspecies which is known to occur in the Cenomanian-Turonian of Japan (Nagao and Matsumoto, 1939) and the Cenomanian of Siberia (Pergament, 1966). Davy Jones of the U.S.G.S. suggested (telecon 10/23/74) that this species is from Cenomanian beds in the Matanuska Formation.

Locality 7786 (Contd.)

Paleoecology:

Disturbed neighborhood assemblage; marine nearshore, perhaps lower shoreface.

Locality 7787. Lubbe Creek Section, McCarthy (C-5) Quad., Alaska. Lower Jurassic-?Upper Triassic, Upper McCarthy Fm.

Field No.	Sample No.	Identification	Count
CR-1075F	3	20881 Indet. ammonite (Aegasteroceras?)	3
		20056 Indet. pteriod pelecypod	4

Age: The ammonite in this collection consists of flattened impressions which will not permit a positive identification. The preserved features are similar to those of Aegasteroceras, Arctoasteroceras (which have been reported from the upper McCarthy), and other evolute, coarse-ribbed forms in the Triassic and Jurassic. The pelecypod is a narrow-hinged pteriod, with a clearly differentiated wing, and strong radial and concentric ornament. Despite the many species identified from this area by Imlay (in MacKevett, 1970, U.S.G.S. Map GQ899; 1971, U.S.G.S. Bull. 1323), this species clearly is not any of these, nor can we identify it with any known taxa.

Paleoecology:

Possibly deposited by gravitational settling from the pelagic zone; the fauna may represent a pelagic community of nektonic ammonites and epiplanktonic pteriods; the apparent absence of benthos suggests restrictive conditions such as low oxygen, turbidity, or other toxic conditions.

Locality 7788. Nikolai Mine, McCarthy (B-5) Quad., Alaska. Lower Cretaceous Kennicott Formation.

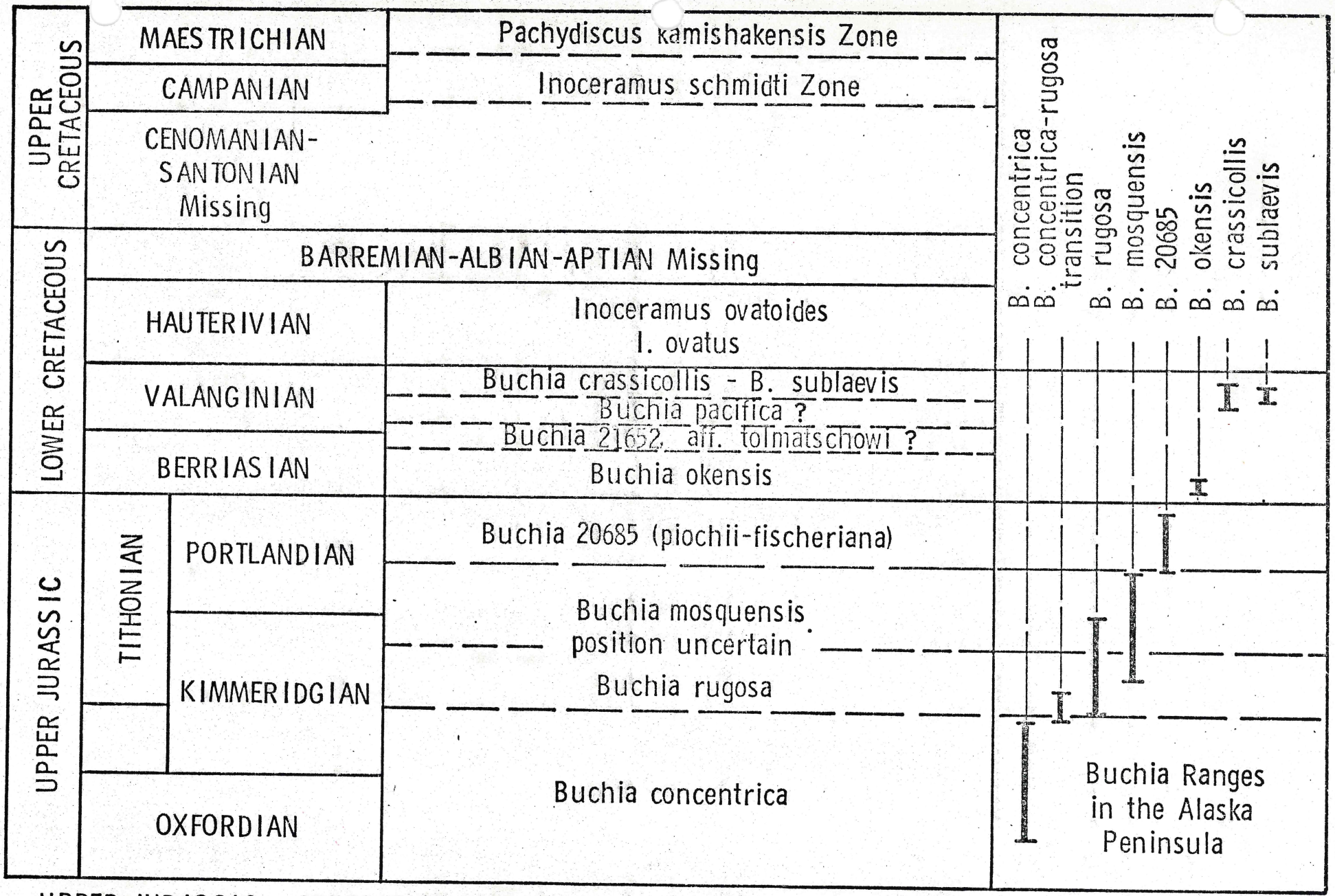
Field No.	Sample No.	Identification	Count
CR-1085F	6	2230 Inoceramus sp., aff. I. anglicus	10

Age: The specimens of Inoceramus cannot be positively identified; however, they show affinity to I. anglicus, which is known from late Early Cretaceous (mid-late Albian) strata in Northern Alaska (Imlay, 1961, U.S.G.S. Prof. Paper 335).

Locality 7788 (Contd.)

Paleoecology:

Probably transported; this type of Inoceramus was byssally attached, possibly in the shoreface zone.



UPPER JURASSIC - CRETACEOUS ZONATION IN THE ALASKA PENINSULA

(? indicates presence on Alaska Peninsula uncertain)

FIGURE 1