Studies of Early Jurassic ammonites from Alaska provide close correlations with Lower Jurassic ammonite zones in Europe and with ammonite successions elsewhere in the world.
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 EARLY JURASSIC AMMONITES FROM ALASKA

BY RALPH W. IMLAY

ABSTRACT

Early Jurassic ammonites of early Hettangian to late Toarcian Age are present in the lower part of the Kingak Shale and equivalent beds in northern Alaska. Well cores from the Arctic Coastal Plain contain ammonites of early Hettangian to Sinemurian Age and of late Pliensbachian to early Toarcian Age. Surface exposures have furnished ammonites of early Pliensbachian to late Toarcian Age. In addition the presence of the pelecypod *Otapiria talliensis* Imlay near the base of the Lower Jurassic exposures throughout much of northern Alaska is good evidence of a Sinemurian Age because this pelecypod occurs in the subsurface with ammonites of early Sinemurian Age and it occurs on the surface near, but not on the same slabs as, *Uptonia* of earliest Pliensbachian Age.

Ammonites of early Hettangian and late Pliensbachian Age are present in part of the Glenn Shale exposed near Old Rampart in east-central Alaska. In the Wrangell Mountains (lat 62° N, long 141°–143° W.), the upper member of the McCarthy Formation has furnished ammonites of early Hettangian to early Sinemurian Age and of latest Sinemurian to fairly early Pliensbachian Ages. The overlying Lubbe Creek Formation contains ammonites of middle to late Pliensbachian Age and possibly also of early Toarcian Age.

In the Talkeetna Mountains, northeast of Anchorage, the exposed upper part of the Talkeetna Formation has furnished ammonites of latest Sinemurian to earliest Pliensbachian Age and of late Pliensbachian to late Toarcian Age.

In the Chulitna River area, only ammonites of early and latest Sinemurian Age have been found. In the Seldovia area, only ammonites of earliest Hettangian and early Sinemurian Age have been found. In the Puale Bay area, the Hettangian and lower Sinemurian are well represented by ammonites in an unnamed formation. Sharply above lies the Kialagvik Formation, which is mostly of Bajocian Age, but which contains the ammonite *Haugia* of middle to early late Toarcian Age about 30 ft (9 m) above its base.

These data show that parts of all these Lower Jurassic successions are not represented by ammonites or are poorly represented. Thus ammonites of late Hettangian and middle Pliensbachian Age are represented only by single occurrences, and the Sinemurian zones of *Cueniostites turneri* and *Oxynotoceras oxynotum* are not represented by any ammonite occurrences.

The Hettangian ammonite succession in Alaska is similar to that in western Europe and probably includes species in common. Its lower part, equivalent to the *Psiloceras planorbis* zone, is represented in many areas by *P. cf. P. planorbis* (J. de C. Sowerby), or by *P. (Francioceras)* cf. *P. (F.) reuidum* (Buckman), or by both. Its middle part, probably equivalent to the *Alaitites liasiocerus* zone, is represented in the Wrangell Mountains by *Discosphiceras* cf. *D. tozophorum* (Gümbel), at Wide Bay (lat 57°45' N, long 156° W.) by *Waechneroceras* cf. *W. portlockii* (Wright), and at the Puale Bay-Alinchak Bay area by these taxa plus *W. tenesrum* (Neumayr) and *Lagoeoceras* cf. *L. sublaqueus* (Wachner). The upper Hettangian is represented by a single specimen of *Schlotheimia* in the Puale Bay area.

The Sinemurian ammonite succession in Alaska is likewise similar to that in western Europe but does not include genera that are definitive for nearly half of the stage (*Cueniostites turneri-Oxynotoceras oxynotum* zones). Its lowest part, equivalent to the *Arietites bucklandii* zone of Europe, is represented in the subsurface of the Arctic Coastal Plain by *Arietites* cf. *A. bucklandii* (Sowerby), by *Charmassaeioceras*, and by species of *Coroniceras* both below and above *Charmassaeioceras*. Its lowest part in southern Alaska is represented in the Chulitna River, Seldovia, and Puale Bay areas by *Paracaloceras rursicostatum* Frebold, which in the Chulitna area is associated with *Budowia canadenensis* (Frebold).

The overlying beds in most of these areas are characterized by *Arnioceras*, whose presence and stratigraphic position are evidence for correlation with the late early Sinemurian *Arnioceras semicostatum* zone of Europe. Such an age for *Arnioceras* in the Arctic Coastal Plain is confirmed by its position below that of *Coroniceras*, a genus not known above the *A. semicostatum* zone. Such an age for *Coroniceras* (*Paracaloceras*) in the Seldovia area is shown by the known range of the subgenus in Europe.

The highest part of the Sinemurian, representing the *Echioceras rariuscostatum* zone, has been identified by the occurrence of *Paltechioceras* in the Wrangell and Talkeetna Mountains and in the Chulitna River area. That genus in the Talkeetna Mountains is associated with *Crucilobiceras*, which ranges upward into the lower Pliensbachian. In the Chulitna River area *Paltechioceras* is associated with *Arcoasteroceras*, a genus that in arctic Canada occurs with *Oxynoticeras oxynotum* (Quenstedt).

The Pliensbachian ammonite succession in northern Alaska is incomplete. At its base, the *Uptonia janesoni* zone is represented by *Up- tonia* cf. *U. janesoni* (J. de C. Sowerby) obtained from outcrops near the Ipanik and Etivlik Rivers (tributaries of the Colville River). The next two higher zones of western Europe have not been recognized. The still higher zone of *Amaltheus margaritatus* is present throughout northern Alaska as well as farther southeast in the Old Rampart area of east-central Alaska. The highest zone of *Pleuroceras spinaturn* is represented by *Amaltheus (Pseudoamaltheus) engelhardti* in the subsurface of the Arctic Coastal Plain. These occurrences of *Amaltheus* in abundance at many places furnish exact correlations with the upper Pliensbachian beds of northern Eurasia.

Pliensbachian ammonite successions in southern Alaska have been identified only in the Wrangell and Talkeetna Mountains and questionably in the Yakutat district. The *Uptonia jamesoni* zone is represented in the Wrangell Mountains by *Uptonia* cf. *U. dayiceratoides* Mouterde, in the Talkeetna Mountains by *Apopodoceras*, and probably in the Yakutat district by a fragment that resembles the outer whorl of *Uptonia* rather than *Crucilobiceras*. The next higher zone of *Tragophylloceras* *ibex*, is represented by *Tropidoceras octoeon* (d'Orbigny) in association with *Crucilobiceras*. The *Prodactylioceras daweoi* zone is possibly represented in the Wrangell Mountains by some float specimens of *Prodactylioceras* that were collected along with *Uptonia*. The highest two zones of the Pliensbachian are represented by the ammonites *Protogrammoceras*, *Leptaleoceras*, *Arietites*, and *Fontanellioceras*, which are identical...
or nearly identical with species in the Mediterranean area. With these taxa at one locality in the Talkeetna Mountains were found two specimens of Amaltheus.

This association with Amaltheus furnishes a correlation with the upper Pliensbachian of northern Alaska. Otherwise the late Pliensbachian ammonites in southern Alaska have nothing in common generically with ammonites of that age in the Arctic region. The same genera do occur farther south, however, in western British Columbia and in eastern Oregon, as well as in the Mediterranean area.

The Toarcian ammonite succession in Alaska is similar to that in western Europe and probably includes species in common. Characteristic taxa from the base upward include (1) Dactylioceratidae and Catacloceratidae, (2) Harpoceratidae cf. H. euripatum (Young and Bird) and Eleganticieras, (3) Haugia, Brodieia, and Pseudolociceras, and (4) Pseudolociceras and Grammomceras. The most complete Toarcian ammonite sequence is in the Talkeetna Mountains.

INTRODUCTION

Early Jurassic ammonites obtained from eight areas in northern, eastern, and southern Alaska (figs. 1–6) are described herein in order to present all available evidence concerning the stratigraphic and geographic distribution of the taxa (figs. 7–9), to evaluate their faunal setting in relation to other parts of the world, to make regional and continental correlations, and to date the formations in Alaska as precisely as possible in terms of the standard Jurassic zones of western Europe (figs. 10–14).

This study is based mainly on fossil collections and stratigraphic data furnished by many U.S. Geological Survey geologists, as listed in Inlay and Detterman (1973, p. 8, 9). It is also based on excellent fossil collections and data obtained by British Petroleum (Alaska), Inc., in 1964 in northern Alaska and by the Richfield Oil Co. (now Atlantic Richfield Oil Co.) in 1962 on the east shore of Puale Bay in the Alaska Peninsula. Biostratigraphic data for northern Alaska were furnished by W. P. Brosgé, R. L. Detterman, and H. N. Reiser; for east-central Alaska, by E. M. MacKevett, Jr.; for the Talkeetna Mountains, by Arthur Grantz; and for the Chuitina Valley, by D. L. Jones.

The described specimens are deposited in the type collections of the U.S. National Museum and are labeled USNM.

BIOLOGIC ANALYSIS

Alaska ammonites of Early Jurassic (Hettangian to Toarcian) age described or mentioned herein number about 500 specimens whose distribution by family, subfamily, genus, and subgenus is shown on table 1. This table shows that the families present include the Arietitidae (15 percent), Polyphylidae (20 percent), Schlotheimiiidae (16 percent), Hildoceratidae (15 percent), Psiloceratidae (9 percent), Hammatoceratidae (6 percent), and Eoderoceratidae (6 percent). The remaining families combined represent only 13 percent of the total number of specimens.

The classification shown in table 1 is essentially that proposed by Donovan and Forsey (1973 p. 2–4), except for Fanninoceras and Arctoasteroceras, which those writers consider to be synonyms of Radstockiceras and Agasteroceras, respectively. Nonetheless, Fanninoceras (McLearn, 1930, p. 4, 5; 1932, p. 76–80) differs morphologically from Radstockiceras by having a thinner whorl section and an undercut umbilical wall (Frebold, 1967a, p. 1146). It differs timewise by occurring in beds of late Pliensbachian Age in eastern Oregon (Inlay, 1972, p. 1146, p. 1146, p. 140) in beds of earliest to latest Pliensbachian Age in the Queen Charlotte Islands (Hans Frebold, written commun., 1975), whereas Radstockiceras in northwest Europe is characteristic of

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The earliest Pliensbachian (Dean and others, 1961, p. 463, fig. 7).

The genus *Arctoasteroceras* of Frebold (1960, p. 13, 14, pl. 2 figs. 1–5, pl. 3, figs. 1–3) differs morphologically from *Aegasteroceras* of Spath (1925, p. 265, 267, fig. 6a) by having weak ribs on the upper parts of the flanks and on the venter and commonly by having an asymmetrical suture line. These differences were not accepted as valid by Hallam (1965, p. 1495) or by Donovan and Forsey (1973, p. 3). Nonetheless, some European specimens of *Aegasteroceras*, including the holotype of the genotype species, *A. simile* Spath (Guerin-Franiatte, 1966, p. 310–313, pls. 189–192), bear strong ribs on the upper part of the flanks and on the margins of the venter, and some ribs are weakly connected across the venter. This strong ribbing contrasts markedly with the weak ribs on *Arctoasteroceras jeletzkyi* Frebold from Canada.

These genera likewise differ slightly in age. Thus, *Aegasteroceras* in Europe occurs in the zone of *Asteroceras obtusum* of earliest late Sinemurian Age (Dain and others, 1961, p. 454). *Arctoasteroceras jeletzkyi* in Canada is dated as middle late Sinemurian because of its occurrence with *Oxynoticeras oxynotum* and below echioceratid ammonites (Frebold, 1960, p. 14, 26). The Alaskan specimens of *Arctoasteroceras* described herein are dated as probably latest Sinemurian.
because they were collected with *Paltechioceras* (*Orthochioceras*)?, which in Europe occurs only in the *Echioceras raricostatum* zone (Getty, 1973, p. 6).

The characteristics of the Early Jurassic ammonites described herein agree very well with those of various genera and subgenera defined in the "Treatise on Invertebrate Paleontology" (Arkell and others, 1957). In addition, the taxonomy of the Psiloceratidae has been discussed by Donovan (1952, p. 634, 641) and Frebold (1967b, p. 17); the Schlotheimiidae by Lange (1951, p. 23, 25), Donovan (1952, p. 644–655), Frebold (1960, p. 13), and Guex and Taylor (1976, p. 525); the Arietitidae by Donovan (1952, p. 717, 725, 739, 746), Donovan and Forsey (1973, p. 6, 7), and Guerin-Franjatite (1966, p. 106–118, 150, 252, 281, 283, 309, 310, 313); the Echioceratidae by Getty (1973, p. 7, 8, 17–21, 23, 24); the Amaltheidae by Howarth (1958, pt. 1, p. 21; pt. 2); the Polymorphitidae by Bremer (1965, p. 177); the Dactylioceratidae by Pinna and Levi-Setti (1971) and Schmidt-Effing (1972); the Polymorphitidae, Dactylioceratidae, and Hildoceratidae by Geczy (1976); and the Dactylioceratidae by Fischer (1966, p. 20–48). In addition, the taxonomy of the Early Jurassic ammonite families of southern Germany has been briefly described by Schlegelmilch (1976, p. 32–95).

**BIOSTRATIGRAPHIC SUMMARY**

**NORTHERN ALASKA**

Lower Jurassic marine beds cropping out in northern Alaska (figs. 1, 13) have been briefly described or mentioned by Imlay and Detterman (1973, p. 9; p. 12 fig. 11B). Those from the Sagavanirktok River eastward have been described in considerable detail by Detterman and others (1975, p. 18–20). In general the outcrops are poorly exposed and sparsely fossiliferous, but they have furnished fossils representing most of the Pliensbachian and Toarcian Stages and perhaps the Sinemurian (fig. 8). Field studies to 1978 are insufficient to demonstrate
whether the absence of earlier Jurassic is due to lack of deposition, poor outcrops, or insufficient field work in poorly fossiliferous beds.

The westernmost exposures in the DeLong Mountains consist mostly of clay shales that bear limestone concretions, are of unknown thickness, and have furnished ammonites of late Pliensbachian to early Toarcian Age. Next to the east between the Ipnavik and Itkillik Rivers, the Lower Jurassic apparently consists of 60 feet (18 m) or less of siliceous claystone that locally contains some limestone and is dated as Sinemurian to early Pliensbachian. Such an age is shown by the widespread distribution of *Otapiria tailleuri* Imlay, which in the subsurface is found associated only with ammonites of early Sinemurian Age, and by the presence on the surface of the early Pliensbachian ammonite *Uptonia* in slabs that do not contain *Otapiria*, although that genus occurs nearby.

Still farther east, in the area between the Sagavanirktok and Aichilik Rivers, the Lower Jurassic beds (Detterman and others, 1975, p. 18–20, 44) represent the lower part of the Kingak Shale and range in thickness from 100 feet (30 m) or less, to about 900 feet (274 m). This lower part consists of fissile black papery shale that at the Aichilik River is about 600 feet (180 m) thick and on the Kavik River contains *Otapiria tailleuri* Imlay of Sinemurian Age. The upper part consists of dark-gray clay shale and claystone that in places is as much as 300 feet (92 m) thick and contains ammonites of late Pliensbachian to late Toarcian Age.

The Lower Jurassic sequences in the subsurface of northern Alaska differ from those on the surface mainly by containing minor amounts of glauconitic sandstone, by being somewhat more fossiliferous, and by containing ammonites representing all Lower Jurassic stages (table 2). They have not, however, furnished any ammonites representing middle Sinemurian to middle Pliensbachian time, or late Toarcian time.
In the northern part of east-central Alaska, the Lower Jurassic is poorly exposed but is reported to consist of about 1000 feet (305 m) of sandstone, siltstone, shale, and quartzite that are part of the Glenn Shale (Brosge and Reiser 1964, 1969; Imlay and Detterman, 1973, p. 13, 14). The basal 120 feet (37 m) exposed on Spike Mountain about 30 miles (48 km) north of Old Rampart, consists of sandy beds, rests on granite, and contains the Hettangian ammonites *Psiloceras* (*Psiloceras*) and...
FIGURE 5.—Detailed index map of Lower Jurassic ammonite localities in the Seldovia area (Seldovia (B-5) quadrangle) on the Kenai Peninsula, southern Alaska.

*P. (Franziceras)* throughout. The only other Jurassic ammonite from the same general area is a specimen of *Amaltheus stokesi* (J. Sowerby) obtained about 9 miles (14.4 km) east-southeast of Old Rampart.

**SOUTHERN ALASKA**

**WRANGELL MOUNTAINS**

The Lower Jurassic sequence in the Wrangell Mountains has been described in detail by MacKevett (1969, 1970, 1971); has been mentioned briefly by Imlay and Detterman (1973, p. 8, 11) regarding its position relative to a Jurassic volcanic island-arc system; and is depicted herein (figs. 10, 14) in regard to fossil occurrences and ages. Most of the sequence is represented by the upper member of the McCarthy Formation which consists of 2,000–2,500 feet (610–760 m) of very thin to medium-bedded, dark-gray laminated chert and spiculite, grades into adjoining lithologic units, and is of Hettangian, Sinemurian, and earliest Pliensbachian Age. At the top, of the sequence is the Lubbe Creek Formation, which consists of 100–300 feet (30–91 m) of medium-gray spiculite and chert, is overlain unconformably by beds of Bajocian Age, and is of middle and late Pliensbachian to possibly early Toarcian Age.

**TALKEETNA MOUNTAINS**

The Lower Jurassic sequences in the Nelchina area of the Talkeetna Mountains and in the adjoining upper part of the Matanuska River valley (figs. 11, 14) have been studied by Arthur Grantz. Most of the lithologic and
stratigraphic data shown in figure 11 were prepared by Grantz (written commun., 1977), along with these comments:

The Talkeetna Formation comprises a diverse assemblage of volcanic arc deposits. Waterlain pyroclastic and tuffaceous sedimentary rocks are much dominant over lava flows. If all rocks mapped as Talkeetna Formation are correctly assigned, its composition ranges from basaltic to rhyolitic, with andesitic rocks apparently dominant. The Talkeetna volcanic breccias and tuffs were commonly, and perhaps dominantly, deposited in marine waters. Marine fossils are widespread, and locally abundant in the waterlain tuffs and in associated more-or-less tuffaceous sands and lutites. However, the presence of thick intervals of coarse volcanic breccias, tuffs and some flows that are barren of fossils and some outcrops that are rich in plant fossils suggest that nonmarine facies may also constitute an important part of the formation. Presumably, the fossiliferous marine beds represent inter-volcanic vent or arc-distal facies, and the pyroclastic and plant-rich beds represent submarine and subaerial composite volcanic cones that formed at major volcanic vents.

The Talkeetna Formation in the upper Matanuska Valley and Nelchina area occurs in large but well-separated outcrop areas. The lack of mapping continuity combined with moderate to locally great structural complexity, locally intense plutonism, and some metamorphism makes the recognition of the stratigraphic succession in these rocks difficult. The chief problem is the possibility, indeed probability, that the local lithologic succession in each isolated outcrop area of the formation owes as much, or more, to its geographic position (i.e., facies) as to its biostratigraphic position. However, if the prior assumption is made that the local succesions do have regional validity, then [a] * * * gross, and incomplete, succession can be inferred. Even with this assumption, however, the reconstruction given does not represent the only possible explanation of the available facts.

On the basis of these data and inferences, the Talkeetna Formation of the Talkeetna Mountains is 15,000–19,000 feet (4,660–5,790 m) thick, is incompletely exposed basally, is dominated by volcanic rocks, is mostly marine, and contains ammonites of latest
**Figure 7.**—European ranges of Early Jurassic ammonite genera present in Alaska.
Sinemurian to late Toarcian Age (fig. 11). Other studies show (Grantz and others, 1963) that the Talkeetna Formation is overlain unconformably by beds of early Bajocian Age, that the unconformity is dated paleontologically as of latest Toarcian and earliest Bajocian Age, and that the formation is intruded by granitic rocks that may be of the same age as the unconformity.

**CHULITNA RIVER AREA**

The Lower Jurassic sequence exposed in the Healy (A-6) quadrangle in the south-central part of the Alaska Range has not been described. It has furnished ammonites of early Sinemurian Age at six localities and of latest Sinemurian Age at one locality (fig. 4). Most of the ammonites of early Sinemurian Age are preserved in a matrix of gray calcareous sandstone or of silty phosphatic limestone. The ammonites of latest Sinemurian Age (USGS Mesozoic loc. 31261) are preserved in a unit of massive tuffaceous argillite that apparently underlies, or is in fault contact with, siliceous argillite of Late Jurassic age (Jones and others, 1980).

**SHELLABARGER AND RAINY PASS AREAS**

The Lower Jurassic sequences exposed in the Talkeetna (C-6) and (B-6) quadrangles in the south-central part of the Alaska Range have not been described. In the Rainy Pass area of the Talkeetna (B-6) quadrangle, Early Jurassic fossils were obtained from gray, calcareous, fine-grained sandstone. In the Shellabarger Pass area of the Talkeetna (C-6) quadrangle, such fossils were obtained from brown siltstone and sandstone in T.28 N., R. 19 W.

**KENAI PENINSULA NEAR SELDOVIA**

Lower Jurassic beds are exposed on the shore of the Kenai Peninsula for several miles southwestward from Seldovia Bay (figs. 5, 14) in the northwestern part of the Seldovia (B-15) quadrangle. They consist of interbedded tuff, agglomerate, sandstone, shale, and limestone that probably are 2,000-3,000 feet (610-915 m) thick, according to Martin (1926, p. 135). The same sequence, based on unpublished field studies by Don Miller and the author for the U.S. Geological Survey in 1948, includes a thick middle unit consisting of unfossiliferous red lava.
AGES AND CORRELATIONS

<table>
<thead>
<tr>
<th>Series Stage</th>
<th>Northwest European Ammonite zones (Modified from Dean, Donovan and Howarth, 1961)</th>
<th>Wrangell Mountains in southern Alaska</th>
<th>Talkeetna Mountains in southern Alaska</th>
<th>Chuitna River area in Healy (A-D) quadr., south-central part of Alaska Range</th>
<th>Seldovia area on the Kenai Peninsula</th>
<th>Puale Bay area on the Alaska Peninsula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Jurassic</td>
<td>Dumortiera levesquei</td>
<td>Gramnoceras</td>
<td>Gramnoceras</td>
<td>Haugia and Pseudoloscioceras</td>
<td>Haugia and Pseudoloscioceras</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gramnoceras bicornis</td>
<td>Haugia variabilis</td>
<td>Haugia variabilis</td>
<td>Haugia variabilis</td>
<td>Haugia variabilis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hildloceras bicornis</td>
<td>Hildloceras bicornis</td>
<td>Hildloceras bicornis</td>
<td>Hildloceras bicornis</td>
<td>Hildloceras bicornis</td>
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</tr>
<tr>
<td></td>
<td>Harpoceras falcler</td>
<td>Dactylioceras teucriostatum</td>
<td>Dactylioceras teucriostatum</td>
<td>Dactylioceras teucriostatum</td>
<td>Dactylioceras teucriostatum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prodactylioceras duciei</td>
<td>Tropidoceras</td>
<td>Tropidoceras</td>
<td>Tropidoceras</td>
<td>Tropidoceras</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trachyloceras bax</td>
<td>Uptonia janesoni</td>
<td>Uptonia janesoni</td>
<td>Uptonia janesoni</td>
<td>Uptonia janesoni</td>
<td></td>
</tr>
<tr>
<td>Sinemurian</td>
<td>Echioceras raricostatum</td>
<td>Paltechioceras and Cruciblouxoceras</td>
<td>Paltechioceras and Cruciblouxoceras</td>
<td>Paltechioceras and Cruciblouxoceras</td>
<td>Paltechioceras and Cruciblouxoceras</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oxytocardites oxynutum</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asterostrites obtusum</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Caenisites turneri</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arnioceras samicostatum</td>
<td>Amnioceras</td>
<td>Amnioceras</td>
<td>Amnioceras</td>
<td>Amnioceras</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arietites buckeliandi</td>
<td>Coronoceras? and artemiidites</td>
<td>Coronoceras? and artemiidites</td>
<td>Coronoceras? and artemiidites</td>
<td>Coronoceras? and artemiidites</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Schlothemia angulata</td>
<td>Diamochiceras</td>
<td>Diamochiceras</td>
<td>Diamochiceras</td>
<td>Diamochiceras</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peloceras planorbis</td>
<td>Peloceras planorbis</td>
<td>Peloceras planorbis</td>
<td>Peloceras planorbis</td>
<td>Peloceras planorbis</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 9.**—Correlation of Early Jurassic ammonite faunas in southern Alaska.

green lava, tuff, and agglomerate overlain and underlain by units consisting of green sandstone, tuffaceous sandstone, tuff, agglomerate, and gray limestone. Fossils occur in limestone, tuff, and sandstone beds in both the lower and upper units. The ammonites present are of Hettangian and early Sinemurian Age.

This Lower Jurassic sequence, on the basis of recent studies by Kelley (1978, p. 2356), is about 4,000 m thick and consists mainly of pyroclastic breccias and tuff. It is divisible into three mappable lithofacies, from bottom to top: (1) a "graded pyroclastic lithofacies" deposited below wave base; (2) a "pyroclastic debris flow and turbidite lithofacies" deposited below wave base; and (3) a "reworked volcaniclastic lithofacies" marked basally by fairly thick coal beds but deposited partly under tidal influences. Kelley noted that fossils occur in all three units.

**PUALE BAY–ALINCHAK BAY AREA**

The Lower Jurassic sequence in the Puale Bay area, as described by Imlay and Detterman 1977, is at least 1,850 feet (550 m) thick. At its base is a limestone unit about 780 feet (238 m) thick that in its lower part contains ammonites of Hettangian Age and that rests conformably on limestone of latest Triassic age. The overlying 1,040 feet (317 m) of beds consists mostly of massive tuffaceous conglomeratic sandstone but includes some siltstone and limestone. These beds contain ammonites of early Sinemurian Age. This sandstone is overlain sharply by sandy siltstone of the Kialagvik Formation, which is mostly of early to middle Bajocian Age. Its lowest beds, however, are of middle to early late Toarcian Age, as shown by the presence of Haugia about 30 feet (9 m) above its base. The Toarcian probably also includes some of the overlying 320-370 feet (98-113 m) of siltstone between this occurrence of Haugia and the lowest occurrence of Pseudoloscioceras whiteavesi (White) of late early Bajocian Age (figs. 9, 12). The sharp contact at the base of the Kialagvik Formation probably represents a fault rather than an unconformity.

**AGES AND CORRELATIONS**

**HETTANGIAN AMMONITES**

Hettangian ammonites have been found in the subsurface of northern Alaska, in the Old Rampart area of
northern east-central Alaska, in the Wrangell Mountains of southern Alaska, in the Seldovia area of the Kenai Peninsula and in the Puale Bay-Alinchak Bay and Wide Bay areas of the Alaska Peninsula (figs. 8–10, 12).

The earliest Hettangian is represented in all these areas, except for Wide Bay, either by a fairly smooth species of *Psiloceras* or by the ribbed subgenus *P. (Franziceras)* similar to *P. (F.) ruidum* (Buckman). The middle Hettangian, probably correlative with the *Alsatites liasicus* zone of Europe, is characterized by *Waehneroceras* at Wide Bay, by *Waehneroceras*, *Discamphiceras*, and *Laqueoceras* at Puale Bay, by *Discamphiceras* in the Wrangell Mountains, and questionably by *Waehneroceras* in the Arctic Coastal Plain near Point Barrow (fig. 8). The late Hettangian, correlative with the *Schlotheimia angulata* Zone, is represented by one specimen of *Schlotheimia* in the Puale Bay area. All these genera are represented by species that are closely similar to, and probably in part identical with, species described from western Europe.

Evidently the succession of Hettangian ammonite genera and species in Alaska is the same as in western Europe.

**SINEMURIAN AMMONITES**

Sinemurian ammonites have been found in northern Alaska only in the subsurface of the Point Barrow-Cape Simpson area (fig. 7). In southern Alaska, such ammonites occur in five areas from the Wrangell Mountains on the east to Puale Bay on the west (figs. 10–12). The lower Sinemurian zones of *Arieticeras* and *Arieticeras semicostatum* are represented in all these areas except in the Talkeetna Mountains, where beds of that age are not exposed. The uppermost Sinemurian (*Echioceras raricostatum* Zone) is represented in the Wrangell and Talkeetna Mountains and in the Chuitna River area of the Alaska Range. The remainder of the Sinemurian (*Canisites turneri*, *Asteroceras obtusum*, and *Oxytocolas oxynotum* Zones) has not been identified by ammonites anywhere in Alaska but is probably represented by poorly fossiliferous beds in the Arctic Coastal Plain, in the Wrangell Mountains, and possibly elsewhere.
The lowermost Sinemurian (Arietites bucklandi Zone) in the Arctic Coastal Plain is represented by A. cf. A. bucklandi (Sowerby) in the Avak test well no. 1 at the depth of 1,836 feet (560 m). It is represented by Charrnasseiceras in the South Barrow test well no. 3 at depths of 2,412 and 2,419.5 feet (735 and 737 m) and in the South Barrow test well no. 12 at depths of 2,056, 2,061, 2,061.5 and 2,068 feet (627-630 m). The Sinemurian Age of Charrnasseiceras in the South Barrow test well no. 3 is attested by the presence of Coroniceras sp. C (pl. 4, fig. 14) in the same well at the depth of 2,470 feet (753 m).

The earliest Sinemurian in the Wrangell Mountains is probably represented by fragmentary arietitid ammonites that occur a little below beds containing Arnioceras (figs. 9, 10). Beds of earliest Sinemurian Age in the Chulitna River, Seldovia, and Puale Bay areas are represented by Paracaloceras rursicostatum Frebold.
<table>
<thead>
<tr>
<th>Formation</th>
<th>Generalized description</th>
<th>Fossil localities</th>
<th>Characteristic fossils</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kialagvik Formation</td>
<td>1300 ft (396 m)</td>
<td>21235</td>
<td><em>Inoceramus lucifer</em> and <em>Erycites</em></td>
<td>Upper lower to lower middle Bajocian</td>
</tr>
<tr>
<td>(Lower part beneath 30 m of coarse conglomeratic beds)</td>
<td>Silstone, sandy, dark gray to black, contains few beds of hard buff sandstone, becomes sandier toward top, bears many limy concretions in upper two-thirds.</td>
<td>ROC 1303</td>
<td><em>T. scissum</em> and <em>Erycites</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ROC 1366</td>
<td><em>Pseudolioceras whiteaves</em> and <em>Erycites</em></td>
<td>Bajocian (Aalenian)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ROC 1351 and 1356</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19804</td>
<td>19804</td>
<td><em>Haugia</em> and <em>Pseudolioceras</em></td>
<td></td>
</tr>
<tr>
<td>Unnamed Lower Jurassic beds</td>
<td>160 ft (49 m)</td>
<td>ROC 1303</td>
<td><em>Coroniceras?</em></td>
<td>Lower Sinemurian</td>
</tr>
<tr>
<td></td>
<td>Sandstone, conglomeratic, massive, tuffaceous</td>
<td>ROC 1282</td>
<td><em>Arnioceras</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>130 ft (40 m)</td>
<td>ROC 1283 and 21227</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Silstone and sandstone, limy, party tuffaceous</td>
<td>ROC 1241 and 1240</td>
<td><em>Paracaloceras ruscocostatum</em> and <em>Bedouxia canadensis</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>255 ft (78 m)</td>
<td>12396 (part)</td>
<td><em>Monotis cf. M. salinaria</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sandstone, massive, gray, conglomeratic, tuffaceous</td>
<td></td>
<td><em>Waehneroceras, Pseudoceras</em> and <em>Discamphiceras</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>265 ft (81 m)</td>
<td></td>
<td><em>Waehneroceras, Schlotheimia</em></td>
<td>Hettangian</td>
</tr>
<tr>
<td></td>
<td>Sandstone and shale, limy, well-bedded, some limestone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>245 ft (75 m)</td>
<td></td>
<td><em>Waehneroceras</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tuff, gray to green interbedded with brown limestone and agglomerate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>780 ft (238 m)</td>
<td>10820 (part)</td>
<td><em>Waehneroceras, Pseudoceras</em> and <em>Discamphiceras</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Limestone, mostly thin-bedded, dense, dark-gray; some interbedded limy shale and tuffaceous sandstone that become more common toward top. Grades downward into upper Triassic beds.</td>
<td>3106, 31370</td>
<td><em>Waehneroceras</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Triassic beds (highest part)</td>
<td>320 ft (97.5 m)</td>
<td>19806</td>
<td><em>Monotis cf. M. salinaria</em></td>
<td>Upper Norian</td>
</tr>
<tr>
<td></td>
<td>Limestone, thin-bedded, dense, gray. Some thin beds of sandstone and shale</td>
<td>3108</td>
<td><em>Metasibirites</em></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 12.**—Occurrences and ages of ammonites present in unnamed Lower Jurassic beds on northeast side of Puale Bay, Alaska Peninsula.
(1967b, p. 26, pl. 7, figs. 1, 2; pl. 9, fig. 1). That species in the Chulitna River area occurs with *Psiloceras canadense* Frebold (1951, p. 3, pl. 6, figs. 1-6; pl. 2, fig. 1; pl. 3, fig. 1) which is now assigned to *Badouxia* Guex and Taylor (1976, p. 525). Those species of *Paracaloceras* and *Badouxia* in association with others in north-central British Columbia were tentatively assigned a middle Hettangian Age by Frebold (1967b, p. 31). Later studies by Guex and Taylor (1976) show, however, that *Paracaloceras* and *Charmrasseiceras* in many parts of the world are associated with ammonites of early Sinemurian Age as young as the *Arnioceras semicostatum* zone. Such an age for those genera in British Columbia is confirmed by their association with *Vermiceras multicostatum* (Frebold), which genus is characteristic of the earliest Sinemurian.

The lower Sinemurian zone of *Arnioceras semicostatum* is represented in four areas in Alaska by a finely ribbed species of *Arnioceras* similar to *A. deniscoeta* (Quenstedt). In the Seldovia area, the same zone is probably represented by the subgenus *Coroniceras* (*Paracoroniceras*), which is not known in younger zones.

The next three younger Sinemurian zones, although not identified faunally, could be represented by poorly fossiliferous beds, or in part by the presence of the genus *Arnioceras*, which in Europe ranges upward through most of the *Asteroceras obtusum* Zone.

The uppermost Sinemurian zone of *Echiceras raricostatum* is represented in both the Wrangell and Talkeetna Mountains by *Paltechioceras cf.* *P. harbledownense* (Crickmay) in association with species of *Crucilobiceras* that closely resemble described species.
EARLY JURASSIC AMMONITES FROM ALASKA

from western Europe. Paltechioceras occurs also in the Chuitina River area in association with Arctoasteroceras jeletzkyi Frebold, whose type specimens in arctic Canada were collected along with Oxynoticeras oxynotum (Quenstedt) below beds containing echyceratid ammonites. This shows that Arctoasteroceras occurs in the highest two zones of the Sinemurian.

Other mollusks of some age significance during Sinemurian time include the bivalves Otupiria tailleuri Imlay and Entolium? semiplicatum Hyatt. Of these, O. tailleuri in the subsurface of northern Alaska occurs in the South Barrow test well No. 3 at depths of 2,412-2,417 feet (735 m) and in the South Barrow test well No. 12 at depths of 2,055-2,078.5 feet (627-634 m). Comparisons with the ammonite occurrences in those test wells (table 2) show clearly that O. tailleuri is associated with ammonites of early Sinemurian Age, occurs above ammonites of Hettangian Age, and has its highest occurrence at 214 feet (65 m) below ammonites of late Pliensbachian Age.

Otupiria tailleuri Imlay has been found in outcrops in northern Alaska in a fairly thin unit of fissile clay shale that extends from the Ipanvik River eastward at least 200 miles (320 km) to the Kavik River (Imlay, 1967, p. B6, B7; Imlay and Detterman, 1973, p. 12; Detterman and others, 1975, p. 44). Apparently it does not occur throughout the entire thickness of the shale in all areas. It does occur in the same rock slabs as some crushed, generically undeterminable ammonites (Imlay, 1967, p. B6). It does not occur on the same slabs as some ammonites of early Pliensbachian Age that are described herein as Uptonia cf. U. jamesoni (J. de C. Sowerby) and...
AGES AND CORRELATIONS

Table 2.—Early Jurassic ammonites from well cores in northern Alaska

<table>
<thead>
<tr>
<th>Genus and species</th>
<th>Depths in test wells, in feet, from which fossils were obtained</th>
<th>Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Simpson test well 1</td>
<td>Avak test well 1</td>
</tr>
<tr>
<td>D. sp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catacoloceras sp. juv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaltheus margaritatus (Montfort)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. cf. A. margaritatus (Montfort)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. stokesi (J. Sowerby)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. cf. A. stokesi (J. Sowerby)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. sp</td>
<td>5,677; 5,680; 5,691</td>
<td></td>
</tr>
<tr>
<td>A. (Pseudoamaltheus) engelhardtii (d'Orbigny)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arietites cf. A. bucklandi (Sowerby)</td>
<td></td>
<td>1,836</td>
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<tr>
<td>Coroniceras sp. B</td>
<td></td>
<td>2,470</td>
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<tr>
<td>Coroniceras sp. C</td>
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<td>2,056</td>
</tr>
<tr>
<td>Arnioceras sp. juv</td>
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<td>2,056</td>
</tr>
<tr>
<td>Charmasauerceras sp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. cf. C. marmoreum (Oppel)</td>
<td></td>
<td>2,412; 2,419.5</td>
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<tr>
<td>Psiloceras (Franziceras) sp</td>
<td></td>
<td>2,170.5</td>
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<tr>
<td>Waehnereceras? sp</td>
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<td>2,181.5</td>
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The Pliensbachian ammonites

Pliensbachian ammonites have been found in both the subsurface and surface in northern Alaska, in the Old Rampart area in east-central Alaska, and in the Wrangell and Talkeetna Mountains in the eastern part of southern Alaska. They probably occur in the Yakutat District in the northern part of southeastern Alaska (figs. 8–11).

In northern and east-central Alaska, most Pliensbachian ammonite occurrences consist of Amaltheus of late Pliensbachian Age. In the South Barrow test well No. 3, Amaltheus is represented by the same species in the same succession as in northwestern Europe (table 2). The only other ammonite of Pliensbachian Age found in northern Alaska consists of a single large specimen of Uptonia similar to U. jamesoni (J. de C. Sowerby) from an outcrop on Lisburne Ridge (USGS Mesozoic loc. 29774) between the Ipnakiv et Etiuk Rivers in the Howard Pass quadrangle. This specimen is good evidence that the beds in which it occurs are of earliest Pliensbachian Age. In addition Uptonia, rather than Crucilobiceras, may be represented in the Ipnakiv-Anatuvuk River area by several crushed molds (pl. 9, figs. 9–11) (USGS Mesozoic locs. 29281, 29282, and 29775) that resemble the inner whorls of the large specimen of Uptonia.

The Pliensbachian ammonite successions in the Wrangell and Talkeetna Mountains in southern Alaska contrast with those in northern Alaska by being fairly complete, by containing some ammonites that are closely similar to taxa in the Mediterranean region, and by the genus Amaltheus being represented by only two specimens from a single locality. In the Wrangell Mountains the Uptonia jamesoni zone is represented by U. cf.
EARLY JURASSIC AMMONITES FROM ALASKA

18

U. dayiceroides Mouterde, which was collected with Pro-
dactylioceras italicum (Fucini) less than 100 feet (30 m) below the upper contact of the upper member of the Mc-
Carthy Formation (USGS Mesozoic locs. 28671–28673,
28175). Most of the Tragophylloceras ibex zone is re-
presented by Tropidoceras actaeon (dlOrbigny), which
was collected with Crucilobiceras cf. C. pacificum
Frebold about 1 m below the upper contact of the Mc-
Carthy Formation (USGS Mesozoic loc. 28534). The up-
permost Pliensbachian is represented by Arieticeras
at the top of the McCarthy Formation (USGS Mesozoic loc.
28531).

In the Talkeetna Mountains (figs. 9, 11), the Uptonia
jamesoni zone is represented by a well-preserved
specimen of Apoderoceras cf. A. subtriangulare (Young
and Bird) and a fragmentary specimen that probably
represents Uptonia. The next two younger zones of
western Europe are not represented by fossils, but the
uppermost two Pliensbachian zones are represented by
Leptaleoceras pseudoradians (Reynes), Fontanelliceras
cf. F. fontanellense (Gemmellaro) Arieticeras cf. A.
domarense (Meneghini), Protogrammoceras cf. P.
pallum (Buckman), P. cf. P. argutum (Buckman), Fan-
ninoceras kunae McLearn, and Amaltheus cf. A. stokesi
(J. Sowerby).

TOARCIAN AMMONITES

The Toarcian is not well represented by ammonites in
Alaska except in the Talkeetna Mountains (figs. 8, 9, 11).
In the subsurface of the arctic Coastal Plain, only the
lowermost Toarcian (characterized by Dactylioceras)
has been identified. In the DeLong Mountains, that
genus is succeeded upward by Harpoceras cf. H. ex-
varatum (Young and Bird), which succession accounts for
about two-fifths of Toarcian time. The same species of
Harpoceras was obtained in northeastern Alaska on a
tributary of the Sadlerochit River (USGS Mesozoic loc.
22081). Near Red Hill on Ignek Creek in the Mt.
Michelson (C–4) quadrangle, was obtained Pseudo-
lioceras cf. P. compactile (Simpson) and P. cf. P. lythense
(Young and Bird) of late Toarcian Age at USGS
Mesozoic loc. 23772 (Imlay, 1955, p. 89 pl. 12, figs. 17,
18, 20, 21).

In the Talkeetna Mountains of southern Alaska, the
lower Toarcian is represented by a similar sequence of
Dactylioceras and Harpoceras as in northern Alaska.
The lower upper Toarcian is represented by Haugia,
Brodieia, and Pseudolioceras, which genera in associa-
tion are good evidence for correlation with the Haugia
variabilis Zone of western Europe. Still higher occurs
Grammoceras, a genus that in western Europe occurs
only in the uppermost two zones of the Toarcian.

In the Puale Bay area, the middle to lower upper Toar-
cian is represented by Haugia and Pseudolioceras.

AMMONITE FAUNAL SETTING

No distinct ammonite faunal province existed in
Alaska during most of Early Jurassic time, as shown by
the remarkable resemblance of most of the ammonites
present to those elsewhere in the world. During late
Pliensbachian time, a close tie with northern Europe is
shown by the presence of Amaltheus in northern Alaska
and in the Talkeetna Mountains of southern Alaska. At
the same time, a close tie with the Mediterranean region
is shown by the presence of Arieticeras in the Wrangell
Mountains and of Arieticeras, Leptaleoceras, Font-
nelliceras, and Protogrammoceras in the Talkeetna
Mountains but not farther north. These occurrences of
Arieticeras and Leptaleoceras in southern Alaska are
not much farther north than their northernmost known
occurrences in the southern Yukon (Frebold, 1970, p.
446).

GEOGRAPHIC DISTRIBUTION

The geographic occurrences of Early Jurassic am-
monites from Alaska described herein are shown on
figures 1–6 and tables 3–6. Detailed descriptions of the
occurrences are given in table 7.
### Geographic Distribution

**Table 3.** Geographic distribution of Early Jurassic ammonites from outcrops in northern and east-central Alaska

[Quadrangle occurrences are listed in table 7. Numbers 5-15 are keyed to area numbers in figure 1. Higher numbers are USGS Mesozoic locality numbers]

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<th>North-eastern Alaska</th>
<th>East-central Alaska</th>
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<td>Clay shale</td>
<td>Claystone</td>
<td>Kingak shale</td>
<td>Green shale (in part)</td>
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<td><strong>Psiloceras sp</strong></td>
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<td><strong>P.? sp</strong></td>
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<tr>
<td><strong>P. (Franziceras) sp</strong></td>
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<tr>
<td><strong>P. (F.) cf. P. (F.) ruidum (Buckman)</strong></td>
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<tr>
<td><strong>Uptonia cf. U. jamesoni (J. de C. Sowerby)</strong></td>
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<tr>
<td><strong>Uptonia? sp</strong></td>
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<tr>
<td><strong>Amaltheus margaritatus (Montfort)</strong></td>
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<td><strong>A. stokesi (J. Sowerby)</strong></td>
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<td><strong>A. cf. A. stokesi (J. Sowerby)</strong></td>
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<td><strong>A. sp</strong></td>
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<td><strong>Dactylioceras (Orthodactylites) cf. D. (O.) directum (Buckman)</strong></td>
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<td><strong>Harpoceras cf. H. exaratum (Young and Bird)</strong></td>
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<td><strong>Eleganticeras sp. juv</strong></td>
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<td><strong>Pseudolioceras cf. P. compactile (Simpson)</strong></td>
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<td><strong>P. cf. P. lythense (Young and Bird)</strong></td>
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**Note:** Numbers 5-15 are keyed to area numbers in figure 1. Higher numbers are USGS Mesozoic locality numbers.
Table 4.—Geographic distribution of Early Jurassic ammonites in the Yakutat area and in the Wrangell Mountains in southern Alaska

[Quadrangles are listed in Table 7. Numbers 16-19 are keyed to generalized area numbers in figure 1. Higher numbers are USGS Mesozoic locality numbers]

<table>
<thead>
<tr>
<th>Genus and species</th>
<th>Yakutat area</th>
<th>Chitina Mountain area, McCarthy (C-4) quadrangle</th>
<th>McCarthy area between headwaters of Nizina River and Kennicott Glacier in McCarthy (C-4) quadrangle</th>
<th>Headwaters of Nizina River McCarthy (C-7) quadrangle</th>
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<tbody>
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</table>

*Psiloceras cf. P. planorbis* (J. de C. Sowerby) 
*Discamphiceras sp.* 
*Arnioceras cf. A. densicosta* (Quenstedt) 
*Coroniceras? sp.* 
*Arrietiitid genus undetermined* 
*Paltechioceras cf. P. harbourownense* (Crickmay) 
*P.? sp.* 
*Cruziobaccom cf. C. cruciobatum* Buckman 
*C. cf. C. pacificum* Preboll 
*C. sp.* 
*Uptonia cf. U. dayiceroides* 
*Mouteria? sp. A.* 
*Tropidoceras octaeon* (d'Orbigny) 
*Prodaicityoceras italicum* 
*italicum* (Fucini) 
*P. cf. P. italicum fucini* 
*R. Fischer* 
*P.? sp.* 
*Arrietiitid genus undetermined* (Meneghini) 
*A. cf. A. algovianum* (Oppel) 
*A. sp.*
### Geographic Distribution

**Table 5.** Geographic distribution of Early Jurassic ammonites in the Talkeetna Mountains in southern Alaska

[Quadrangle occurrences are listed in Table 7. Numbers 20–23 are keyed to generalized area numbers in Figure 1. Higher numbers are USGS Mesozoic locality numbers.]

<table>
<thead>
<tr>
<th>Talkeetna Mountains</th>
<th>Western Copper River basin</th>
<th>Sheep Mountain to Horn Mountain</th>
<th>Chickaloon–Kings Mountain area</th>
<th>Osheta River headwaters</th>
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</thead>
<tbody>
<tr>
<td>Genus and species</td>
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<th>Talkeetna Formation</th>
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<tr>
<td>Paltechioceras cf. P. harbledownense (Crickmay)</td>
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<tr>
<td>C. cf. C. denisinodulum Buckman</td>
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<td>22</td>
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<tr>
<td>C. cf. C. muticum (d'Orbigny)</td>
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<tr>
<td>C. cf. C. submuticum (Oppel)</td>
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<tr>
<td>C. sp. juv</td>
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<tr>
<td>Apoderoceras cf. A. subtriangulare (Young and Bird)</td>
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<tr>
<td>Fanninoceras kunae McLearn</td>
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<tr>
<td>F. cf. F. carlottense McLearn</td>
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<td>Uptonia? sp. B</td>
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<td>Amaltheus cf. A. stokesi (J. Sowerby)</td>
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<tr>
<td>Dactylioceras cf. D. commune (J. Sowerby)</td>
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<tr>
<td>D. (Orthodaetylites) kanense McLearn</td>
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<tr>
<td>Arietoceras cf. A. domarensis (Meneghini)</td>
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<tr>
<td>Leptaleoceras pseudoradians (Reynes)</td>
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<tr>
<td>Fontanelllicerocs cf. F. fontanelense (Gemmellaro)</td>
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<tr>
<td>Harpoceras cf. H. exaratum (Young and Bird)</td>
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<tr>
<td>Proogrammoceras cf. P. paltum (Buckman)</td>
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<tr>
<td>P. cf. P. argutum (Buckman)</td>
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<tr>
<td>Pseudolooceras sp</td>
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<tr>
<td>Grammoceras sp</td>
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<td>Phymatoeceras? sp</td>
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<tr>
<td>Brodieia cf. B. tenuiocostata var. nodosa (Jaworski)</td>
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<tr>
<td>Hawqa cf. H. grandis Buckman</td>
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<tr>
<td>H. cf. H. variabilis (d'Orbigny)</td>
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<tr>
<td>H. cf. H. compressa Buckman</td>
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<tr>
<td>H. sp</td>
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### EARLY JURASSIC AMMONITES FROM ALASKA

Table 6. - Geographic distribution of Early Jurassic ammonites in the Chulitna River area of the Alaska Range, in the Seldovia Quadrangle occurrences are listed in table 7.

<table>
<thead>
<tr>
<th>South-central part of Alaska Range</th>
<th>Kenai Peninsula</th>
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<tbody>
<tr>
<td>Chulitna River area</td>
<td>Seldovia area</td>
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<tr>
<td>Healy A-6 quadrangle</td>
<td>Volcanic rocks, sandstone, limestone</td>
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<tr>
<td>H. columbiae</td>
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<tr>
<td>Badouxia</td>
<td></td>
</tr>
<tr>
<td>Pseudolioceras</td>
<td></td>
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<tr>
<td>Psiloceras</td>
<td></td>
</tr>
<tr>
<td>Charmasseiceras</td>
<td></td>
</tr>
<tr>
<td>cf. W. canadensis</td>
<td></td>
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<tr>
<td>portlocki (Wright)</td>
<td></td>
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<tr>
<td>Frebold (Quenstedt)</td>
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<tr>
<td>(Waehner)</td>
<td></td>
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<tr>
<td>(Buckman)</td>
<td></td>
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<tr>
<td>(Oppel)</td>
<td></td>
</tr>
<tr>
<td>Lytoceras sp.</td>
<td></td>
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<tr>
<td>Psiloceras cf. P. planorbis</td>
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<tr>
<td>(J. de C. Sowerby)</td>
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<tr>
<td>P. Franzioceras cf. P. (F). ruicum (Buckman)</td>
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<tr>
<td>Dicromphriceras cf. D. toxyphorum (Buckman)</td>
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<tr>
<td>Logroceraeas cf. L. sublaqueus</td>
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<tr>
<td>Waehneroceras cf. W. tenerum (Neumayr)</td>
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<tr>
<td>W. cf. W. portlocki (Wright)</td>
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<tr>
<td>Scholtheimia sp.</td>
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<tr>
<td>Badouzia canadensis (Frebold)</td>
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<td>B. colombiae (Frebold)</td>
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<tr>
<td>Charmasseiceras cf. C. marmoreum (Oppel)</td>
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<td>Coroniceras sp. A</td>
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<tr>
<td>Coroniceras sp.</td>
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<tr>
<td>C. (Paracromoceras) sp</td>
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<tr>
<td>Arotonoceras cf. A. donsiostra (Quenstedt)</td>
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<tr>
<td>Paracococeras rursicosta (Frebold)</td>
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<td>Arotonoceras jejeltzi Frebold</td>
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<tr>
<td>Palteckioceras (Ortheckioceras?) sp</td>
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<td>Pseudolioceras sp</td>
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<tr>
<td>Haugia cf. H. grandis Buckman</td>
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<tr>
<td>H. cf. H. comossa Buckman</td>
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<table>
<thead>
<tr>
<th>South-central part of Alaska Range</th>
<th>Kenai Peninsula</th>
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</thead>
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<tr>
<td>Sandstone, siltstone, limestone, and argillite</td>
<td>Volcanic rocks, sandstone, limestone</td>
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GEOGRAPHIC DISTRIBUTION

area of the Kenai Peninsula, and in the Puale Bay-Alinchak Bay and Wide Bay areas of the Alaska Peninsula

Higher numbers are USGS Mesozoic locality numbers.

<table>
<thead>
<tr>
<th>Alaska Peninsula</th>
<th>Wide Bay area</th>
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<tbody>
<tr>
<td>Puale Bay-Alinchak Bay area</td>
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<tr>
<td>Limestone, shale, siltstone, sandstone, and massive conglomerate</td>
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<p>|      | 2109 | 3110 | 10830 | 12075 | 12261 | 12264 | 12293 | 15068 | 16271 | 25294 | 25604 | 27067 | 27081 | M1738 | 31377 | 31372 | ROC1186 | ROC1240 | ROC1288 | ROC1286 | ROC1285 | ROC1284 | ROC1303 | ROC1301 | ROC1300 | ROC1302 | ROC1300 |
|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |         |         |         |         |         |         |         |         |         |         |         |</p>
<table>
<thead>
<tr>
<th>Locality No.</th>
<th>USGS Mesozoic loc. No.</th>
<th>Collector's Collector, year of collection, description of locality, and stratigraphic assignment</th>
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<tr>
<td>1</td>
<td>56ATr204F</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
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<td>56ATr204C</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
</tr>
<tr>
<td>3</td>
<td>56ATr204B</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
</tr>
<tr>
<td>4</td>
<td>56ATr204A</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
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<td>5</td>
<td>56ATr204D</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
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<td>6</td>
<td>56ATr204E</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
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<td>7</td>
<td>56ATr204F</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
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<td>8</td>
<td>56ATr204G</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
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<td>9</td>
<td>56ATr204H</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
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<td>10</td>
<td>56ATr204I</td>
<td>I. L. Tailleur and H. A. Tourtelot, 1968. On bluff in the middle fork Salmon Trout River, east of Lake Schrader, lat 69°33' N., long 156°28'06&quot; W., Cape Simpson area, Cape Simpson, Alaska. Late Pliensbachian.</td>
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### Table 7.—Description of Lower Jurassic fossil localities in Alaska—Continued

<table>
<thead>
<tr>
<th>No.</th>
<th>Collector, year of collection, description of locality, (figs. 2-6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>F. H. Moffitt, 1927. McCarthy Creek valley, near creek on east side, 2.5 mi (4 km) from the glacier, NE¼NW¼ sec. 26, T. 4 S., R. 16 E., McCarthy (B-4) quadrangle, Wrangell Mountains, southern Alaska. Upper member of McCarthy Formation, a few hundred feet (100 m) above base. Late Sinemurian.</td>
</tr>
<tr>
<td>18</td>
<td>E. M. MacKevett, Jr., 1961. DEWISNW¼NW¼ sec. 2 T. 4 S., R. 14 E., McCarthy (C-5) quadrangle, Wrangell Mountains, southern Alaska. Upper member of McCarthy Formation. About 1,900 ft (580 m) stratigraphically above base of member. Early Sinemurian.</td>
</tr>
<tr>
<td>18</td>
<td>E. M. MacKevett, Jr., 1962. On ridge west of McCarthy Creek, SW¼NW¼NW¼ sec. 26, T. 3 S., R. 14 E., McCarthy (C-5) quadrangle, Wrangell Mountains, southern Alaska. Upper member of McCarthy Formation, a few feet (about 1 m) below upper contact. Early Sinemurian.</td>
</tr>
<tr>
<td>18</td>
<td>E. M. MacKevett, Jr., 1961. In area of small folds southeast of USGS Mesozoic loc. 31174 but only 100 ft (30.5 m) below top of upper member of McCarthy Formation. Late Sinemurian.</td>
</tr>
<tr>
<td>18</td>
<td>E. M. MacKevett, Jr., 1963. Same location as USGS Mesozoic loc. 31174 but only 100 ft (30.5 m) below top of upper member of McCarthy Formation. Late Sinemurian.</td>
</tr>
</tbody>
</table>

### Table 7.—Description of Lower Jurassic fossil localities in Alaska—Continued

<table>
<thead>
<tr>
<th>No.</th>
<th>Collector, year of collection, description of locality, (figs. 2-6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>E. M. MacKevett, Jr., 1964. In saddle on ridge between Lubbe Creek and Diamond Creek east of McCarthy Creek, in east-central part of NW¼NW¼ sec. 7, T. 4 S., R. 15 E., McCarthy (C-5) quadrangle, Wrangell Mountains, southern Alaska. Upper member of McCarthy Formation. Probably late Sinemurian.</td>
</tr>
<tr>
<td>18</td>
<td>E. M. MacKevett, Jr., 1962. West of McCarthy Creek opposite Lubbe Creek ridge in east-central part of SW¼NW¼ sec. 35, T. 3 S., R. 14 E., McCarthy (C-5) quadrangle, Wrangell Mountains, southern Alaska. About 1,200 ft (366 m) above base of upper member of McCarthy Formation. Probably late Sinemurian.</td>
</tr>
<tr>
<td>18</td>
<td>E. M. MacKevett, Jr., 1964. On ridge west of McCarthy Creek near center NW¼NW¼ sec. 35, T. 3 S., R. 14 E., McCarthy (C-5) quadrangle, Wrangell Mountains, southern Alaska. In upper part of upper member of McCarthy Formation. Early Sinemurian.</td>
</tr>
<tr>
<td>19</td>
<td>E. M. MacKevett, Jr., 1967. On ridge west of McCarthy Creek near center NW¼NW¼ sec. 35, T. 3 S., R. 14 E., McCarthy (C-5) quadrangle, Wrangell Mountains, southern Alaska. In upper part of upper member of McCarthy Formation. Early Sinemurian.</td>
</tr>
<tr>
<td>19</td>
<td>E. M. MacKevett, Jr., 1963. Same location as USGS Mesozoic loc. 31174 but only 100 ft (30.5 m) below top of upper member of McCarthy Formation. Late Sinemurian.</td>
</tr>
<tr>
<td>19</td>
<td>E. M. MacKevett, Jr., 1967. On ridge west of McCarthy Creek near center NW¼NW¼ sec. 35, T. 3 S., R. 14 E., McCarthy (C-5) quadrangle, Wrangell Mountains, southern Alaska. In upper part of upper member of McCarthy Formation. Early Sinemurian.</td>
</tr>
<tr>
<td>19</td>
<td>E. M. MacKevett, Jr., 1963. Same location as USGS Mesozoic loc. 31174 but only 100 ft (30.5 m) below top of upper member of McCarthy Formation. Late Sinemurian.</td>
</tr>
<tr>
<td>19</td>
<td>E. M. MacKevett, Jr., 1967. On ridge west of McCarthy Creek near center NW¼NW¼ sec. 35, T. 3 S., R. 14 E., McCarthy (C-5) quadrangle, Wrangell Mountains, southern Alaska. In upper part of upper member of McCarthy Formation. Early Sinemurian.</td>
</tr>
<tr>
<td>19</td>
<td>E. M. MacKevett, Jr., 1963. Same location as USGS Mesozoic loc. 31174 but only 100 ft (30.5 m) below top of upper member of McCarthy Formation. Late Sinemurian.</td>
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TABLE 7.—Description of Lower Jurassic fossil localities in Alaska—Continued

<table>
<thead>
<tr>
<th>Locality No. (figs. 2-6)</th>
<th>USGS Mesosoc.</th>
<th>Collector’s field No.</th>
<th>Collector, year of collection, description of locality, and stratigraphic assignment</th>
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<td>24107</td>
<td>52AGz68</td>
<td>Arthur Grantz, 1959. On north tributary of Little King Creek that heads against Little Alasa. Talkeetna Formation, Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>24108</td>
<td>52AGz66</td>
<td>Arthur Grantz, 1962. Talus and stream float. Lat 63'20'20&quot; N., long 147°24'56&quot; W., Talkeetna Mountains, upper part. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>24114</td>
<td>52AGz68</td>
<td>Arthur Grantz, R. R. Hoard, and R. W. Imlay, 1952. Differs from USGS Mesosoc. loc. 24107 by being 1.9 miles (3.1 km) N. 28° W. of southeast summit of Gunight Mountain. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>24787</td>
<td>53AGz40</td>
<td>Arthur Grantz and L. F. Fay, 1953. About 0.6 mile (1 km) northeast of point where Camp Creek crosses Glenn Highway, lat 61°50'53&quot; N., long 147°24'56&quot; W., Anchorage (D-2) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>25316</td>
<td>54AGz48A</td>
<td>Arthur Grantz and L. F. Fay, 1954. Lat 62°00'45&quot; N., long 147°27'45&quot; W., Talkeetna Mountains (A-1) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation, upper part. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>25317</td>
<td>54AGz49A</td>
<td>Arthur Grantz and L. F. Fay, 1954. Lat 62°00'00&quot; N., long 147°31'20&quot; W., Talkeetna Mountains (A-2) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>25318</td>
<td>54AGz50</td>
<td>Arthur Grantz and L. F. Fay, 1954. Lat 62°00'10&quot; N., long 147°32'30&quot; W., Talkeetna Mountains (A-2) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation, late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>25319</td>
<td>54AGz51</td>
<td>Arthur Grantz and L. F. Fay, 1954. Lat 62°00'00&quot; N., long 147°32'45&quot; W., Talkeetna Mountains (A-2) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation, upper part. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>25342</td>
<td>54AFy24</td>
<td>L. F. Fay, 1954. Lat 62°02'48&quot; N., long 147°29'34&quot; W., Talkeetna Mountains. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>25359</td>
<td>54AFy130</td>
<td>L. F. Fay, 1954. Lat 62°02'40&quot; N., long 147°21'30&quot; W., Talkeetna Mountains (A-1) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>25940</td>
<td>55AGz228A</td>
<td>Arthur Grantz, 1955. Lat 62°01'37&quot; N., long 147°17'53&quot; W., Talkeetna Mountains (A-1) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>25941</td>
<td>55AGz294</td>
<td>Arthur Grantz, 1965. Lat 61°51'51&quot; N., long 147°31'52&quot; W., at end of Squaw Creek, Anchorage (D-1) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation, upper part. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>27508</td>
<td>6-10BB</td>
<td>General Petroleum Corp. 1959. Near head of McDougall Creek. Coordinates 31°00'57&quot; N., 147°01'50&quot; W., Talkeetna Mountains (A-2) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>29449</td>
<td>66AGz51A</td>
<td>Arthur Grantz, 1966. Same place and stratigraphic position as USGS Mesosoc. loc. 24105. Late Toarcian.</td>
</tr>
<tr>
<td>21</td>
<td>29450</td>
<td>66AGz31B</td>
<td>Arthur Grantz, 1966. On south tributary of Squaw Creek, 1.50 miles (2.4 km) southeast of summit of Gunight Mountain, near USGS Mesosoc. loc. 24107. Anchorage (D-2) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Late Toarcian.</td>
</tr>
</tbody>
</table>

TABLE 7.—Description of Lower Jurassic fossil localities in Alaska—Continued

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</tr>
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<tbody>
<tr>
<td>22</td>
<td>M6171</td>
<td>73APf485A</td>
<td>George Pfleger, 1972. On shore of Chilkat River, 1.50 miles (2.4 km) south of mouth of Talkeetna River, Anchorage (D-1) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Early Toarcian.</td>
</tr>
<tr>
<td>22</td>
<td>6706</td>
<td></td>
<td>A. H. Brooks, 1916. Creek entering Chilkat River from west 1 mile (1.6 km) above Government Bridge at altitude of 2,000 ft (600 m). Coordinates 3.0-9.0. Anchorage (D-4) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Early Toarcian.</td>
</tr>
<tr>
<td>22</td>
<td>6797</td>
<td></td>
<td>A. H. Brooks, 1916. Creek entering Chilkat River from west 1 mile (1.6 km) above Government Bridge at altitude of 2,000 ft (600 m). Coordinates 3.0-9.0. Anchorage (D-4) quadrangle, Talkeetna Mountains, southern Alaska. Talkeetna Formation. Early Toarcian.</td>
</tr>
<tr>
<td>22</td>
<td>27586</td>
<td>13177-2</td>
<td>Standard Oil of California Carbon Creek, 2.5 miles (4.0 km) S. 70° W. of its mouth near center of SE1/4 sec. 7, T. 14 N., R. 1 W., Anchorage (C-4) quadrangle, coordinates 1.4-17.3, Chugach Mountains, southern Alaska. Talkeetna Formation. Late Toarcian.</td>
</tr>
<tr>
<td>22</td>
<td>29198</td>
<td>SUS62</td>
<td>British Petroleum Explor. Alaska Co. From saddle on south side of Kings Mountain 2 ½ miles (4 km) S. 15° E. of the mount of Talkeetna Mountain. Late Sinemurian.</td>
</tr>
<tr>
<td>23</td>
<td>16229</td>
<td>32AT1</td>
<td>Elmer Bedger, 1956. Head of eastern tributary of Partin Creek that passes against Little Shotgun Creek on west side of Chulitna River valley north of Edzirge Glacier. Probably same place as USGS Mesosoc. loc. 31262 in Healy (E-6) quadrangle, south-central part of Alaska Range, southern Alaska. Named beds. Late early to early middle Sinemurian.</td>
</tr>
</tbody>
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</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>75A38A</td>
<td>R. L. Detterman and D. L. Jenm, 1975. Altitude 5,850 ft (1,768 m), 3.5 mi (5.6 km) west of Shellshadger Pass, sec. 12, T. 28 N., R. 20 W., lat 62°31'49&quot; N., long 151°47'1&quot; W. Talkevra (C-6) quadrangle, south-central part of Alaska Range, southern Alaska. Unnamed beds. Early Sinemurian.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>75A39A</td>
<td>D. L. Jones, 1975. Altitude 1,010 ft (305 m), 5 miles (8 km) southwest of Shellshadger Pass, lat 62°32'27&quot; N., long 151°47'1&quot; W. Talkevra (C-6) quadrangle, south-central part of Alaska Range, southern Alaska. Unnamed beds. Early Sinemurian.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>76(76 AR17)</td>
<td>Bruce Reed and R. L. Detterm, 1976. Float from 180 to 150 ft (57 to 46 m) of alluvial and shale exposed on north side of ridge about 1 mile (1.6 km) northwest of Tatina River in south-central part of NW3/4W4 sec. 25, T. 29 N., R. 20 W., lat 62°31'49&quot; N., long 151°47'1&quot; W. Talkevra (B-6) quadrangle, south-central part of Alaska Range, southern Alaska. Early Sinemurian.</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>2981</td>
<td>T. W. Stanton and G. C. Martin, 1984. Sea cliffs 2 miles (3.2 km) west of Seldovia Bay, eastern part of sec. 34, T. 8 S., R. 16 W., Seldovia (B-5) quadrangle, on Kenai Peninsula, southern Alaska. Talkevra Formation about 200 ft (61 m) above horizontal conglomerate. Earliest Sinemurian.</td>
<td></td>
</tr>
</tbody>
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</tr>
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<tbody>
<tr>
<td>26</td>
<td>22664</td>
<td>J. L. Sprague</td>
<td>Arthur Grant, 1951. Sea cliffs 2.8 miles (4.5 km) west of Point Naskouwak on south shore of Kachemak Bay, near point on west side of sec. 34, T. 8 S., R. 16 W., Seldovia (B-5) quadrangle, on Kenai Peninsula, southern Alaska. Talkevra Formation. Early Hettangian.</td>
</tr>
<tr>
<td>26</td>
<td>31128</td>
<td>J. S. Kelly</td>
<td>Cliff near head of small bay southwest of Point Naskouwak in NE1/4NW1/4 sec. 36, T. 15 S., R. 14 W., Seldovia (B-5) quadrangle, on Kenai Peninsula, southern Alaska. Early Sinemurian.</td>
</tr>
<tr>
<td>26</td>
<td>31684</td>
<td>J. S. Kelly</td>
<td>Sea cliffs, 1.2 miles (1.9 km) 5° SE. of Pt. Naskouwak, in NW1/4SW1/4 sec. 31, T. 8 S., R. 14 W., lat 59°39'5&quot; N., long 151°44'22&quot; W. Seldovia (B-5) quadrangle, on Kenai Peninsula, southern Alaska. Early Sinemurian.</td>
</tr>
<tr>
<td>26</td>
<td>31687</td>
<td>J. S. Kelly</td>
<td>Sea cliffs, 0.6 mile (0.9 km) 6° SE. of Pt. Naskouwak in NW1/4SW1/4 sec. 31, T. 8 S., R. 14 W., lat 59°39'5&quot; N., long 151°44'22&quot; W. Seldovia (B-5) quadrangle, on Kenai Peninsula, southern Alaska. Early Sinemurian.</td>
</tr>
<tr>
<td>26</td>
<td>31686</td>
<td>J. S. Kelly</td>
<td>Sea cliffs, 0.19 mile (0.3 km) 14° SE. of Pt. Naskouwak, NE1/4SE1/4 sec. 26, T. 8 S., R. 14 W., lat 59°39'5&quot; N., long 151°43'50&quot; W. Seldovia (B-5) quadrangle, on Kenai Peninsula, southern Alaska. Early Sinemurian.</td>
</tr>
<tr>
<td>26</td>
<td>31649</td>
<td>S. Kelley</td>
<td>Sea cliffs, 3 miles (4.8 km) 66° SW. of Pt. Naskouwak in NE1/4SW1/4 sec. 34, T. 8 S., R. 15 W., lat 59°39'5&quot; N., long 151°43'50&quot; W. Seldovia (B-5) quadrangle, on Kenai Peninsula, southern Alaska. Early Sinemurian.</td>
</tr>
<tr>
<td>27</td>
<td>3109</td>
<td>T. W. Stanton</td>
<td>Point Naskouwak, at entrance to Seldovia Bay, Seldovia (B-5) quadrangle, on Kenai Peninsula, southern Alaska. Unnamed beds. Early Sinemurian.</td>
</tr>
<tr>
<td>27</td>
<td>1241</td>
<td>H. M. Hopkins, 1962.</td>
<td>Sea cliffs just west of buried valley of Miocene age, lat 59°20'6&quot; N., long 151°47'1&quot; W., probably from same places as USGS Mesozoic loc. 2901, Seldovia (B-5) quadrangle, Kenai Peninsula, southern Alaska. Early Sinemurian.</td>
</tr>
</tbody>
</table>
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</tr>
</thead>
</table>
27. 19809  | 44 AKm F75  | B. L. Kellum, S. N. Daviess, and C. M. Swinney, 1944. Northeast shore of Puale Bay about 2 miles (3.2 km) northeast of Chignik Point and 1,000 ft (305 m) north of northermost large waterfall, Karluk (C-4 and C-5) quadrangles, Alaska Peninsula. In dense limestone interbedded with limy shale, and some tuffaceous sandstone 380 ft (110 m) below base of massive tuff and agglomerate. Unnamed beds. Middle Hettangian. |
27. 19804  | 44 AKm F76  | B. L. Kellum, S. N. Daviess, and C. M. Swinney, 1944. Northeast shore of Puale Bay about 2 miles (3.2 km) northeast of Chignik Point and 1,000 ft (305 m) north of northermost large waterfall, Karluk (C-4 and C-5) quadrangles, Alaska Peninsula. In dense limestone interbedded with limy shale, and some tuffaceous sandstone 380 ft (110 m) below base of massive tuff and agglomerate. Unnamed beds. Middle Hettangian. |
27. 21237  | 40AI 112  | R. W. Imlay and J. M. Miller, 1948. Northeast shore of Puale Bay, Alaska Peninsula, 1.6 miles (2.6 km) N. 22°W of Chignik Point. Float probably from light-gray sandstone exposed in cliffs about 240 ft (73 m) below base of Kialagvik Formation. Near middle of Tetraceras. |
27. 25894  | 56AKe6  | A. S. Keller, 1955. Southwest side of Alichak Bay in limestone overlying Triassic beds. Probably same place as 12075, 12394, and 25694. Unnamed beds. Middle Hettangian. |
27. 29267  | 65AP 175  | Marvin Morgan, 1965. Northeast shore of Puale Bay about 1 mile (1.6 km) northwest of Chignik Point, Alaska Peninsula. Probably from same place as Mesozoic locs. 3110 and 19804. Unnamed beds. Middle Hettangian. |
27. 29298  | 65AME55  | G. W. Moore, 1965. Southwest shore of Alichak Bay, lat 57°46.8’ N., long 155°16.9’ W., Karluk (D-4) quadrangle, Alaska Peninsula. Unnamed beds. Middle Hettangian. |
27. M1738  | ALp70IM  | British Petroleum, Inc., 1962. From core near the same place as Mesozoic locs. 3110 and 19803, 0.6 miles (1 km) west of Cape Kokouro, lat 57°43.4’ N., long 155°25.2’ W., east shore of Puale Bay, Alaska Peninsula. Unnamed beds. Early to middle Hettangian. |
27. 31370  | 77A11  | R. W. Imlay, Martha Yount, Carleen Holloway, and Fred Wilson, 1977. Northeast side of Puale Bay. About 4,300 ft (1,311 m) S. 12°E. of VABM Bay 119. About 270 to 280 ft (82-86 m) stratigraphically above base of massive tuffaceous sandstone, Karluk (C-4-C5) quadrangle, Alaska Peninsula. Early Sinemurian. |
27. 31372  | 77A13  | R. W. Imlay, Martha Yount, Carleen Holloway, and Fred Wilson, 1977. Northeast side of Puale Bay. About 4,300 ft (1,311 m) S. 12°E. of VABM Bay 119. About 270 to 280 ft (82-86 m) stratigraphically above base of massive tuffaceous sandstone, Karluk (C-4-C5) quadrangle, Alaska Peninsula. Early Sinemurian. |
27. ROC 1185  |  | W. T. Rothwell and associates, 1962. From 1,900 ft (640 m) N. 36°W. of VABM 96 Hole on northeast shore of Puale Bay, Alaska Peninsula. Float from or near same place as locations 3110 and 19803. Unnamed beds. Early to late Hettangian. |
27. ROC 1240  |  | W. T. Rothwell and associates, 1962. From 10 ft (3 m) stratigraphically below locality ROC 1241 and probably 270 to 280 ft (82-86 m) stratigraphically above base of tuffaceous sandstone, unnamed beds. Early Sinemurian. |

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</table>
27. ROC 1282  |  | W. T. Rothwell and associates, 1962. Same general location as Mesozoic loc. 19804. At point about 3,000 ft (914 m) S. 12°E. of VABM 119 Bay (N) bed north of fault, 8-bed south of fault. In massive sandstone about 290 ft (88 m) below the base of the Kialagvik Formation. Unnamed beds. Early to late Sinemurian. |
27. ROC 1305  |  | W. T. Rothwell and associates, 1962. Same general location as Mesozoic loc. 19804. At point about 2,700 ft (823 m) S. 12°E. of VABM 119 Bay. From unit of massive sandstone 169 ft. (49 m) thick underly the Kialagvik Formation. Unnamed beds. Sinemurian. |
28.  |  | Richfield Oil Co., Wide Bay Test Well 1, core 5 at depth of 2,225 to 2,236 ft (681 m), at Wide Bay, Alaska Peninsula. Unnamed beds. Hettangian. |

SYSTEMATIC DESCRIPTIONS

Family PSILOCERATIDAE Hyatt, 1867
Genus PSILOCERAS Hyatt, 1867
Psiloceras cf. P. planorbis (J. de C. Sowerby)

Plate 1, figures 1, 2

Ten compressed molds represent a highly evolute smooth ammonite similar to P. planorbis (J. de C. Sowerby) (1824, pl. 448; Dean and others, 1961, pl. 63, fig. 1; Arkell and others, 1957, p. L232, fig. 258-10, a-c) of early Hettangian Age. Their occurrence with Waackenoceras of middle Hettangian Age in three collections implies either that some of the specimens herein compared with P. planorbis are of that age or that the collections were made from more than one stratigraphic unit. The presence of beds of earliest Hettangian Age in the areas where these collections were made is shown by the upward gradation of marine Upper Triassic beds in to marine Lower Jurassic beds.

Figured specimens.—USNM (U.S. National Museum) 247950, 247951.

Occurrences.—Upper member of McCarthy Formation at USGS Mesozoic loc. 29891 in the Wrangell Mountains; unnamed beds on the small peninsula between Puale Bay and Alichak Bay, Alaska Peninsula, at USGS Mesozoic locs. 12075 and M1738 and ROC (Richfield Oil Co.) localities 1185 and 3002.
Subgenus FRANZICERAS Buckman, 1923
Psiloceras (Franziceras) cf. P. (F.) ruidum (Buckman)
Plate 1, figures 12–14, 18–24

Twelve external molds of immature ammonites are fairly evolute, have a subovate whorl section that is a little higher than wide, an umbilicus that represents about 50 percent of the diameter, and rather sharp, widely spaced ribs. These ribs begin near the umbilicus, trend radially or slightly adapically on the flanks, and terminate rather abruptly a little above the middle of the flanks. In addition, faint lines that trend radially on the flanks and arch forward on the venter are preserved on a few specimens from the Seldovia area.

The suture line is simple, has fairly narrow saddles, and does not have a strongly retracted suspensive lobe.

This species differs from plicate forms of Psiloceras such as P. (P.) plicatum (Quenstedt) (1883, pl. 1, figs. 9, 11; Donovan, 1952, pl. 22, figs. 1, 2; Lange, 1941, pl. 2, fig. 20) by having sharp ribs instead of folds. It differs from species of the subgenus P. (Coloiceras) by being less evolute, by having a smaller umbilicus relative to its diameter, by ribs trending radially instead of projecting adorally, and by having a somewhat different suture pattern. It appears to have somewhat weaker ribbing than the fragmentary specimens of Psilocerus from the northern Yukon that were described by Frebok and Poulton (1977, p. 92, 93, pl. 1 figs. 3–8). Overall it shows most resemblance to P. (Franziceras) ruidum Buckman (1923, pl. 423) but differs by having shorter ribs and a less retracted suspensive lobe. These differences may be related to its much smaller size.

It is associated at USGS Mesozoic loc. 29737 with small specimens of Psiloceras, of which some are smooth and some bear faint ribs on their innermost whorls.

**Figure specimens.**—USNM 247952–247955.

**Occurrences.**—Glenn Shale in the Coleen quadrangle of east-central Alaska at USGS Mesozoic loc. 29742; Kingak Shale in northernmost Alaska in the South Barrow No. 12 well at the depth of 2,170.5 feet (661.4 m).

Genus DISCAMPHICERAS Spath, 1923
Discamphiceras cf. D. toxophorum (Waehner)
Plate 1, figures 3, 4, 8–10

This species is represented by 12 specimens, of which 10 are crushed laterally. It is characterized by moderately involute coiling; an umbilicus that is about two-fifths as wide as the shell diameter; a high whorl section; a narrow, fairly sharp venter, and by moderately spaced ribs that trend radially, or incline slightly forward on the flanks, and that arch forward on the vental area of smaller specimens. These ribs broaden and weaken ventrally and are faint or absent on venter of medium to large specimens. On the largest specimen the adapical half bears widely spaced ribs that fade out ventrally, whereas the adoral half is completely smooth. The suture line is not preserved.

This species closely resembles D. toxophorum Waehner (1884, p. 109, pl. 24, figs. 5a,b to 7a–c) in most respects but has somewhat sparser ribbing. The small specimens differ from comparable specimens of D. kammakerharense (Gümbel) (Waehner, 1884, p. 113, pl. 24, figs. 3a–c, 4a–d) and from D. calcmontanum (Waehner) (1884, pl. 112, pl. 24, figs. 1a–c, 2a,b) by having a wider umbilicus and sharper, sparser ribbing. The ribbing on the outer whorl of the largest Alaskan specimens is somewhat similar to that on the largest specimens of D. kammakerharense (Gümbel) (Waehner, 1884, pl. 25, figs. 1a–c) and of D. calcmontanum (Waehner) (1884, pl. 24, figs. 1a,b).

Assignment of these Alaskan specimens to Discamphiceras rather than Waehnernoceras is favored by their moderately involute coiling, by their ribs fading on the venter of small specimens, and by their adult outer whorl being fairly smooth.

**Figure specimens.**—USNM 247958–247961.

**Occurrences.**—Unnamed beds on peninsula between Puaie Bay and Alinchak Bay on Alaska Peninsula at USGS Mesozoic locs. 3110, 25694, M1738, and ROC loc. 3002.

Discamphiceras sp.
Plate 1, figures 5–7

Seven laterally crushed molds differ from the Alaskan specimens herein compared with Discamphiceras tox-
**ophorum** (Waehner) by having weaker and more closely spaced ribs. In that respect they resemble a small specimen of *D. calcimontanum* (Waehner) (1884, p. 112, pl. 24, figs. 2a, b). Their ribs are much weaker and do not extend as far ventrally as on the type specimens of *D. toxophorum* (Waehner) (1884, p. 109, pl. 24, figs. 5a–c to 7a–c).

**Figured specimens.**—USNM 247962.

**Occurrence.**—Upper member of the McCarthy Formation in the Wrangell Mountains at USGS Mesozoic locs. 29890.

**Genus LAQUEOCERAS** Lange, 1925

*Laqueoceras* cf. *L. sublaqueus* (Waehner)

Plate 3, figure 13

This species is represented by one laterally crushed specimen that includes a large internal mold and a small, shell-bearing fragment. The specimen is highly evolute, consists of many whorls, and bears fine radial, rather closely spaced ribs. These ribs are fairly distinct on the inner whorls at diameters as large as 75 mm but gradually become faint at greater diameters and are barely evident on the outermost whorl. The venter is poorly exposed but apparently does not bear a keel.

The specimen is similar to *L. sublaqueus* (Waehner) (1886, p. 142, pl. 15, fig. 2; pl. 16, fig. 10; pl. 30, fig. 4; Donovan, 1952, p. 641, 642) in size and in the strength, closeness, and persistence of its ribbing.

**Figured specimen.**—USNM 247963

**Occurrence.**—Unnamed Lower Jurassic beds on south side of Aichnak Bay on Alaska Peninsula at ROC loc. 3002.

**Genus WAEHNEROCERAS** Hyatt, 1889

*Waehneroceras* cf. *W. tenerum* (Neumayr)

Plate 2, figures 1–6


This species is represented by 30 crushed molds. It has highly evolute coiling, a wide umbilicus, and an ovate whorl section. Its ribs are widely spaced, trend nearly radially on the flanks, become stronger ventrally, project forward and become much weaker on the margin of the venter, and are reduced in strength along the midline of the venter.

This species differs from the specimens herein compared with *W. portlockii* (Wright) by having a lower whorl section and much stronger and sparser ribbing. Its features are essentially the same as those of *W. tenerum* (Neumayr) (Arkell and others, 1957, p. L235, fig. 260–1a,b). It is associated at four localities in Alaska with *Waehneroceras* cf. *W. portlockii* (Wright) and at three localities with *Discamphiceras*.

**Figured specimens.**—USNM 247964–247966.

**Occurrence.**—Unnamed beds on south side of Aichnak Bay on Alaska Peninsula at USGS Mesozoic locs. 12075, 12394, 25694, 29268 and ROC loc. 3002; unnamed beds on east side of Puale Bay on Alaska Peninsula at USGS Mesozoic locs. 3109, 3110, 19803, 31370, and ROC loc. 1185.

*Waehneroceras* cf. *W. portlockii* (Wright)

Plate 2, figures 7, 10–15


cf. *Macroagrammites grammicus* Buckman, 1928, Type ammonites, v. 7, pl. 761 a,b.


This species is represented by 33 internal and external molds, of which most are laterally crushed. These specimens have highly evolute coiling, a wide umbilicus, and a compressed whorl section. Their ribs trend nearly radially on the flanks, bend forward slightly on the ventral margin, are rather closely spaced on septate whorls and become more widely spaced on the incomplete body chamber. The venter is smooth along its midline as shown on several specimens. The suture line is not exposed.

In coiling and ribbing this species is essentially identical with the specimen of *Waehneroceras portlockii* (Wright) figured by Dean, Donovan, and Howarth (1961, pl. 63, figs. 4a,b) and probably represents the same species. None of the Alaska specimens, however, include the large outer whorl as figured by Wright (1881, pl. 48, figs. 4, 5) and Buckman (1928, pl. 761a,b). *W. curvioratum* (Waehner) (1882, p. 75, pl. 16, figs. 2–4) appears to have slightly coarser ribbing on its inner whorls and develops a smooth venter on its outer whorls.

**Figured specimens.**—USNM 247967–247972.

**Occurrence.**—Unnamed beds on south side of Aichnak Bay on Alaska Peninsula at USGS Mesozoic locs. 12075, 12394, 25694, and 29268; unnamed beds on east side of Puale Bay on Alaska Peninsula at USGS Mesozoic locs. 3109, 3110, 19803, 31370, and ROC loc. 1185.

*Waehneroceras* sp.

Plate 2, figures 8, 9

*Waehneroceras* is possibly represented in the subsurface of northern Alaska by one small fragment of a whorl in which only the venter and upper part of the
flank are preserved. The specimen is characterized by simple ribs that project strongly forward on the venter and that are only slightly reduced in strength on the venter. These features are similar to those on immature specimens of *Waehneroceras tenerum* (Neumayr) (Arkell and others, 1957, p. L235, figs. 1a,b).

**Figured specimen.**—USNM 247973.

**Occurrence.**—Kingak Shale in South Barrow test well No. 12 at depth of 2181.5 ft. (665 m) in northern Alaska. This occurrence is 11 ft (3.3 m) below that of *Psiloceras* (Franziceras).

Family SCHLOTHEIMIIDAE Spath, 1924
Genus SCHLOTHEIMIA Bayle, 1878
Schlotheimia sp.
Plate 2, figures 16-17

One specimen is moderately involute. Its whorl section is a little higher than it is wide. The umbilical width is 40 percent of the diameter. Its ribs are simple, sharp, inclined forward on the flanks, become a little stronger ventrally, arch forward on the venter, and are only slightly reduced in strength along the midline of the venter.

The ribbing on this specimen resembles that on the inner whorls of *S. montana* (Waehner) (1886, p. 165, pl. 19, fig. 1; pl. 20, fig. 1) and of *S. donar* (Waehner) (1886, p. 173, pl. 21, figs. 2, 5).

**Figured specimens.**—USNM 247974.

**Occurrence.**—Unnamed beds in the Puale Bay area on Alaska Peninsula at USGS Mesozoic quadrangle in Alaska Range at USGS Mesozoic locs. 31266; unnamed beds at Puale Bay in Alaska Peninsula at ROC loc. 1240, and USGS Mesozoic loc. 31372.

Genus BADOUXIA Guex and Taylor, 1976

**Badouxia canadensis** (Frebold)
Plate 2, figures 18-21, 24-28

*Psiloceras canadensis* Frebold, 1961, Canada Geol. Survey Bull. 18, p. 3, pl. 1, figs. 1-6; pl. 2, fig. 1a-c; pl. 3, fig. 1.

*Psiloceras canadensis* Frebold, 1964a, Canada Geol. Survey Bull. 116, p. 6, pl. 1, figs. 1-5b.

*Psiloceras canadensis* Frebold, 1967b, Canada Geol. Survey Bull. 158, p. 18, pl. 1, figs. 2a, 2a-c.


This species is represented in Alaska by 10 fairly small specimens. Most of these (pl. 2, figs. 18, 24, 28) bear rather closely spaced ribbing comparable with that on certain specimens illustrated by Frebold (1951, pl. 1, fig. 5a; 1967b, pl. 1, fig. 2a). A few specimens (pl. 2, figs. 20, 26, 27) bear sparser ribbing, as does another specimen illustrated by Frebold (1951, pl. 1, figs. 1e,d; 1967b, pl. 1 fig. 3a).

The species has ovate whorls that are higher than they are wide, embrace half or more of the preceding whorl, and are rounded ventrally. Its smaller whorls bear straight, fairly sharp, forwardly inclined ribs that extend across the lower two-thirds of the flanks and then either fade out rather abruptly or pass into very weak secondary ribs. Its larger whorls are marked only by strong forwardly inclined ribs that fade out rather abruptly at the base of the upper third of the flanks. Its assignment to the genus *Psiloceras* is questioned because it is more involute and more strongly ribbed than is typical of that genus. Its ribbing is much stronger on the lower part of the flanks than in *Arotoasteroceras jeletzkyi* Frebold.

**Hypotypes.**—USNM 247975-247977 and 248062.

**Occurrences.**—Unnamed beds in the Healy (A-6) quadrangle in Alaska Range at USGS Mesozoic locs. 31266; unnamed beds at Puale Bay in Alaska Peninsula at ROC loc. 1240, and USGS Mesozoic loc. 31372.

**Badouxia columbae** (Frebold)
Plate 2, figures 22, 23

*Psiloceras (Curviceras) columbae* Frebold, 1967b, Canada Geol. Survey Bull. 158, p. 20, pl. 1, figs. 10a-c; pl. 2, figs. 1-5; p. 3, figs. 2a-c.

*Schlotheimia?* sp. indet. Frebold, 1951, p. 7, figs. 2-4.

One fragmentary ammonite bears simple ribs that incline forward on the flanks as do those on *B. canadensis* (Frebold), but that continue across the venter where they arch strongly forward as in *B. columbae* (Frebold).

**Figured specimen.**—USNM 247978.

**Occurrence.**—Unnamed beds in the Healy (A-6) quadrangle, Alaska Range at USGS Mesozoic loc. 31264.

Genus CHARMASSIECERAS Spath, 1924

**Charmassieceras** cf. *C. marmoreum* (Oppel)
Plate 3, figures 1-3

This species is represented by three fragmentary molds of immature specimens. The best preserved internal mold shows that the species is fairly involute, that its ribbing changes during growth from fairly fine to moderately strong, that many ribs fork low on the flanks, and that all ribs curve forward on the upper parts of the flanks. One external mold bears similar forwardly curved ribs that terminate ventrally in shelly material whose smoothness suggest a ventral band.

These specimens are closely similar in involution and ribbing to the small specimen of *Charmassieceras marmoreum* (Oppel) figured by Waehner (1886, pl. 22, figs. 2-4) and by Frebold (1967b, pl. 3, figs. 1c and 1d; pl. 4, figs. 2a-c).

**Figured specimens.**—USNM 247979.

**Occurrence.**—Kingak Shale in northern Alaska in the South Barrow test well No. 12 at depths of 2061.5 and 2068 feet (628 and 630 m). Unnamed beds in Seldovia area in northern Alaska at USGS Mesozoic locs. 2979 and 31637.

**Charmassieceras** sp.
Plate 3, figures 4-10

Three small specimens are characterized by a sub-quadrate whorl section that is much higher than it is...
wide; by a flattened venter; by high, sharp, widely spaced ribs that incline forward strongly on the upper parts of the flanks; and by prominent forwardly inclined ventral swellings that on the largest specimen are joined across the venter by low weak chevron-shaped ribs.

These specimens differ from immature specimens of *C. marmoreum* (Oppel) (Waehner, 1886, pl. 22 figs. 2–6) by having slightly coarser ribs of which only a few fork low on the flanks. In whorl shape and ribbing, the specimens show more resemblance to some small specimens that were figured as *C. charmassei* (d'Orbigny) (1844, pl. 91, figs. 1, 2). They also resemble some small specimens of *C. postaurinum* (Waehner) (1886, pl. 23, figs. 17a–c) in ribbing but are much more compressed.

*Figured specimens.*—USNM 247980, 247981. *Occurrences.*—Kingak Shale in northern Alaska in the South Barrow test well No. 12 at depth of 2,056 feet (627 m) and in the South Barrow test well No. 3 at depths of 2,412 and 2,419.5 feet (735 and 737 m).

Family **ARIETITIDAE** Hyatt, 1874
Subfamily **ARIETITINAE** Hyatt, 1874
Genus **ARIETITES** Waagen, 1869
Arietites cf. *A. bucklandi* (J. Sowerby)


The assignment of this species to *Arietites* was accepted by Arkell (1956, p. 550). No other specimen of the genus has yet been found in Alaska.

*Figured specimen.*—USNM 108778. *Occurrence.*—Kingak Shale in northern Alaska in the Avak test well No. 1 at depth of 1836 ft (560 m).

Genus **CORONICERAS** Hyatt, 1867
Coroniceras sp. A

Plate 4, figures 1–5

This species, represented only by fragmentary material, is similar in appearance to *Coroniceras multicostatum* (J. de C. Sowerby) (1824, v. 5, p. 75, pl. 454; Reynes, 1879, pl. 25, figs. 1–2; Guerin-Franiatte, 1966, p. 141, pls. 29–32). The specimens from Alaska are fairly evolute. Their whorls are higher than they are wide. Their ribs are fairly strong, radial on the flanks, bend forward on the ventral margin, and bear ventrolateral tubercles. Their keel is fairly strong and on internal molds is bordered by shallow furrows.

*Figured specimen.*—USNM 247982. *Occurrence.*—Unnamed Lower Jurassic beds in Talkeetna (C–6) quadrangle, central part of the Alaska Range at USGS Mesozoic loc. 30908.

Coroniceras sp. B

Plate 4, figures 6–10

This species is represented by 12 poorly preserved internal and external molds. Its appearance is similar to that of the specimens herein described as *Coroniceras* sp. A, but differs by having ribs curving forward much more strongly on the upper part of its flanks. In that respect it shows more resemblance to *C. haueri* (Waehner) (1886, p. 38, (127), pl. 19, fig. 1a,b; pl. 20, fig. 2a,b). Its ribbing also resembles some species of *Caeneites* (J. de C. Sowerby, 1824, pl. 452, fig. 1; Wright, 1879, pl. 12, fig. 1; Arkell, 1956, pl. 31, fig. 1; Dean and others, 1961, pl. 66, figs. 1,2; Guerin-Franiatte, 1966, pls. 204, 208). It differs from that genus, however, in that its keel is bordered by very weak instead of deep furrows.

*Figured specimens.*—USNM 247983, 247984. *Occurrences.*—Kingak Shale in northern Alaska in the South Barrow test well No. 12 at depth of 1987.4 to 1987.6 ft (606 m).

Coroniceras sp. C

Plate 4, figure 14

Three small fragmentary molds of ammonites from the subsurface of northern Alaska possibly represent the inner whorls of the species described herein as *Coroniceras* sp. A. They appear, however, to have slightly sparser ribs that bear stronger tubercles on the ventrolateral margin. The keel is fairly low and is not bordered by furrows.

*Figured specimen.*—USNM 247985. *Occurrence.*—Kingak Shale in northern Alaska in the South Barrow test well No. 3 at depth of 2470 ft (753 m).

Subgenus **PARACORONICERAS** Spath, 1922
Coroniceras (Paracoroniceras) sp.

Plate 4, figures 23–25

One species, represented by a crushed fragment of an outer whorl and by one internal mold, bears prominent widely spaced ribs that trend radially on the flanks and curve forward on the ventral margin. Its keel is fairly high and is not bordered by furrows. Its whorl section is considerably higher than wide.

This specimen resembles the adoral end of the outermost preserved whorl of the coarsely ribbed holotype of *Coroniceras (Paracoroniceras) charlesi* Donovan (1955, p. 12, 28; Reynes, 1879, pl. 16, figs. 1, 2; Guerin-Franiatte, 1966, p. 153, pl. 38).

*Figured specimen.*—USNM 247986. *Occurrence.*—Unnamed beds in the Seldovia area on Kenai Peninsula at USGS Mesozoic locs. 31128 and 31650.
Genus ARNIOCERAS Hyatt, 1867

Arnioceras cf. A. densicosta (Quenstedt)
Plate 5, figures 9–11, 16–24

This species is represented by 38 specimens, of which most are molds; but shelly material is preserved on some small specimens obtained from a well core in northern Alaska. It has highly evolute coiling. Its ribs are sharp, fairly closely spaced, trend radially on the flanks, bend forward on the margins of the venter, and then fade out on the venter. Its innermost whorls are smooth to a diameter of 15 to 20 mm. Its venter bears a keel that is bordered by distinct furrows on the internal mold and by weak furrows where shelly material is preserved. These features are essentially identical with those on the lectotype of Arnioeceras densicosta (Quenstedt) (1858, pl. 7, fig. 7; 1884, p. 100, pl. 13, fig. 7; Guerin-Franjiat, 1966, pl. 142, figs. 1a,b) and on other comparable illustrated specimens (Guerin-Franiat, 1966, p. 265, pl. 142, figs. 2, 3; Reynes, 1879, pl. 14, figs. 5, 6).

The suture line is similar to that on A. densicosta Quenstedt (1884, pl. 13, fig. 7). The first lateral lobe is broad, bifid, and a little deeper than the ventral lobe. The first lateral saddle is bifid.

**Figured specimens.**—USNM 247987–247989.

**Occurrences.**—Unnamed beds in the Puale Bay area on Alaska Peninsula at USGS Mesozoic locs. 21237, and ROC locs. 1282N, ROC 1282S, and ROC 1283A; unnamed beds in the Healy (A–6) quadrangle, Chulitna Valley area in the Alaska Range at USGS Mesozoic locs. 16229, 31260, 31262, 31263, 31265. Upper member of McCarthy Formation in the Wrangell Mountains at USGS Mesozoic locs. 28535, 28558, and 30140.

Arnioceras sp. juv.
Plate 5, figures 5, 6, 12–15

Arnioceras is represented in northern Alaska by many small immature specimens obtained from a well core in the Point Barrow area. These specimens are nearly identical in coiling, whorl shape, and ornamentation with the inner whorls of the specimens herein described as A. cf. A. densicosta (Quenstedt). They differ by their innermost whorls, being smooth only to diameters of 8 to 15 mm.

**Figured specimens.**—USNM 247990.

**Occurrence.**—Kingak Shale in northern Alaska in the South Barrow test well No. 12 at depth of 2056 ft (626.7 m)

Genus PARACALOCERAS Spath, 1923

Paracaloceras rursicostatum Frebold
Plate 6, figures 1–11

Paracaloceras rursicostatum Frebold, 1967b, Canada Geol. Survey Bull. 158, p. 26, pl. 7, figs. 1a–c, 2a–c; pl. 9, fig. 1.

Ten laterally crushed internal molds are characterized by highly evolute coiling and by strong, rather widely spaced ribs that curve adapically on most flanks, curve adorally and become stronger on the ventral margin, and then terminate abruptly. The keel on the mold is fairly low and is bounded laterally by two furrows that are bounded by ridges. The furrows and the lateral ridges are very weak on the small specimens but are strong on the larger specimens (pl. 6, figs. 1, 5, 11). On the least crushed specimen (pl. 6, figs. 7, 11), the whorl section is nearly as wide as it is high. During growth, the adapical arching of the ribs becomes more pronounced.

All the specimens from Alaska have sparser and somewhat coarser ribbing than those described as Paracaloceras cf. P. coregonense (Sowerby) by Frebold (1951, p. 7, pl. 5, figs. 1–6; pl. 6, fig. 1; 1967b, p. 24, pl. 7, figs. 3–7). Their ribbing is similar, however, to some specimens illustrated by Waehner (1888, pl. 21, figs. 1–2; pl. 23, fig. 4) as Arietites coregonensis Sowerby. They differ mainly by having ribs bending adapically more strongly on their largest whorls, a feature characteristic of P. rursicostatum Frebold.

**Hypotypes.**—USNM 247991–247997 and 248070.

**Occurrences.**—Unnamed beds in the Puale Bay area on Alaska Peninsula at USGS Mesozoic locs. 10820, 12396, 31372, and ROC loc. 1241; unnamed beds in the Seldovia area on Kenai Peninsula at Mesozoic loc. 2981; unnamed beds in the Healy (A–6) quadrangle in Alaska Range at Mesozoic loc. 31266.

Genus ARCTOASTEROCERAS Frebold, 1960

Arctoasteroceras jeletzkyi Frebold
Plate 5, figures 1–4

Arctoasteroceras jeletzkyi Frebold, 1960, Canada Geol. Survey Bull. 59, p. 14, pl. 2, figs. 1–8; pl. 3, figs. 1–3.

Arctoasteroceras jeletzkyi Frebold, 1964b, Canada Geol. Survey Bull. 63–4, p. 5, pl. 2, figs. 1, 2.

This species is represented in Alaska by two specimens, of which the larger closely resembles the holotype (Frebold, 1960, pl. 2, fig. 1a,b) and the smaller resembles a paratype (Frebold, 1960, pl. 3, fig. 3a,b). Resemblances include a moderately involute shell, an ovate whorl section, gently convex flanks, a low blunt keel, and moderately spaced ribs that incline forward on the lower two-thirds of the flanks and then bend forward and become faint on the upper third and on the venter. The only difference is the presence of faint sulci bordering the keel. The suture line is poorly preserved on the Alaska specimens.

**Hypotypes.**—USNM 247998, 247999.

**Occurrences.**—Unnamed beds in the Healy (A–6) quadrangle in Alaska Range at USGS Mesozoic loc. 31261.
Family ECHIOCERATIDAE Buckman, 1913
Genus PALTECHIOCERAS Buckman, 1924

Paltechioceras cf. P. harbledownense (Crickmay)
Plate 4, figures, 15–22


Ten specimens represent a species characterized by highly evolute coiling, an elliptical whorl section that is much higher than it is wide, a single keel that is not bordered by furrows, and moderately spaced, simple, slightly flexuous ribs. On the smallest specimens up to a diameter of about 27 mm, the ribs trend radially or curve adacipally on the flanks, become stronger ventrally, and terminate abruptly on the ventral margin (pl. 4, figs. 18–21). During further growth, as shown on the larger specimens, the ribs gradually become nearly radial, or incline slightly adorally on the flanks, and their ventral ends curve a little adorally.

These specimens closely resemble the paratypes of *Melanhippites harbledownensis* Crickmay (1928, pl. 4, figs. a-d) and likewise are associated with *Eltolium? semipliicipatam* (Hyatt) (equals *E. balteatm* Crickmay, 1928, pl. 4 figs. e–g). The ribbing on the Alaskan specimens is slightly sparser than on the holotype of *Paltechioceras aplanatum* Hyatt (Buckman, 1924, pl. 482) but nearly identical with that on the same species as figured by Getty (1973, p. 20, pl. 4, fig. 1a,b). The ribbing is likewise similar to that on *Vermiceras bavarium mexicanum* Erben (1956, p. 207, pl. 36, figs. 507), which is assigned to *Paltechioceras* by Hallam (1965, p. 1493).

*Figured specimen.*—USNM 248000–248002.

*Occurrence.*—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic locs. 28661 and 28663; upper member of McCarthy Formation in the Wrangell Mountains at USGS Mesozoic locs. 30139 and 31174.

Subgenus ORTHECHIOCERAS Trueman and Williams, 1925

*Paltechioceras (Orthechioceras?)* sp.
Plate 3, figures 11, 12

One small specimen, consisting of five incomplete whorls, is characterized by highly evolute coiling, by a subquadrate whorl section that is slightly wider than high; by a carinate bisulcate venter whose sulci are fairly shallow; and by simple forwardly curved ribs that are rather closely spaced on the innermost whorls but become more widely spaced on the outermost whorl.

The specimen shows considerable resemblance to *P. (O.) radiatum* Trueman and Williams (1925, p. 724, pl. 2, fig. 9a,b; Getty, 1975, p. 23, pl. 5 figs. 1a,b, 2a,b), but its ribbing is denser on its four smallest whorls. It also shows some resemblance to the inner whorls of *P. (P.) elicitum* Buckman (1924, pl. 483) but differs by having shallower sulci and by ribs which become more widely spaced adorally.

The specimen is assigned to the subgenus *Orthechioceras* rather than the subgenus *Paltechioceras* because of its fairly shallow sulci and because its ribs become widely spaced during growth. Its poor preservation, however, does not warrant a positive subgeneric determination.

*Figured specimen.*—USNM 248003.

*Occurrence.*—Unnamed beds in the Healy (A–6) quadrangle in Alaska Range at USGS Mesozoic loc. 31261.

Family EODEROCERATIDAE Spath, 1925
Subfamily XIPHEROCERATINAE Spath, 1925
Genus CRUCILOBICERAS Buckman, 1920

*Crucilobiceras* cf. *C. crucilobatum* Buckman
Plate 5, figures 7, 8

One laterally crushed, fairly large external mold represents a highly evolute, fairly large bituberculate ammonite that is similar in appearance to *Crucilobiceras* and *Microderoceras*. Its outer two whorls bear rather weak, fairly sparse radial ribs that become stronger ventrally. The tubercles in the outer row occur near the ventral margin, are fairly prominent, and are round to slightly elongate spirally. The tubercles in the inner row occur at about the top of the lower third of the flanks, are fairly weak, are elongate radially, and appear to be a little stronger on the outermost whorl than on the next smaller whorl. The smallest whorls are much corroded.

The same species is probably represented by one small crushed mold that differs from the large specimen mainly by having more pronounced ribs and tubercles.

These specimens are similar in appearance to *C. crucilobatum* Buckman (1920, pl. 178) except for having more closely spaced ribs. Their assignment to *Crucilobiceras* rather than *Microderoceras* is based on the weakness of the inner row of tubercles and the rather high ventral position of the outer row of tubercles.

In England *C. crucilobatum* Buckman occurs in the lower part of the *Echioceras raricostatum* zone (Buckman, 1920, v. 3, pl. 178).

*Figured specimens.*—USNM 248004, 248005.

*Occurrence.*—Upper member of McCarthy Formation in the Chitina Valley of Wrangell Mountains at USGS Mesozoic loc. 14472 and probably at Mesozoic loc. 14030.

*Crucilobiceras* cf. *C. densinodulum* Buckman
Plate 7, figures 4, 5

*cf. Crucilobiceras densinodulum* Buckman, 1923, Yorkshire type ammonites, v. 5, pl. 442.

*cf. C. densinodulum* Buckman, Dean, Donovan, and Howarth, 1961, p. 459, pl. 67, fig. 5.

One worn specimen is characterized by highly evolute coiling; by a quadrate whorl section that is a little wider than high; and by very widely spaced flank ribs that incline slightly adorally, are swollen radially on the lower
part of the flanks, weaken near the middle of the flanks, and terminate ventrally in prominent spirally elongate tubercles. These tubercles are well preserved at only one place.

This specimen differs from C. densinodulum Buckman by having weaker ribs near the middle of its flanks. C. densinodulum (Quenstedt) as figured by Wright (1880, pl. 39, figs. 6, 7; 1882, pl. 50, figs. 11, 12) has much stronger ribbing and a higher whorl section. The species C. densinodulum occurs in the lower part of the Echioceras raricosatum zone (Dean and others, 1961, p. 459).

Figured specimen.—USNM 248006

Occurrence.—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic loc. 28661.

Crucilobiceras cf. C. muticum (d'Orbigny)

Plate 7, figures 6–10, 12–15

This species is represented by 17 laterally compressed specimens, of which 15 are from USGS Mesozoic loc. 28661. It is characterized by highly evolute coiling; a subquadrate whorl section that is a little higher than wide; and ribs that are strong, straight, rather sparse, incline forward on the flanks, become stronger ventrally, and terminate in fairly prominent tubercles on the ventral margin. The venter is gently rounded, smooth on the inner whorls, but marked on some outer whorls by weak swellings that arch gently forward from the tubercles. Most of the specimens have rather widely spaced ribs, as in C. muticum (d'Orbigny) (1844, p. 274, pl. 80).

C. muticum (d'Orbigny) in Europe is recorded from the Uptonia jamesoni Zone at the base of the Pliensbachian (Arkell, 1956, pl. 128; Bremer, 1965, p. 156). Similar finely ribbed specimens from Hungary are recorded from the Tragophylloceras ibex Zone (Geczy, 1976, p. 58).

Figured specimens.—USNM 248008, 248009.

Occurrence.—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic locs. 6706 and 28661.

Crucilobiceras cf. C. pacificum Frebold

Plate 8, figures 10–12, 15–17

C. submucicum (Oppel) in Europe is recorded from the Uptonia jamesoni zone at the base of the Pliensbachian (Arkell, 1956, pl. 128; Bremer, 1965, p. 156). Similar finely ribbed specimens from Hungary are recorded from the Tragophylloceras ibex Zone (Geczy, 1976, p. 58).

Figured specimens.—USNM 248010.

Occurrence.—Near top of upper member of the McCarthy Formation in the Wrangell Mountains at USGS Mesozoic loc. 28534.

Subfamily COELOCRETIDAE Haug, 1910

Genus APODEROCERAS Buckman, 1921

Apoderoceras cf. A. subtriangulare (Young and Bird)

Plate 8, figures 14, 18–23

cf. Deroeceras subtriangulare (Young and Bird). Buckman, 1913, Yorkshire type ammonites, v. 2, pl. 71A, B.


This species is represented by two specimens. It is characterized by evolute coiling; a wide, depressed whorl section that is widest near the venter; a venter that is slightly arched on the smallest preserved whorls, nearly flat on the largest whorls, and smooth or faintly striate; and straight simple ribs that begin low on the umbilical wall, incline slightly adorally on the flanks, and terminate in prominent nodes on the margin of the venter. The ribs exposed in the umbilicus of the innermost preserved whorls are sharp and fairly close.
spaced, but at a diameter of about 25 mm they become much stronger and more widely spaced. The suture line is not preserved.

The largest specimen at a diameter of about 120 mm has a whorl height of about 30 mm, a whorl thickness of 46 mm, and an umbilical width of 68 mm.

The largest preserved whorl of this species resembles that of the holotype of *A. subtriangularue* (Young and Bird) (Buckman, 1913, pl. 71A,B) from England but differs by having a flatter venter and more closely spaced ribs. The smallest whorls resemble those of *Platypleuroceras?* sp. indet. of Frebold (1970, pl. 1, fig. 3) from the McConnell Creek area in western British Columbia, except possibly for an abrupt change in strength of ribbing.

**Figured specimens.**—USNM 248011, 248012.

**Occurrences.**—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic locs. 6697 and M6171.

Family OXYNOTICERATIDAE Hyatt, 1875

Genus FANNINOCERAS McLearn, 1950

*Fanninoceras kunae* McLearn

Plate 7, figure 11

Four immature specimens resemble *F. kunæ* McLearn (1930, p. 5, pl. 2, fig. 4; 1932, pl. 9, figs. 1–6; Frebold, 1964b, pl. 9, fig. 4) in having a fairly wide umbilicus, a narrowly rounded venter, and moderately strong ribs that project forward on the flanks and become very weak on the venter.

**Hypotype.**—USNM 248013.

**Occurrences.**—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic locs. 24107, 24108, and 27586.

*Fanninoceras* cf. *F. carlottense* McLearn

Twelve specimens resemble *Fanninoceras carlottense* McLearn (1932, p. 76, pl. 8, figs. 9, 10) in having a tiny umbilicus, a sharp venter, very weak, widely spaced ribs on small and intermediate-sized whorls, and nearly smooth outer whorls.

**Occurrences.**—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic locs. 24108 and 29449.

Family POLYMORPHITIDAE Haug, 1887

Genus UPTONIA

*Uptonia* cf. *U. dayiceroides* Mouterde

Plate 9, figures 1–4, 8, 12–16


Eighty laterally crushed molds from the Wrangell Mountains are identical in coiling and density of ribbing with a specimen from the Queen Charlotte Islands that Frebold (1970, p. 438, pl. 1, figs. 9a,b) compared with *Uptonia dayiceroides* Mouterde.

On the small and intermediate-sized specimens from Alaska, the flank ribs are gently flexuous, become stronger ventrally, bear tubercles on the ventral margin, and then curve adorally. On the largest available specimens the flank ribs differ by not bearing tubercles. None of the specimens shows the middle part of the venter. Several associated specimens (pl. 9, figs. 2, 14) that have slightly coarser and sparser ribbing are herein interpreted as a variant.

**Figured specimens.**—USNM 248014, 248015.

**Occurrences.**—Upper member of McCarthy Formation in the Wrangell Mountains at USGS Mesozoic locs. 28671–28673 and 28675.

*Uptonia* cf. *U. jamesoni* (J. de C. Sowerby)

Plate 9, figure 17

One laterally crushed ammonite from northern Alaska greatly resembles a specimen of *Uptonia jamesoni* (J. de C. Sowerby) from England (Wright, 1882, p. 352, pl. 51, figs. 1–3; Dean and others, 1961, pl. 68, figs. 3a,b) in its evolute coiling and in its ribbing. Its ribs are fairly strong, incline slightly forward on the flanks, incline strongly forward on the margins of the venter, become swollen ventrally, and become much stronger adorally. Sharp ventral tubercles are not evident. Most of the venter is not exposed.

**Figured specimen.**—USNM 248016.

**Occurrence.**—Unnamed shale in northern Alaska at USGS Mesozoic loc. 29774.

*Uptonia?* sp.

Plate 9, figures 9–11

Six small crushed ammonites from northern Alaska are nearly identical in coiling and ornamentation with the inner whorls of the fairly large ammonite described herein (pl. 9, fig. 17) as *Uptonia cf. U. jamesoni* (J. de C. Sowerby). The only difference consists of the presence of very small, sharp tubercles on some ribs at the ventral margin. Such close resemblances suggest that the small ammonites are probably immature forms of the same species as the large ammonite. Their assignment to *Uptonia* rather than *Crucilobiceras* is favored by the forward curvature of their ribs on the highest parts of the flanks.

**Figured specimens.**—USNM 248017.

**Occurrences.**—Unnamed shale in northern Alaska at USGS Mesozoic locs. 29775, 29231, and 29282.

*Uptonia?* sp. A

Plate 8, figure 13

One fragmentary internal mold of a fairly large whorl bears ribbing similar to that on large specimens of *Crucilobiceras* and *Uptonia*. Assignment to *Uptonia* instead of *Crucilobiceras* is favored by the forward cur-
vature of the ribs at the ventral margin and by the fact that the ribs are not distinctly tuberculate.

The specimen constitutes the only evidence for the presence of Lower Jurassic beds in the Yakutat district.

**Figured specimen.**—USNM 248018.

**Occurrence.**—Float from unnamed beds in the Yakutat D-4 quadrangle, southeastern Alaska, at USGS Mesozoic loc. 29773.

**Uptonia? sp. B**

Plate 9, figures 5–7

Two small specimens have a compressed, fairly evolute shell and fairly sharp, simple ribs that incline slightly adorally on the flanks, become stronger ventrally, form pronounced chevrons on the venter, and do not bear ventral tubercles.

These features suggest that the specimens are immature forms of *Uptonia*. Such an assignment is suggested by their association with a fairly large, typical specimen of *Apoderoceras*, which genus in Europe is characteristic of the lower part of the *Uptonia jamesoni* zone of earliest Pliensbachian Age (Dean and others, 1961, p. 463).

**Figured specimen.**—248019.

**Occurrence.**—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic loc. 6697.

**Genus TROPIDOCERAS Hyatt, 1867**

*Tropidoceras actaeon* (d'Orbigny)

Plate 8, figures 1–9

(For synonymy see Frebold, 1970, p. 440)

This species is represented in Alaska by four molds that are identical in appearance with the type specimens of *T. actaeon* (d'Orbigny) (1844, p. 232, pl. 61, figs. 1, 2) from France and with specimens of that species from the Queen Charlotte Islands illustrated by Frebold (1970, pl. 2, figs. 13a,b, 14a,b, 15a,b). The Alaskan specimens of the species have fairly evolute coiling. Their ribs are simple, moderately spaced, radial or slightly sigmoidal on the flanks, and they curve forward sharply on the ventral margins, where they fade out abruptly. On internal molds the venter ranges from narrowly rounded to fairly sharp and in places on some specimens bears a low blunt keel.

In Europe, this species is indicative of the lower to middle parts of the *Tragophylloceras ibex* zone of early Pliensbachian Age, according to Frebold (1970, p. 444, 445).

**Hypotypes.**—USNM 248020–248023.

**Occurrence.**—Near top of upper member of the McCarthy Formation in Wrangell Mountains at USGS Mesozoic loc. 28534.
Talkeetna Formation in the Talkeetna Mountains in southern Alaska at USGS Mesozoic loc. 25941.

Subgenus PSEUDOAMALTHEUS Frebold, 1922
A. (Pseudoamaltheus) engelhardti (d’Orbigny)

This taxon is represented in northern Alaska by a fragment from the South Barrow test well No. 3 at the depth of 2090 feet (637 m). It was assigned by Imlay (1955, p. 87, pl. 10, fig. 3) to Amaltheus sp. and by Howarth (1958, p. xxvi) to A. (Pseudoamaltheus) engelhardti (d’Orbigny). Howarth’s identification was based on the presence of spiral ribs on the upper part of the flanks and on the keel, and on the lack of radial ribbing. He noted that the species and subgenus in Europe ranges from the upper part of the Amaltheus margvatitis zone to the end of the Pliensbachian, or Pleuroceras spinatum zone, and is a descendant of Amaltheus margvatitis (Howarth, 1958, p. 21-23).

Hypotype.—USNM 108766.

Family DACTYLIOCERATIDAE Hyatt, 1867
Genus PRODACTYLIOCERAS Spath

Prodactylioceras italicum italicum (Fucini)
Plate 10, figure 3

Coeloceras loriolii Bettoni, 1900, Schweizer. palaeont. Gesell. Abh., v. 27, p. 76, pl. 7, fig. 12.
Coeloceras italicum Meneghini in Fucini, 1900, Palaeontographica Italica, v. 7, p. 72, pl. 13, fig. 4.
Coeloceras italicum Meneghini in Fucini, 1905, Palaeontographica Italica, v. 11, p. 115, pl. 6, figs. 11, 12, 14.
Prodactylioceras italicum italicum (Fucini) in Fischer, 1971, Geologica et Palaeontologica, v. 5, p. 111, pl. 2, fig. 12.
Prodactylioceras (Avgeyrenoceras) italicum (Meneghini in Fucini).

One laterally crushed specimen from Alaska is characterized by highly evolute coiling; by very fine, dense, simple, forwardly inclined ribs that become a little stronger ventrally, and by a few weak tubercles high on the flanks of the innermost whorls. Its appearance is identical with that of the finely ribbed subspecies, P. italicum italicum (Fucini) from Italy as described in Fischer (1971, p. 111). It has slightly finer ribbing than a specimen from eastern Oregon described as P. cf. P. italicum Meneghini (Imlay, 1968, p. C28, pl. 2, fig. 14). It differs from specimens in northern British Columbia and southern Yukon, described by Frebold (1964a, p. 10, pl. 3, figs. 2; 1970, p. 442, pl. 4, figs. 1, 2), by lacking forked ribs.

The association of the Alaskan specimen of Prodactylioceras with Uptonia shows that it occurs at or near the base of the Pliensbachian. Comparable finely ribbed specimens from southern Europe as listed herein are recorded from the zone of Tragophylloiceras ibex near the base of the Pliensbachian (Fischer, 1971, p. 118, 123).

Figured specimen.—USNM 248030.

Occurrence.—Upper member of the McCarthy Formation in upper 100 ft (30.5 m), Wrangell Mountains, at USGS Mesozoic loc. 28671.

Prodactylioceras cf. P. italicum fucini R. Fischer
Plate 10, figures 4, 5

Three crushed molds are characterized by highly evolute coiling; by high, narrow, moderately spaced nearly radial ribs that become slightly stronger ventrally and bifurcate rarely, low on the flanks; and by lacking tubercles, at least on their outer whorls. Their rib spacing resembles that on P. italicum fucini R. Fischer (1971, p. 111, pl. 2, figs. 8, 11) and is somewhat denser than in P. colubriforme (Bettoni) (1900, pl. 7, fig. 10; Finna, 1966, pl. 10, fig. 6; Fischer, 1971, pl. 2, fig. 10) from southern Europe. The resemblance of these Alaskan specimens to P. italicum fucini Fischer plus their association with Uptonia suggests an age as early as the zone of Uptonia janesoni (Fischer, 1971, p. 118, 123) or as the lower part of the Tragophylloiceras ibex zone.

Figured specimen.—USNM 248031, 248032.

Occurrences.—Upper member of McCarthy Formation on Wrangell Mountains at USGS Mesozoic locs. 28540, 28671, and 28673.

Genus DACTYLIOCERAS Hyatt, 1867
Dactylioceras cf. D. commune (J. Sowerby)
Plate 11, figures 2, 3, 8

Four laterally compressed specimens from the Talkeetna Mountains are characterized by evolute coiling and by sharp, fairly prominent, moderately spaced primary ribs which are inclined slightly forward. Most of the primary ribs pass at about two thirds of the height of the flanks into pairs of slightly weaker secondary ribs that arch gently forward on the venter. Some primary ribs remain simple, and some secondary ribs arise freely on the margins of the venter. Tiny tubercles occur at the furcation points.

These specimens show some resemblance to Dactylioceras crassiusculosum (Simpson) (Buckman, 1912, pl. 62; Fischer, 1966, p. 29, pl. 1, figs. 11; pl. 3, fig. 11; Finna, 1966, p. 94, pl. 5, fig. 3; Sapunov, 1963, p. 120, pl. 2, fig. 3a, b), but they differ by having more closely spaced, weaker ribs that incline forward on the flanks instead of trending nearly radically. Compared with the lectotype of D. commune (Sowerby) (Buckman, 1927, pl. 707; Arkell, 1956, pl. 33, figs. 4a, b), they have denser and weaker ribs on their outermost preserved whorl. They do not differ greatly in ribbing, however, from D. crassibundum (Simpson), which Howarth (1962a, p. 115, pl. 16, fig. 7a, b) considered to be a synonym of D. commune (Sowerby).
These specimens from the Talkeetna Mountains are nearly identical with most of the specimens from arctic Canada that were assigned to D. commune (Sowerby) by Frebold (1958, p. 2, pl. 1, figs. 1–7; 1960, p. 18, pl. 5, figs. 4, 6) but have somewhat sparser ribbing than one specimen so assigned (Frebold, 1960, pl. 5, fig. 5).

**Figured specimen.**—USNM 248047.

**Occurrence.**—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic locs. 24787 and 29198.

**Subgenus ORTHODACTYLITES Buckman, 1926**

**Dactylioceras (Orthodactylites) kanense McLearn**

Plate 11, figures 4, 5, 9

*Dactylioceras kanense* McLearn, 1930, Royal Soc. Canada Trans., 3d ser., v. 24, sec. 4, p. 4, pl. 1, fig. 2

*Dactylioceras kanense* McLearn, 1932, Royal Soc. Canada Trans., 3d ser., v. 26, sec. 4, p. 59-62, pl. 3, fig. 5, pl. 4, figs. 1–7, 9 pl. 5, figs. 6–9.


This species is represented by four molds that are nearly identical in appearance with the holotype. The species is characterized by an evolute, compressed shell, by a narrowly rounded venter, and by fine threadlike ribs that incline gently forward on the flanks and arch forward on the venter. On the inner whorls, furcation of the ribs is fairly common. On the largest whorl, most of the primary ribs are simple and many ribs arise freely on the upper parts of the flanks. The species shows considerable resemblance to *D. attenuatus* (Simpson) (Buckman, 1926, pl. 655) but has fewer forked ribs on its outer whorl.

**Hypotype.**—USNM 248048.

**Occurrence.**—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic loc. 29198. Possibly represented in northern Alaska in the South Barrow test well No. 3 at depth of 2,016 feet (614.5 m) (Imlay, 1955, p. 82, 88).

**Dactylioceras (Orthodactylites) cf. D. directum (Buckman)**

Plate 11, figure 6

cf. *Orthodactylites directum* Buckman, 1926, Type ammonites, pl. 654. cf. *Orthodactylites mitis* Buckman, 1927, Type ammonites, pl. 738.

One specimen, whose outermost preserved whorl is crushed laterally, resembles the holotype specimen of *D. (O.) directum* Buckman in coiling and ribbing. It also resembles *D. (O.) mitis* Buckman, which Howarth (1973, p. 254, 255) considered to be a synonym of *D. (O.) directum*. As in those species, its ribs are fairly strong, nearly straight, rectiradiate, cross the venter nearly transversely and mostly bifurcate high on the flanks. Some ribs, however, remain simple.

**Figured specimen.**—USNM 248049.

**Genus CATACOELOCERAS Buckman, 1929**

**Catacoeloceras? sp. juv.**

Plate 12, figure 6


The assignment of this species to *Catacoeloceras* by Howarth was probably based on the generic definition published by Arkell and others (1957, p. L254). Later studies by Howarth (1962b, p. 407–410) showed, however, that most of the taxa listed in the treatise as synonyms of *Catacoeloceras* actually had different characteristics than the type species of *Catacoeloceras*, occurred in older beds just above the upper range of *Amaltheus*, and could appropriately be referred to *Nodicoeloceras*. He noted that *Nodicoeloceras* had small tubercles and looped ribs only on its innermost whorls. In contrast *Catacoeloceras* developed small ventrolateral tubercles on its inner and on some intermediate whorls but did not develop looped ribs.

The stratigraphic position of the Alaskan species above *Amaltheus* and below *Dactylioceras* (Imlay, 1955, p. 82; 1968, p. C21) favors an assignment to *Nodicoeloceras* rather than to *Catacoeloceras*. Nonetheless the presence of fairly prominent tubercles and the lack of looped ribs are indicative of *Catacoeloceras* such as *C. confectum* Buckman (1923, pl. 413) and *C. crassum* (Young and Bird) (Buckman, 1918, pl. 119).

**Figured specimen.**—USNM 108758a–c.

**Occurrence.**—Kingak Shale in South Barrow test well No. 3 at depth of 2,063 ft (629 m).

**Family HILDOCERATIDAE Hyatt, 1867**

**Subfamily ARIETICERATINAE Howarth, 1955**

**Genus ARIETICERAS Seguenza, 1885**

**Arietoceras** cf. *A. domarense* (Meneghini)

Plate 10, figures 1, 2, 6–15, 22

This species is represented by 38 molds that match very well with specimens from eastern Oregon described previously under the same name (Imlay, 1968, p. C33, C34, pl. 4, figs. 9–12). Most of the molds also match certain specimens from northern British Columbia and southern Yukon that were assigned to *Arietoceras* cf. *A. algowianum* (Oppel) by Frebold (1964a, p. 13, pl. 3, figs. 3a, b; pl. 5, figs. 2, 3). The species differs from the species herein called *A. cf. A. algowianum* (Oppel) by having a higher, more compressed whorl section and finer, more closely spaced ribs.

**Figured specimens.**—USNM 248033–248037.
**Occurrence.**—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic locs. 24107, 27586 and 29450. Lubbe Creek Formation in the Wrangell Mountains at Mesozoic loc. 28551. Upper member of the McCarthy Formation in the Wrangell Mountains at USGS Mesozoic loc. 28688.

*Arieticeras* cf. *A. algovianum* (Oppel)

Plate 10, figures 16–20

This species is represented by three fragments that resemble certain specimens from eastern Oregon (Imlay, 1968, p. C34, pl. 4, figs. 1–8) and from northwestern British Columbia (Frebold, 1964a, pl. 3, figs. 4a, b, 5a, b; pl. 4, fig. 2) that were compared, or identified with *A. algovianum* (Oppel). These specimens are characterized by highly evolute coiling, by a low keel that is bordered by shallower furrows, and by high, narrow, widely spaced ribs that trend radially or slightly adapically on the flanks.

*Figured specimens.*—USNM 248038.

*Occurrence.*—Upper member of McCarthy Formation, in the Wrangell Mountains at USGS Mesozoic loc. 28688.

*Arieticeras* sp.

Plate 10, figure 21

On one small specimen the innermost whorls are smooth up to a diameter of about 6 mm. The next outer whorl, whose ventral part is not preserved, bears fairly low, moderately spaced ribs that curve slightly backward on the flanks. The outermost whorl bears fairly strongly on their upper parts, and then fade out on the ventral margin. The venter bears a low keel that is bordered by very shallow furrows.

This specimen differs from those in Oregon and British Columbia that have been compared or identified with *A. algovianum* (Oppel). These specimens are characterized by highly evolute coiling, by a low keel that is bordered by shallow furrows, and by high, narrow, widely spaced ribs that trend radially or slightly adapically on the flanks.

*Figured specimen.*—USNM 248039.

*Occurrence.*—Lubbe Creek Formation in the Wrangell Mountains at USGS Mesozoic loc. 28551.

**Genus LEPTALEOCERAS** Buckman, 1918

*Leptaleoceras* cf. *L. pseudoradians* (Reynes)

Plate 11, figures 12, 13

_Ammorites pseudoradians* Reynes, 1868, Essai de géologie et de paléontologie avyrennoises: Paris (Bailliére), p. 91, pl. 1, figs. 4a–c.


*Leptaleoceras pseudoradians* (Reynes). Frebold, 1964a, Canada Geol. Survey Bull. 116, p. 15, pl. 4, figs. 5–7, pl. 5, figs. 4, 5.

This species is represented by one fairly well preserved specimen that retains some shell material and is mostly septate. Its characteristics are identical with those of specimens from the southern Yukon and British Columbia as illustrated and described by Frebold.

*Hypotype.*—USNM 248040.

*Occurrence.*—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic loc. 29450.

**Genus FONTANELLICERAS** Facini, 1931

_Fontanelliceras* cf. *F. fontanellense* (Gemmellaro)

Plate 11, figures 17–23

(For synonymy see Imlay, 1968, U.S. Geol. Survey Prof. Paper 593-C, p. C36.)


The genus _Fontanelliceras_ is represented by five specimens. The largest specimen (pl. 11, figs. 17, 18, 23) has highly evolute coiling; a tricarinate bisulcate venter; and high, straight, rursiradiate ribs that become stronger ventrally and bend forward slightly before terminating on the ventral margin. The smaller specimens have been crushed laterally but resemble the larger in most respects. They differ by having ribs that are sharper, more widely spaced, and nearly radially arranged. The venter, which is well exposed on the largest specimen, bears a prominent keel bordered by furrows that in turn are bordered by weak ridges.

At a diameter of 59 mm, the largest specimen has a whorl height of 14 mm and an umbilical width of 35 mm. Its suture line is not exposed.

*Figured specimens.*—USNM 248041–248043.

*Occurrence.*—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic locs. 25941, 27586, and 29450.

**Subfamily HARPOCERATINAE** Neumayr, 1875

**Genus HARPOCERAS** Waagen, 1869

_Harpceras* cf. _H. exaratum* (Young and Bird)

Plate 11, figure 11


_Harpceras* cf. *H. exaratum* (Young and Bird). Frebold and Little, 1962, Canada Geol. Survey Bull. 81, p. 17, 18, pl. 2, figs. 1–9, pl. 3, fig. 5.

_Harpceras* cf. *H. exaratum* (Young and Bird). Frebold, 1964 a, Canada Geol. Survey Bull. 116, p. 16, pl. 6, figs. 2–4 (not 1 and 5).
Harpoeceras cf. H. exaratum (Young and Bird). Frebold, 1957, Canada Geol. Survey Mem. 287, p. 47, pl. 17, fig. 1; pl. 18, figs. 2, 3.

This species is represented by five fragmentary specimens from northern Alaska and one from the Talkeetna Mountains in southern Alaska. Their features match very well with those on specimens from western and Arctic Canada as described and illustrated by Frebold in the papers listed above.

**Figured specimen.**—USNM 248044.

**Occurrences.**—Kingak Shale in northern Alaska at USGS Mesozoic localities 22081, 29159, 29160, 29161, and 29776. Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic loc. 29198.

Genus PROTOGRAMMOCERAS Spath, 1913

Protagrommoceras cf. P. paltum (Buckman)

Plate 12, figures 11, 12
cf. Paltarpites paltus Buckman, 1922, Type ammonites, v. 4, pl. 362a and 1923, pl. 362b.

Harpoeceras cf. H. exaratum (Young and Bird). Frebold, 1964a, Canada Geol. Survey Bull. 116, pl. 6, figs. 1, 5 (not 2-4).

Three fragmentary specimens from Alaska bear ribbing similar to that on Protagrommoceras paltum (Buckman). They differ from P. argutum (Buckman) by having fewer ribs that are broader and flat topped. Nonetheless, as discussed by Frebold (1970, p. 443), the ribs during growth on some specimens of P. paltum vary considerably in strength from fine to coarse to fine, or even to striae. Consequentially fragments of whorls bearing only striae, or only very fine ribs, cannot reliably be assigned to either species.

The assignment of both species to Protagrommoceras Spath rather than to Paltarpites Buckman, is based on examination of the type specimens by Howarth (1973, p. 265).

**Figured specimen.**—USNM 248045.

**Occurrences.**—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic locs. 24108, 25941, and 29449.

Protagrommoceras cf. P. argutum (Buckman)

Plate 11, figure 14
cf. Argutarpites argutus Buckman, 1923, Type ammonites, v. 4, pl. 563.


This species is represented by two fragments, that are characterized by very fine falcoid ribs and striae and by a rounded umbilical edge. It could be interpreted as a finely ribbed variant of P. paltum (Buckman), which species is associated with P. argutum (Buckman) in western Canada (Frebold, 1970, p. 444).

**Figured specimen.**—USNM 248046.

**Occurrences.**—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic locs. 24108 and 25941.

Genus ELEGANTICERAS Buckman, 1913

Eleganteceras sp. juv.

Plate 11, figures 10, 15, 16

This species is represented by 12 small internal and external molds. They have a moderately compressed planulate form; a low vertical umbilical wall that rounds fairly abruptly into somewhat flattened flanks; a rather sharp keel on the venter; and an incomplete body chamber that occupies at least half a whorl. The innermost whorls are smooth. Weak, widely spaced ribs appear at a diameter of 7 to 9 mm and gradually become stronger during growth. The largest preserved septate whorl and the adapical end of the nonseptate whorl bear low falcoid ribs that are faint on the lower third of the flanks, become stronger ventrally, and extend almost to the keel. Such ribs are replaced rather abruptly on the adoral half of the largest preserved whorls by much weaker falcoid ribs and then by striae that are apparent only where some of the shell is preserved. The outermost whorl embraces about half of the preceding whorl.

In shape, coiling, and ribbing, this species greatly resembles the holotype of Eleganticularces elegantulum (Young and Bird) (Buckman, 1914, pl. 93). It differs by being only half as large and by its umbilical wall being vertical instead of concave.

**Figured specimen.**—USNM 248050.

**Occurrence.**—Kingak Shale in northern Alaska at USGS Mesozoic loc. 29776.

Genus PSEUDOLIOCERAS Buckman, 1913

Pseudolioceras cf. P. compactile (Simpson)

(See Imlay, 1955, U.S. Geol. Survey Prof. Paper 274-D, p. 89, pl. 12, figs. 17, 18, 21.)

**Occurrence.**—Kingak Shale at USGS Mesozoic loc. 23772.

Pseudolioceras cf. P. lythense (Young and Bird)

(See Imlay, 1955, U.S. Geol. Survey Prof. Paper 274-D, p. D89, pl. 12, fig. 20.)

**Occurrence.**—Kingak Shale at USGS Mesozoic loc. 23772.

Pseudolioceras sp.

Plate 11, figure 1; Plate 12, figure 13

Two laterally compressed specimens from southern Alaska resemble P. muelintoeki (Haughton) from arctic Canada and arctic Alaska (Frebold, 1964b, pl. 10, figs. 4-8, 12; Imlay, 1976, pl. 1, figs. 1-5, 7.) They appear to have a smaller umbilicus and sparser, weaker ribbing, but their preservation is not sufficient for a positive specific determination.
Figured specimens.—USNM 248051, 248052.

Occurrences.—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic loc. 25317; Kialagvik Formation at Puaale Bay on the Alaska Peninsula at USGS Mesozoic loc. 19804.

Subfamily GRAMMOCERATINAE Buckman, 1904
Genus GRAMMOCERAS Hyatt, 1867

Grammoceras sp.
Plate 11, figure 7

One laterally crushed ammonite is characterized by evolute coiling by simple, strong, gently sigmoid ribs, and by a low keel as in Grammoceras. It has slightly coarser ribbing than does the ammonite from the southern Yukon described by Frebold (1964a, p. 17, pl. 7, figs. 1, 2) as G. aff. G. fallaciosum (Bayle).

Figured specimen.—USNM 248053.

Occurrence.—Talkeetna Formation, upper part, in the Talkeetna Mountains at USGS Mesozoic loc. 25939.

Family HAMMATOCERATIDAE Buckman, 1887
Genus PHYMATOCERAS Hyatt, 1867

Phymatoceras? sp.
Plate 12, figures 14, 16–19

The genus is possibly represented by three specimens. The smallest specimen (pl. 12, fig. 18) bears twinned ribs and a carinate venter similar to that on Phymatoceras binodata (Buckman) (1898, Supplement, p. XVI, pl. 1, figs. 11, 12). In each twin the adapical rib is the stronger and is marked near the umbilical edge by a swelling. All ribs curve forward on the venter but are separated from the keel by a smooth area.

The next larger specimen is septate and bears alternating long and short ribs. The long ribs begin on the umbilical wall and are slightly swollen on the umbilical margin. The short ribs begin at or a little above the middle of the flanks. All ribs incline forward on the flanks and venter, become stronger ventrally, become swollen on the venter, and then terminate abruptly before reaching the keel.

The largest specimen is a nonseptate fragment that shows the venter and part of the flank of an adult whorl. It bears broad coarse ribs that are wider than the interspaces, that curve forward slightly on the flanks and more strongly on the venter, and that then terminate abruptly before reaching a rather low keel. The ventral aspect of this specimen is similar to that of P. tumefacta (Buckman) (1898, Supplement, p. XIX, pl. 1, figs. 7–10).

Figured specimens.—USNM 248054–248056.

Occurrences.—Talkeetna Formation, upper part, in the Talkeetna Mountains at USGS Mesozoic locs. 25317 and 25342.

Genus BRODIEIA Buckman, 1898

Brodia cf. B. tenuicostata var. nodosa (Jaworski)
Plate 12, figure 8

cf. Hildoceras (Brodiceras) tenuicostatum var. nodosa Jaworski, 1926, Actas Acad. Nac. Cienc. Cordoba, v. 9, p. 245, pl. 4, fig. 8a,b.

One laterally crushed ammonite consists mostly of an incomplete body chamber that occupies at least three-fourths of a whorl and embraces about two-thirds of the preceding whorl. The venter bears a single low keel. The ribs on the outer whorl are moderately strong, widely spaced, gently falcate, and terminate ventrally near the keel. The primary ribs begin low on the umbilical wall, are fairly strong near the umbilicus, weaken a little near the middle of the flanks, and are strongest on the margin of the venter. Some rib furcation occurs at various heights ranging from the umbilical margin to a little above the middle of the flanks. Other ribs arise freely near or above the middle of the flanks. All ribs are essentially of the same strength on the venter. The ribbing on the penultimate whorl as revealed in the umbilicus is also fairly strong.

This ammonite from Alaska bear ribbing almost identical with that on Brodia tenuicostata var. nodosa (Jaworski) (1926, pl. 4, fig. 8a) from Argentina, but it differs by being a little more involute. In that respect it resembles the typical forms of B. tenuicostata (Jaworski) (1926, pl. 4, figs. 1–4, 6, 7) but differs by having slightly coarser and sparser ribbing. Overall the resemblances are remarkable.

Figured specimen.—USNM 248057.

Occurrence.—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic loc. 25940.

Genus HAUGIA Buckman, 1888

Haugia cf. H. grandis Buckman
Plate 12, figures 4, 10, 15

cf. Haugia grandis Buckman, 1888, Supplement, p. XXVI, pl. 5, fig. 11; 1888, pl. 23, figs. 14, 15; 1889, pl. 24, fig. 1

Ten specimens belong to a fairly involute species that has sharp, moderately spaced, flexuous ribs. The largest specimen is similar in size, involution, and ornamentation to a small specimen of H. grandis Buckman (1888, pl. 23, figs. 14, 15), but its tubercles are smaller and its ribs arch forward more strongly on its ventral margin.

H. dumortieri Buckman (1888, pl. 23, figs. 16, 17) has fewer tubercles and ribs at a comparable size.

Figured specimen.—USNM 248058.

Occurrences.—Talkeetna Formation in Talkeetna Mountains at USGS Mesozoic locs. 24111 and 24114; Kialagvik Formation at Puaale Bay on the Alaska Peninsula at Mesozoic loc. 19804.
Haugia cf. H. variabilis (d'Orbigny)
Plate 12, figures 1, 2, 5

cf. Ammonites variabilis d'Orbigny, 1845, Paléontologie française, Terrains Jurassiques, v. 1, Cephalopods, p. 360, p. 118, figs. 1 and 2 only.

Harpoceras variabilis (d'Orbigny), Wright, 1882, London, Palaeontographical Soc., p. 455, pl. 67, figs. 5, 6 only.


This species is represented by nine crushed molds. It has fairly evolute coiling. The ornamentation on its inner whorls consists of umbilical tubercles, of sharp, nearly radially trending ribs that arise mostly by two's and three's from the umbilical tubercles, and of a few ribs that arise freely between the tubercles. During subsequent growth, both umbilical ribs and ribs gradually become stronger and more widely spaced. The ribs become gentley flexuous on the flanks, arch forward slightly on the venter, and arise mainly in pairs from prominent conical tubercles. The characteristics of the adult body chamber are unknown.

The Alaskan species may be within the range of variation of H. variabilis (d'Orbigny), but it appears to be more evolute and to develop sparser ribbing. In these respects it shows more resemblance to H. aff. H. japonica (Neumayr) as illustrated by Matsumoto and Ono (1947, pl. 2, figs. 5). It has much coarser ornamentation than the holotype of H. japonica (Neumayr) (Kobayashi, 1935, pl. 12, figs. 3, 4).

Figured specimens.—USNM 248059.

Occurrences.—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic locs. 25318 and 27508.

Haugia cf. H. compressa Buckman
Plate 12, figures 3, 7, 9


Nine molds represent a fairly involute and densely ribbed species. The largest specimen at a diameter of 66 mm bears about 21 umbilical tubercles and about 65 gently flexuous ribs that arise in two's and three's from the umbilical tubercles. Many ribs arise freely along the zone of tuberculation.

This species closely resembles H. compressa Buckman in involution and in density of ribbing but at a comparable size has slightly finer ribbing and smaller tubercles than the holotype.

Figured specimens.—USNM 248060, 248061.

Occurrences.—Talkeetna Formation in the Talkeetna Mountains at USGS Mesozoic loc. 24114; basal part of Kialagvik Formation at Puale Bay on Alaska Peninsula at Mesozoic loc. 19804.
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PLATES 1–12

Contact photographs of the plates in this report are available, at cost, from U.S. Geological Survey Library, Federal Center, Denver, Colorado 80225
FIGURES 1, 2. *Psiloceras* cf. *P. planorbis* (J. de C. Sowerby) (p. 28).
   1. Specimen, USNM 247950, from USGS Mesozoic loc. 29891.
   2. Specimen, USNM 247951, from USGS Mesozoic loc. M1738.

   3. Specimen, USNM 247960, from Richfield Oil Co. loc. 3002.
   4. Specimen, USNM 247958, from USGS Mesozoic loc. 3110.
   5. Specimen, USNM 247961, from Richfield Oil Co. loc. 3002.
   9, 10. Crushed fragment and rubber imprint of external mold of one specimen, USNM 247959, from USGS Mesozoic loc. 25694.

5–7. *Discamphiceras* sp. (p. 29).
   Rubber imprints of three external molds, USNM 247962, from USGS Mesozoic loc. 29890.

   11, 15, 16. Ventral and lateral views of specimen, USNM 247956, from South Barrow test well No. 12 at depth of 2,170.5 ft (661.4 m).
   17. Specimen, USNM 247957 from USGS Mesozoic loc. 29742.

   12. Rubber imprint of external mold (× 2) of a specimen, USNM 247952, from USGS Mesozoic loc. 29738.
   13, 14. Rubber imprint of external mold (× 2), specimen, USNM 247954, from USGS Mesozoic loc. 29738.
   18–20. Rubber imprint of external mold and views of internal mold of a specimen, USNM 247955, from USGS Mesozoic loc. 21242.
   21–24. Rubber imprints (× 2) and suture line (× 4) of one specimen, USNM 247963, from USGS Mesozoic loc. 29738.
PSILOCERAS, P. (FRANZICERAS), AND DISCAMPHICERAS
PLATE 2

[Figures natural size unless otherwise indicated]

1–3. Three specimens, USNM 247964, from Richfield Oil Co. loc. 3002. Figure 1 is a rubber imprint of an external mold.
4, 5. Specimen, USNM 247965, from USGS Mesozoic loc. 19803. Figure 5 below fracture is an external mold.
6. Specimen, USNM 247966, from USGS Mesozoic loc. 25894.

7. Specimen, USNM 247971, from USGS Mesozoic loc. 25694.
10. Specimen, USNM 247969, from USGS Mesozoic loc. 12075.
11. Specimen, USNM 247970, from USGS Mesozoic loc. 12584.
12. Specimen, USNM 247967, from Richfield Oil Co. loc. 3002.
13. Specimen, USNM 247968, from USGS Mesozoic loc. 3110.
14, 15. Two specimens, USNM 247972, from Richfield Oil Co., Wide Bay test No. 1 at depth of 2,235–2,236 ft (681 m).

8. Ventral and lateral views (x 2) of specimen, USNM 247973, from the South Barrow test well No. 12 at depth of 2,181.5 ft (665 m).

16, 17. *Schlotheimia* sp. (p. 31).
18, 19. Hypotype, USNM 247977, from Richfield Oil Co. loc. 1240.
20, 21. Hypotype, USNM 247976, from USGS Mesozoic loc. 31266.
24, 28. Lateral views of hypotype, USNM 247975, from USGS Mesozoic loc. 31372. Figure 24 is a rubber imprint of the external mold.
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22, 23. *Badouzia columbiensis* (Frebold) (p. 31).
22, 23. Hypotype, USNM 247978, from USGS Mesozoic loc. 31264.
Lateral views of three specimens, USNM 247979, from the South Barrow test well No. 12 at depth of 2,061.5 ft (628 m).

4-10. *Charmasseiceras* sp. (p. 31).
4-6, 9, 10. Suture line (x 4) and lateral and ventral views of same specimen (x 2 and x 6), USNM 247981, from the South Barrow test well No. 3 at depth of 2,412 ft (735 m).
7, 8. Lateral and ventral views of specimen, USNM 247980, from the South Barrow test well No. 12 at depth of 2,056 ft (627 m).

11, 12. *Paltechioceras* (Orthechioceras?) sp. (p. 34).
Rubber imprint of external mold (fig. 11) and ventral view of specimen, USNM 248003, from USGS Mesozoic loc. 31261.

Rubber imprint of external mold, USNM 247963, from Richfield Oil Co. loc. 3002.
CHARMASSEICERAS, PALTECHIOCERAS, AND LAQUEOCERAS
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Three specimens, USNM 247982, from USGS Mesozoic loc. 30908. Ventral and lateral views of one specimen are shown in figures 1 and 3. Same views of another specimen are shown in figures 2 and 4.

6-10. *Coroniceras* sp. B (p. 32).

6. Rubber imprint of external mold of specimen, USNM 247983, from the South Barrow test well No. 12 at depth of 1,987.5 ft (605.8 m).

7-10. Two specimens, USNM 247984, from the South Barrow test well No. 12 at depth of 1,987.6 feet (605.8 m). Ventral and lateral views of one specimen are shown in figures 7 and 10. Same views of another specimen are shown in figures 8 and 9.


Figure 13 probably represents an inner whorl of specimen shown in figures 11 and 12, USNM 108778, from the Avak test well No. 1 at depth of 1,836 ft (560 m).


Rubber imprint of external mold, USNM 247985, from the South Barrow test well No. 3 at depth of 2,470 ft (753 m).


15, 16. Rubber imprint and external mold of specimen, USNM 248000, from USGS Mesozoic loc. 31174.

17, 22. Specimens, USNM 248001, from USGS Mesozoic loc. 30139.

18-21. Ventral and lateral views of two specimens, USNM 248002, from USGS Mesozoic loc. 28661.


Two specimens, USNM 247986, from USGS Mesozoic loc. 31128. Figure 22 represents a rubber imprint of the inner whorls. Figures 23 and 24 show lateral and ventral views of an outer whorl.
CORONICERAS, C. (PARACORONICERAS), ARIETITES, AND PALTECHIOCERAS
Figures 1-4. Arctosteroberas jeletziyi Frebold (p. 33).
1, 2. Hypotype, USNM 247999, from USGS Mesozoic loc. 31261.
3, 4. Hypotype, USNM 247998, from USGS Mesozoic loc. 31261.
5, 6, 12-15. Arnioceras sp. juv. (p. 33).
5, 6. Ventral and lateral views.
12, 13. Ventral and lateral views.
14, 15. Rubber imprints of two external molds showing smooth inner whorls. Specimens, USNM 247990, from the South Barrow test well No. 12 at depth of 2,056 ft (626.7 m).
7, 8. Crucilobiceras cf. C. crucilobatum Buckman (p. 34).
7. Laterally crushed small specimen (x 2), USNM 248005, from USGS Mesozoic loc. 14030.
8. Rubber imprint of external mold of large specimen, USNM 248004, from USGS Mesozoic loc. 14472.
9, 16, 17. Rubber imprint of inner whorls (fig. 9) and suture line (x 2) of one specimen, USNM 247987, from USGS Mesozoic loc. 16229.
10, 11, 18, 19, 22-24. Five specimens, USNM 247988, from USGS Mesozoic loc. 16229. Ventral and lateral views of one specimen are shown in figures 10 and 11. Same views of another specimen are shown in figures 18 and 19. Figures 22-24 represent rubber imprints of external molds.
20, 21. Lateral and ventral view of specimen, USNM 247989, from USGS Mesozoic loc. 21237.
ARCTOASTEROCERAS, ARNIOCERAS, AND CRUCILOBICERAS

1, 2. Hypotype, USNM 247991, from USGS Mesozoic loc. 12396.
3, 5. Hypotype, USNM 248070, from USGS Mesozoic loc. 31372.
4. Hypotype, USNM 247996, from USGS Mesozoic loc. 10820.
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7, 11. Hypotype, USNM 247995, from Richfield Oil Co. loc. 1241.
8. Hypotype, USNM 247995, from USGS Mesozoic loc. 31266.
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4, 5. Crucilobiceras cf. C. densinodulum Buckman (p. 34).
   Specimen, USNM 248006, from USGS Mesozoic loc. 28661.
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11. Fanninoeceras kunae McLearn (p. 36).
    Hypotype, USNM 248013, from USGS Mesozoic loc. 27586.
CRUCILOBICERAS AND FANNINOCERAS
PLATE 8

[Figures natural size unless otherwise indicated]

1–3. Hypotype, USNM 248021, from USGS Mesozoic loc. 28534.
4–6. Hypotype, USNM 248020, from USGS Mesozoic loc. 28534. Figure 4 is a rubber imprint of the external mold.
7. Hypotype, USNM 248022, from USGS Mesozoic loc. 28534.
8, 9. Hypotype, USNM 248023, from USGS Mesozoic loc. 28534.

One specimen, USNM 248010, from USGS Mesozoic loc. 28534. Figures 15–17 (× 2). Figure 12 is a rubber imprint of an external mold of the same specimen.

Specimen, USNM 248018, from USGS Mesozoic loc. 29773.

14, 18–23. Apodovericeras cf. A. subtriangularare (Young and Bird) (p. 35).
14, 18–21. Specimen, USNM 248011, from USGS Mesozoic loc. 6697. Figures 18 and 19 represent the adapical part of the middle whorl shown on figure 21. Figure 14 does not include the cross section of the outermost whorl. Figure 20 is a rubber imprint of the external mold of the same specimen.
22, 23. Lateral and ventral views of a small specimen, USNM 248012, from USGS Mesozoic loc. M6171.
TROPIDOCERAS, CRUCILOBICERAS, UPTONIA?, AND APODEROCERAS
PLATE 9
[Figures natural size unless otherwise indicated]

1–3. Specimens, USNM 248014, from USGS Mesozoic loc. 28675.
4, 8, 12–16. Specimens, USNM 248015, from USGS Mesozoic loc. 28671.

Specimen, USNM 248019, from USGS Mesozoic loc. 6697. Figures 5 and 7 are (x 2).

Specimen, USNM 248017, from USGS Mesozoic loc. 29775.

Laterally crushed specimen, USNM 248016, from USGS Mesozoic loc. 29774.
1. 2. 8-10, 15. Specimens, USNM 248033, from USGS Mesozoic loc. 28688. Ventral and lateral views of one specimen are shown in figures 1 and 2. Same views of another specimen are shown in figures 9 and 10.
6. Specimen, USNM 248034, from USGS Mesozoic loc. 29590.
7. Specimen, USNM 248036, from USGS Mesozoic loc. 27586.
11-14. Two specimens, USNM 248035, from USGS Mesozoic loc. 24107. Ventral and lateral views of one specimen are shown in figures 11 and 12. Same views of another specimen are shown in figures 13 and 14.
22. Specimen, USNM 248037, from USGS Mesozoic loc. 28531.

Hypotype, USNM 248030, from USGS Mesozoic loc. 28671.

4. Specimen, USNM 248032, from USGS Mesozoic loc. 28673.
5. Specimen, USNM 248031, from USGS Mesozoic loc. 28671.

Specimens, USNM 248038, from USGS Mesozoic loc. 28688. Ventral and lateral views are shown in figures 16 and 17, and also in figures 19 and 20.

21. *Arieticeras* sp. (p. 40).
Specimen, USNM 248039, from USGS Mesozoic loc. 28531.

23. Specimen, USNM 248029, from USGS Mesozoic loc. 30074.
24. Specimen, USNM 248028, from USGS Mesozoic loc. 29441.

25. Hypotype, USNM 248025, from Simpson test well No. 1 at depth of 5,677 ft (1,730m).

27. Hypotype, USNM 248026, from USGS Mesozoic loc. 29340.
28. Hypotype, USNM 248027, from USGS Mesozoic loc. 29165.
ARIETICERAS, PRODACTYLOICERAS, ARIETICERAS, AND AMALTHEUS
PLATE 11
[Figures natural size unless otherwise indicated]

FIGURE 1. *Pseudolioceras* sp. (p. 41).
   Specimen, USNM 248052, from USGS Mesozoic loc. 19804.
   Specimens, USNM 248047, from USGS Mesozoic loc. 24787.
   Hypotype, USNM 248048, from USGS Mesozoic loc. 29198. Figure 5 is a rubber imprint of an external mold.
   Specimen, USNM 248049, from USGS Mesozoic loc. 29163.
7. *Grammoceras* sp. (p. 42).
   Specimen, USNM 248053, from USGS Mesozoic loc. 25939.
10, 15, 16. *Eleganticeras* sp. juv. (p. 41).
   Specimens (x 2), USNM 248050, from USGS Mesozoic loc. 29776. Figure 16 is a ventral view of figure 15.
   Specimen, USNM 248044, from USGS Mesozoic loc. 29161.
   Specimen, USNM 248040, from USGS Mesozoic loc. 29450.
   Specimen, USNM 248046, from USGS Mesozoic loc. 25941.
   7, 18, 23. Specimen, USNM 248043, from USGS Mesozoic loc. 29450.
   19, 20. Specimen, USNM 248041, from USGS Mesozoic loc. 25941.
   21, 22. Specimen, USNM 248042, from USGS Mesozoic loc. 27586.
PSEUDOLIOCERAS, DACTYLIOCERAS, D. (ORTHODACTYLITES), GRAMMOCERAS, ELEGANTICERAS, HARPOCERAS, LEPTALEOCERAS, PROTOGRAMMOCERAS, AND FONTANELLICERAS
FIGURES 1, 2, 5. *Haugia* cf. *H. variabilis* (d'Orbigny) (p. 43).
Specimens, USNM 248059, from USGS Mesozoic loc. 25318.

Specimens, USNM 248060, from USGS Mesozoic loc. 24114.
7. Specimen, USNM 248061, from USGS Mesozoic loc. 19804.

5. *Catacroloceras*? sp. juv. (p. 39).
Specimen, USNM 108758, from South Barrow No. 3 test well at depth of 2,063 ft (629 m).

Lateral views of three specimens, USNM 248058, from USGS Mesozoic loc. 24114. Adoral part of figure 4 is an internal mold.

Specimen, USNM 248057, from USGS Mesozoic loc. 25940.

Specimen, USNM 248045, from USGS Mesozoic loc. 25941. Figure 12 is a rubber imprint of an external mold.

Specimen, USNM 248051, from USGS Mesozoic loc. 25317.

14, 16. Specimen, USNM 248055, from USGS Mesozoic loc. 25317.
17, 19. Specimen, USNM 248054, from USGS Mesozoic loc. 25317.
18. Specimen, USNM 248056, from USGS Mesozoic loc. 25342.
HAUGIA, CATACOELOCERAS, BRODIEIA, PROTOGRAMMOCERAS, PSEUDOLIOCERAS, AND PHYMATOCERAS?