Paleozoic Corals of Alaska

Geologic and Paleogeographic Setting of
Paleozoic Corals in Alaska
By MICHAEL CHURKIN, JR.

Ordovician, Silurian, and Devonian Corals of Alaska
By WILLIAM A. OLIVER, JR., CHARLES W. MERRIAM, *and*
MICHAEL CHURKIN, JR.

Carboniferous Corals of Alaska—A Preliminary Report
By AUGUSTUS K. ARMSTRONG

Stratigraphic Distribution of Permian Corals in Alaska
By CHARLES L. ROWETT

GEOLOGICAL SURVEY PROFESSIONAL PAPER 823-A, B, C, D

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1975

UNITED STATES DEPARTMENT OF THE INTERIOR

STANLEY K. HATHAWAY, *Secretary*

GEOLOGICAL SURVEY

V. E. McKelvey, *Director*

Library of Congress Cataloging in Publication Data

Main entry under title:

Paleozoic corals of Alaska.

(Geological Survey professional paper ; 823)

CONTENTS: Churkin, M. Jr. Geologic and paleogeographic setting of Paleozoic corals in Alaska.—Oliver, W. A. Jr., Merriam, C. W. and Churkin, M., Jr. Ordovician, Silurian, and Devonian corals of Alaska. [etc.]

Includes bibliographies and indexes.

Supt. of Docs. no.: I 19.16:823-A,B,C,D

1. Corals, Fossil. 2. Paleontology—Paleozoic. 3. Paleiontology—Alaska. I. Churkin, Michael, 1932– II. Series: United States. Geological Survey. Professional paper ; 823.

QE778.P34 563'.6'09798 75–619102

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402
Stock Number 024-001-02666-0

CONTENTS

[The letters in parentheses preceding the titles are those used to designate the chapters]

Geologic and Paleogeographic Setting of Paleozoic Corals in Alaska

By MICHAEL CHURKIN, JR.

PALEOZOIC CORALS OF ALASKA

GEOLOGICAL SURVEY PROFESSIONAL PAPER 823-A

Corals in geosynclinal and shelf strata of Alaska help correlate adjacent parts of Canada and Northeast U.S.S.R. and test paleogeographic reconstructions of the Arctic

CONTENTS

ILLUSTRATIONS

GEOLOGIC AND PALEOGEOGRAPHIC SETTING OF PALEOZOIC CORALS IN ALASKA

By MICHAEL CHURKIN, JR.

ABSTRACT

Ordovician through Permian coral faunas in Alaska occur in structurally complex limestone deposits in most of the geological provinces of the State. Coral-rich strata are found in volcanic rock-graywacke geosynclinal facies or in carbonate-clastic rocks of the shelf facies. In the early Paleozoic the southern and northern margins of Alaska were oceanic areas with geosynclines in which coral- and stromatoporoid-rich limestone closely associated with volcanic rocks developed in reef and reef-related shallow-water deposits around volcanic islands. Separating the two oceanic areas was a narrow continental shelf area that received mainly carbonate sediments. Reef or reef-breccia deposits are distributed around the margins of this shelf.

In the Late Devonian the geosynclinal sediments in northern Alaska were deformed into a foldbelt and uplifted. During the Carboniferous and Permian, successor-basin deposits developed on a broad shelf that covered the roots of the middle Paleozoic foldbelt. Corals in these shelf deposits of arctic Alaska form biostromal carbonate rocks or occur as abraded fossils in clastic nearshore sedimentary rocks. In southern parts of Alaska during the late Paleozoic, reef and reef-related deposits developed around volcanic centers as in the early Paleozoic.

Preliminary correlations of coral-bearing strata between Alaska and neighboring parts of Canada and Northeast U.S.S.R. together with resulting paleogeographic reconstructions of the Arctic are offered as working hypotheses to be tested by future paleontological studies.

HISTORY OF ALASKAN CORAL STUDIES

Corals of Paleozoic age have been collected in Alaska since the earliest days of geological exploration, but until recently, corals in shelly faunas were identified only in the broadest terms and then only to round out the lists of invertebrates. The pioneers in Alaskan paleontology who provided most of the fossil identification for the first geological publications are G. H. Girty, E. M. Kindle, Edwin Kirk, and Charles Schuchert (Dutro, 1956).

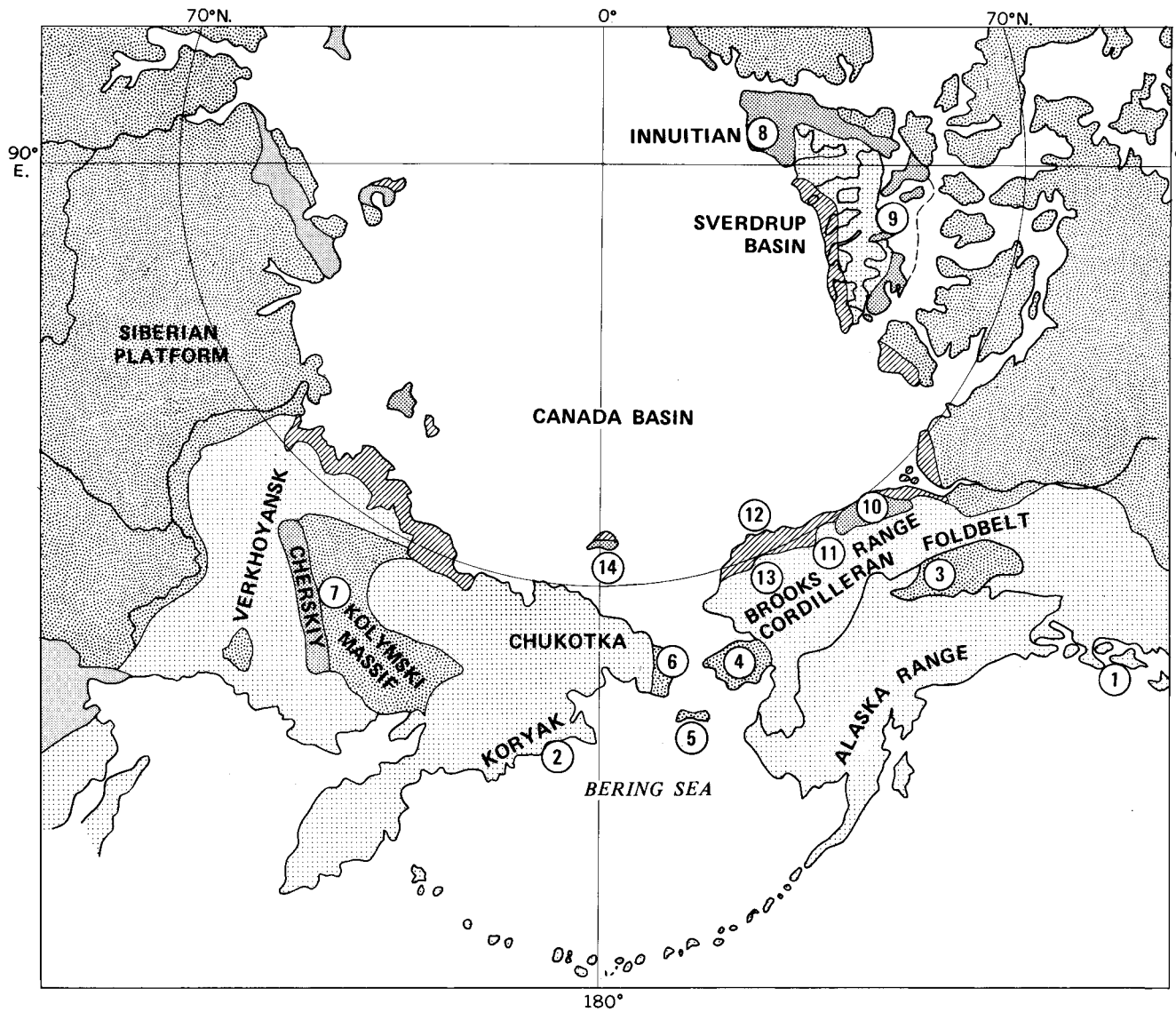
The first corals described from Alaska were Devonian species from the Porcupine River (Meek, 1867). Much later, a few Mississippian lithostrotionid corals were described by Hayasaka (1936), a new genus *Sciophyllum* was described by Harker and McLaren (1950), and photographs of some of the Devonian corals of east-central Alaska were published (Churkin and Brabb, 1967). Since about 1950, a small group of specialists including A. K. Armstrong, C. W. Merriam, W. A. Oliver, Jr., and Charles Rowett have become interested in Alaska's Paleozoic corals. In the last decade, the first monographic descriptions of Paleozoic corals of Alaska were published (Rowett, 1969; Armstrong, 1970a, b).

This volume of professional-paper chapters, that summarizes our knowledge of Alaskan Paleozoic corals, is an outgrowth of similar but more generalized papers prepared by us for the International Coral Symposium held in Novosibirsk, U.S.S.R., in August 1971. Besides summarizing the results of all the coral studies to date, much of the older work has been revised and updated to modern standards of taxonomy and classification. Particular emphasis is on the distribution and stratigraphic occurrence of the coral faunas. Preliminary correlations of coral-bearing strata with other formations, many containing other types of fossils, are shown in a series of correlation diagrams adapted from Churkin (1970, 1973).

REGIONAL GEOLOGIC SETTING

Paleozoic coral faunas of Alaska occur in structurally complex limestone deposits of Ordovician through Permian age that are scattered widely through most of the geologic provinces of the State.

Paleozoic rocks in the Alaska Range and farther south are geosynclinal deposits that form the northern end of the Cordilleran foldbelt that rims the eastern Pacific and continues westward to connect with similar rocks in the Koryak Mountains of Northeast U.S.S.R. (fig. 1, loc. 2). Northern Alaska —the northeastern Brooks Range (fig. 1, loc. 10) and the Arctic Coastal Plain (fig. 1, loc. 12)—is underlain by early Paleozoic geosynclinal rocks that discontinuously rim the margin of the Canada basin of the Arctic Ocean and probably connect with simi-



EXPLANATION

FOLDBELTS

Cenozoic and Mesozoic

Late Paleozoic

Middle Paleozoic

PLATFORMS

Cenozoic and Mesozoic

Paleozoic and Precambrian

(6) Location of section shown in figures 3, 4, and 5

FIGURE 1.—Major tectonic features of the Arctic.

lar geosynclinal deposits in the Innuitian foldbelt of the Canadian Arctic Islands (fig. 1, loc. 8). East-central Alaska (fig. 1, loc. 3) and Seward Peninsula (fig. 1, loc. 4) have thinner, mainly carbonate rock sections that represent western extensions of the Yukon shelf that separates the circumarctic geosynclinal trend from the circumpacific geosynclinal trend (Churkin, 1969).

In the Late Devonian and Early Mississippian the circumarctic geosyncline was deformed, intruded by granite, and uplifted to produce wedges of coarse clastic sediments that spread southward onto adjoining areas of Alaska, Canada, and Northeast U.S.S.R. (Churkin, 1969). During the Mississippian through the Triassic, successor basins (Brooks and Sverdrup basins) having restricted marine sedimentation developed on the roots of the earlier geosynclines. In the interior of Alaska, the presence of Late Devonian and Permian chert-quartz conglomerates and sandstone also implies uplifts, probably within the nearby Cordilleran geosyncline, that marked the beginning of a late Paleozoic cycle of increased tectonic activity.

Because Alaska connects North America with Eurasia, it is a key to understanding the geologic correlations around the northern Pacific on the one hand and the circumarctic areas on the other; Alaska thus figures prominently in paleogeographic reconstructions and in tests of theories of continental drift in the Arctic. Corals are important tools for making these correlations for two reasons: (1) they are widespread in Paleozoic strata in the Arctic, and (2) their growth is strongly controlled by their environment.

Preliminary identifications of Alaskan corals by C. W. Merriam, W. A. Oliver, and myself suggested their close affinities with faunas described from various parts of the U.S.S.R. Accordingly, as part of an exchange visit to the U.S.S.R., sponsored by the National Academy of Sciences (U.S.) and the Academy of Sciences of the U.S.S.R., I compared slides of Alaskan corals with those available for study in paleontological collections of the Paleontological Institute, Moscow, the Institute of Geology and Geophysics, Novosibirsk, and the All-Union Geological Scientific Research Institute (VSEGEI), Leningrad. The close similarity of Alaskan corals to those of the U.S.S.R. was confirmed by this direct comparison of samples in consultation with Soviet coral specialists, including E. Z. Bulvanker, I. I. Chudinova, K. A. Ermakova, A. G. Kravtsov, and N. Ya. Spasskiy.

REEF AND REEF-RELATED DEPOSITS IN VOLCANIC ROCK-GRAYWACKE GEOSYNCLINAL FACIES

In the Cordilleran geosyncline of southern Alaska, deposition of graywacke, conglomerate, and argillaceous rocks—interbedded with pillow basalts, breccias, and tuffs—prevailed throughout most of the Paleozoic (fig. 2). Massive limestones composed mainly of shelly fossils are interbedded with the volcanic rocks. Very rapid facies changes reflect rugged bottom relief, largely controlled by volcanic activity. Many of the coral- and stromatoporoid-rich limestones closely associated with volcanic rocks indicate reef and shallow-water shell bank deposits around volcanic islands (Eberlein and Churkin, 1970) (fig. 3).

Pillow basalts in many places show various stages of fragmentation and are cemented, in varying degree, by calcite. Some of these fragmental volcanic rocks, such as the Coronados Volcanics (Middle Devonian, Prince of Wales Island), are in gradational contact with limestone that is composed almost entirely of abraded fossil fragments. The fossils include mainly tabulate corals—both massive coral heads (*Favosites, Heliolites,* and others) and branching fingerlike corals (*Thamnopora* and *Alveolites*)—together with very abundant encrusting colonies of massive stromatoporoids. Less common are solitary horn corals, gastropods, brachiopods, and crinoid columnals. Although this volcanics facies is known best in southeastern Alaska, it extends north into the Woodchopper Volcanics of east-central Alaska. A present-day analog for this type of volcanic deposit and associated reefs may be the volcanic island arcs of the southwestern Pacific and to some extent the Hawaiian Islands. According to underwater diving investigations, when Hawaiian basalt flows enter the sea, pillow lavas and breccias form, and marine life quickly becomes established on these rocks (J. G. Moore, oral commun., 1971).

Another type of Devonian limestone in southeastern Alaska, represented by the Wadleigh Limestone, is a massive Middle and Upper Devonian limestone composed of fragmented corals and massive stromatoporoids cemented by fine-grained dark limestone rich in crinoid columnals and the small tube-shaped stromatoporoid *Amphipora.* In most beds the fossils are somewhat fragmented or abraded, but in some the more massive colonial corals and especially the stromatoporoids encrust fragments of other fossils and appear to be in growth position, or nearly so. These limestone breccias, in places associated with

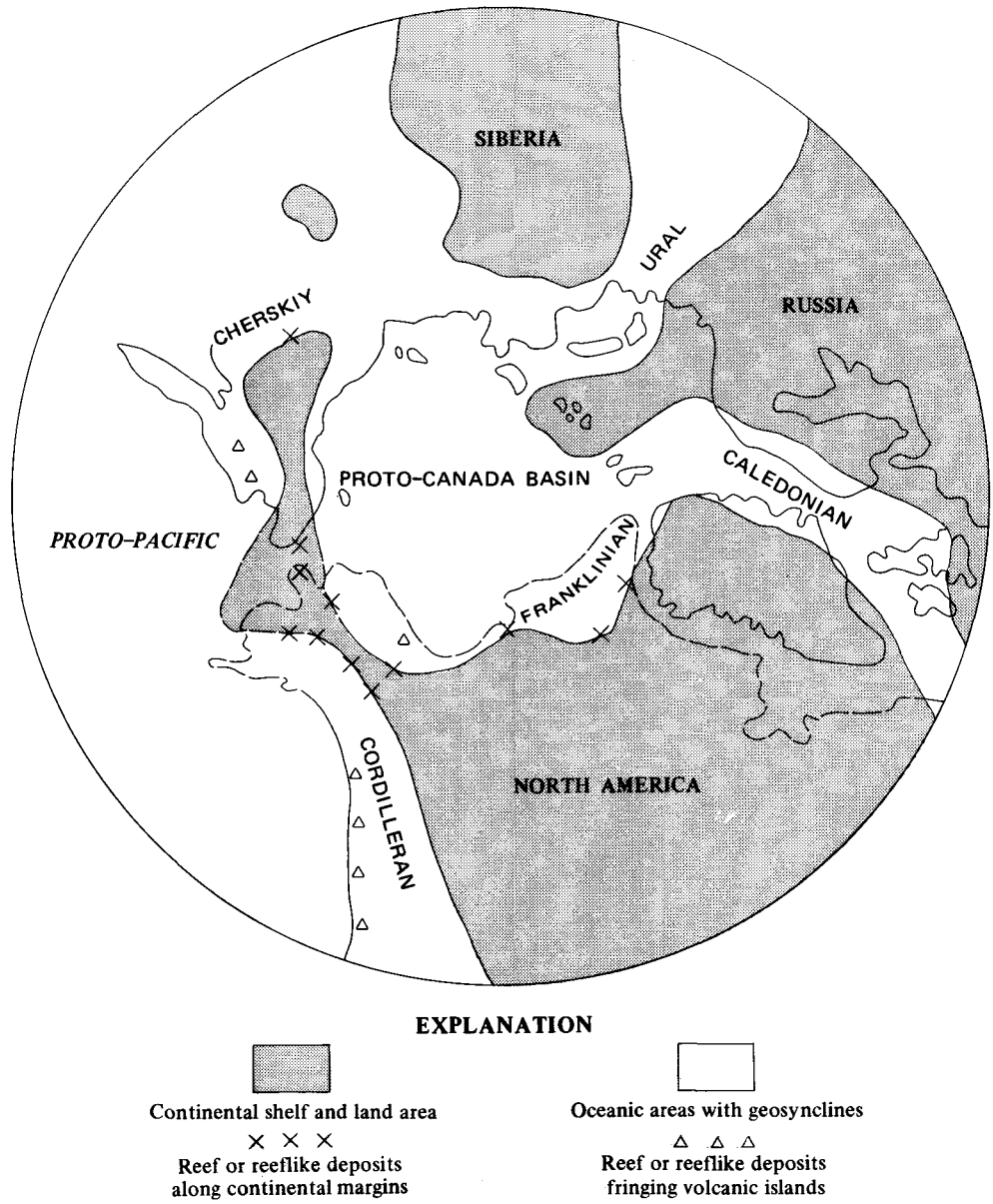


FIGURE 2.—Early Paleozoic paleogeography.

small buildups of corals in growth position, may have developed on the flanks of reefs but some also may represent the remains of reefs that were destroyed by storm waves. Argillaceous limestone and calcareous shale are in places cyclically interbedded with purer limestone that contains scattered corals in growth position. These cyclically bedded finer grained rocks are thought to be off-reef facies developed in quieter water (Eberlein and Churkin, 1970).

Still another type of occurrence of coral- and stromatoporoid-rich limestone in southeastern Alaska is represented in the Lower Devonian part of the Karheen Formation. The Karheen is mainly a conglomerate, graywacke, and calcareous mudstone sequence that overlies with a major unconformity rocks ranging in age from Early Ordovician through Late Silurian and displays many sedimentary features suggestive of nonmarine and beach conglomerate and sandstone grading into intertidal mudflat deposits. The presence of massive limestone breccias composed mainly of tabulate corals and massive stromatoporoids, including large blocks of coral-head limestone as much as 5 meters across (in part slump

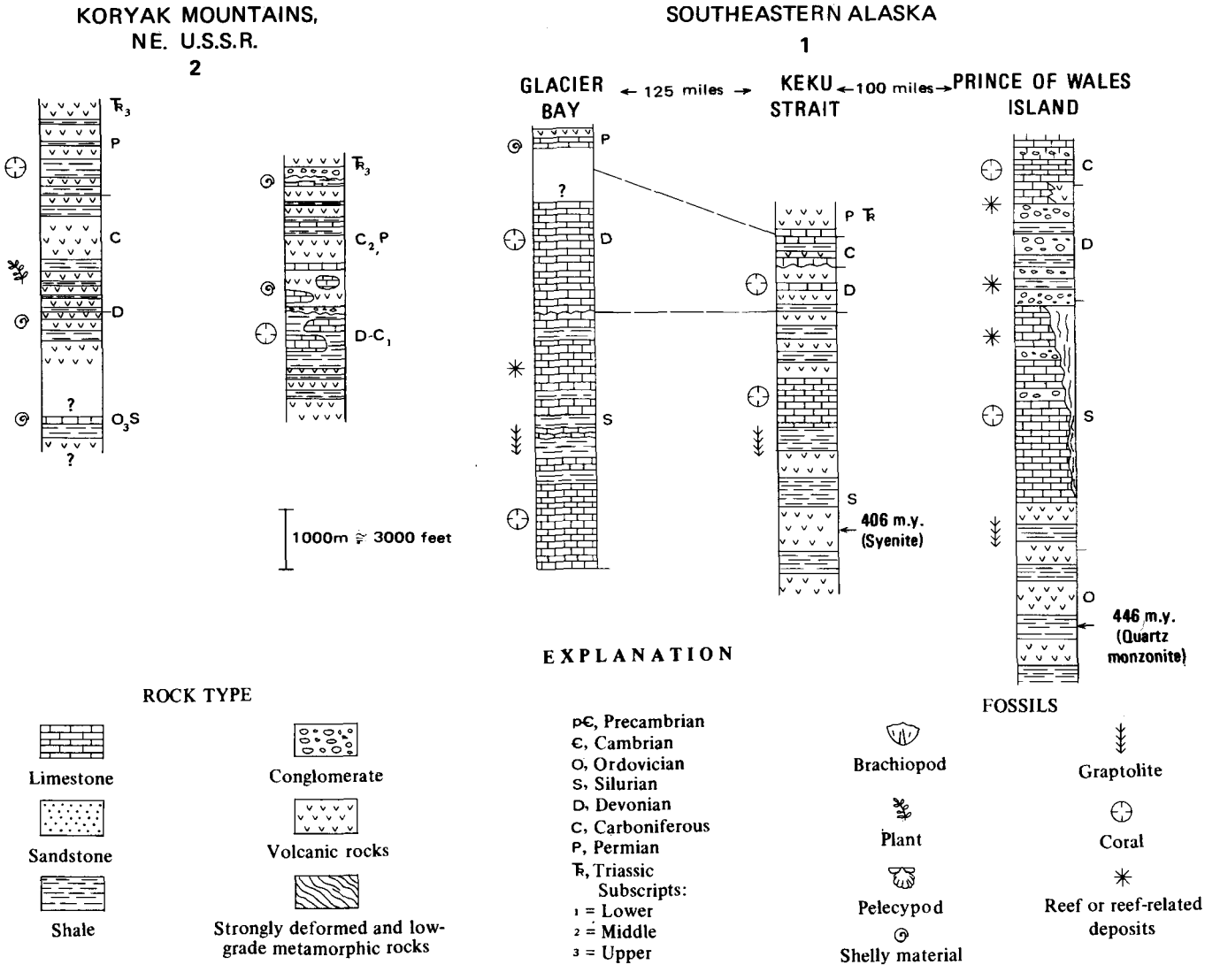


FIGURE 3.—Preliminary correlation of Paleozoic rocks around the northern Pacific basin. See figure 1 for location of numbered sections.

blocks), interstratified within the mainly terrigenous rocks of the Karheen suggests rapid, high-energy sedimentation near the sediment source. Land plants in graptolitic shale interbedded with the coral-rich limestones indicate periods of lower energy conditions when land plants were transported from nearby islands within the geosyncline (Churkin and others, 1969).

Another type of reef deposit especially common in the Devonian of southeastern Alaska is the small patch reef. A good example is found in the Karheen Passage area, where a bioherm some 20 feet in diameter and 5 feet high is preserved so that most of the corals and stromatoporoids are still in their original growth position (G. D. Eberlein and Churkin, unpub. field data). The reef lies directly on limestone edgewise conglomerate and is composed mainly of massive stromatoporoids that are especially numerous at the base of the reef. Tabulate corals, cerioid colonial corals, and solitary horn corals held together by encrusting stromatoporoids form the upper part of the reef.

Thick Silurian limestone formations in southeastern Alaska have similar but generally less clearly developed stratigraphic and textural features that can be related to a reef origin. This is especially true of coarse bioclastic breccias within the Heceta (Eberlein and Churkin, 1970) and Willoughby Limestones (A. T. Ovenshine and Churkin, unpub. data).

In the eastern Alaska Range considerably north of southeastern Alaska there is an exceptionally well developed sequence of Permian reef limestones inter-

layed with volcanic rocks (Bond, 1969). According to C. L. Rowett (written commun., 1971), many of the Lower Permian limestones here are biostromes in which corals make up as much as 40 percent of the stratified layers. Both solitary (large dissepimented species) and fasciculate corals occur, many of which are in living position. Small coral bioherms and biostromes have been reported (Bond, 1969) in the same general area. Bond suggested that these bioherms may have grown along the flanks of active volcanoes and that they did not grow into large reefs because each eruption rapidly buried them with volcanic detritus. Analogously, one of the major environments of modern reef growth is around the edges of active volcanoes that form islands, especially in the Pacific. There are many places, Hawaii, for example, where repeated eruptions have prevented reefs from becoming large, wave-resistant structures, despite the fact that they grow rapidly in this generally favorable environment.

Farther north, in the center of Alaska, a sequence of siliceous and volcanic geosynclinal rocks form an allochthonous? wedge against the attenuated Yukon shelf of mainly carbonate rocks developed farther east (Churkin, 1969, fig. 1). Here, the Woodchopper Volcanics composed of pillow basalt is, as in southeastern Alaska, interbedded with massive limestone rich in corals. Broken pillow breccia in the Woodchopper also has coral heads that definitely date the volcanism and closely associated reef growth as Devonian. In the same region, an older example of coral-rich limestone that is closely associated with volcanic rocks is the Tolovana Limestone of Silurian and Devonian age that overlies the Fossil Creek Volcanics of Ordovician age. Massive colonies of tabulate corals form small bioherms in a tuffaceous limestone that is interpreted as the basal part of the Tolovana where it overlies volcanic boulder conglomerate.

A volcanic rock-graywacke facies similar to that in southern Alaska is found around the northwestern rim of the Pacific basin in the Koryak Mountains of Chukotka, in Japan, and farther south (Krasniy, 1966). Shelly faunas from rare limestones in mainly volcanic and terrigenous rock terranes permit the recognition of Ordovician(?), Silurian, Devonian, Carboniferous, and Permian strata from a number of widely scattered localities. Some geologists (Egiazarov and others, 1965) have concluded that the intervening terrigenous volcanic rocks are also Paleozoic (fig. 3). However, detailed mapping and the discovery of Mesozoic fossils in some of these terrigenous volcanic sequences support the view that the limestones are fault-bounded blocks (Peive, 1969). Despite the structural mixing of Paleozoic and Mesozoic rocks, there are enough places reported where the Paleozoic limestones contain volcanic layers to be reasonably certain that the limestones belong to a Paleozoic volcanic belt.

Where Alaska faces the Arctic Ocean basin there is, in the northeastern Brooks Range, another predominantly siliceous and volcanic rock terrane of Devonian and older age that has massive carbonate rocks in places closely associated with basaltic lavas (Reiser, 1970). The carbonate rocks here include shallow-water carbonates containing stromatolitic structures, oolitic beds, *Amphipora,* and tabulate and rugose corals (Dutro, 1970) that in places probably represent reefs that may be related to volcanic activity as in southeastern Alaska.

CORAL-RICH DEPOSITS IN CARBONATE-CLASTIC ROCK SHELF FACIES

In the interior of Alaska, Devonian reefs or related deposits have been observed in the southern Alaska Range (limestone forming St. John hill—B. L. Reed and Churkin, unpub. field data); Kuskokwim River region (Holitna Group of Cady and others, 1955, p. 24); and east-central Alaska (limestone member of McCann Hill Chert and Salmontrout Limestone—Churkin and Brabb, 1967). These coral-stromatoporoid breccias are developed in stratigraphic sections overlying Silurian and, in places, Lower Devonian graptolitic shale and probably represent a transitional facies from a carbonate shelf facies in the interior of Alaska into the Cordilleran geosyncline on the south and a circumarctic geosyncline on the north (figs. 2 and 4). The breccias were probably related to reefs that grew around the margins of basins that were filled with argillaceous sediments. A similar development of reefs again associated with graptolitic shales has been found along the western margin of the Kolymski massif, Northeast U.S.S.R. (Bogdanov, 1963; figs. 58, 59, 61) (fig. 4).

Reefs and related deposits are less well known in northern Alaska (figs. 2 and 5). The rocks in northern Alaska of Silurian and Devonian age—the period of major reef building in southern Alaska—are largely covered by younger rocks and in many places are highly deformed and weakly metamorphosed. In exception, coral breccia and reeflike structures that have been dolomitized and highly mineralized have been described from the Cosmos Hills, Alaska (Tailleur and others, 1967; Fritts, 1970). In addition, coral- and stromatoporoid-rich

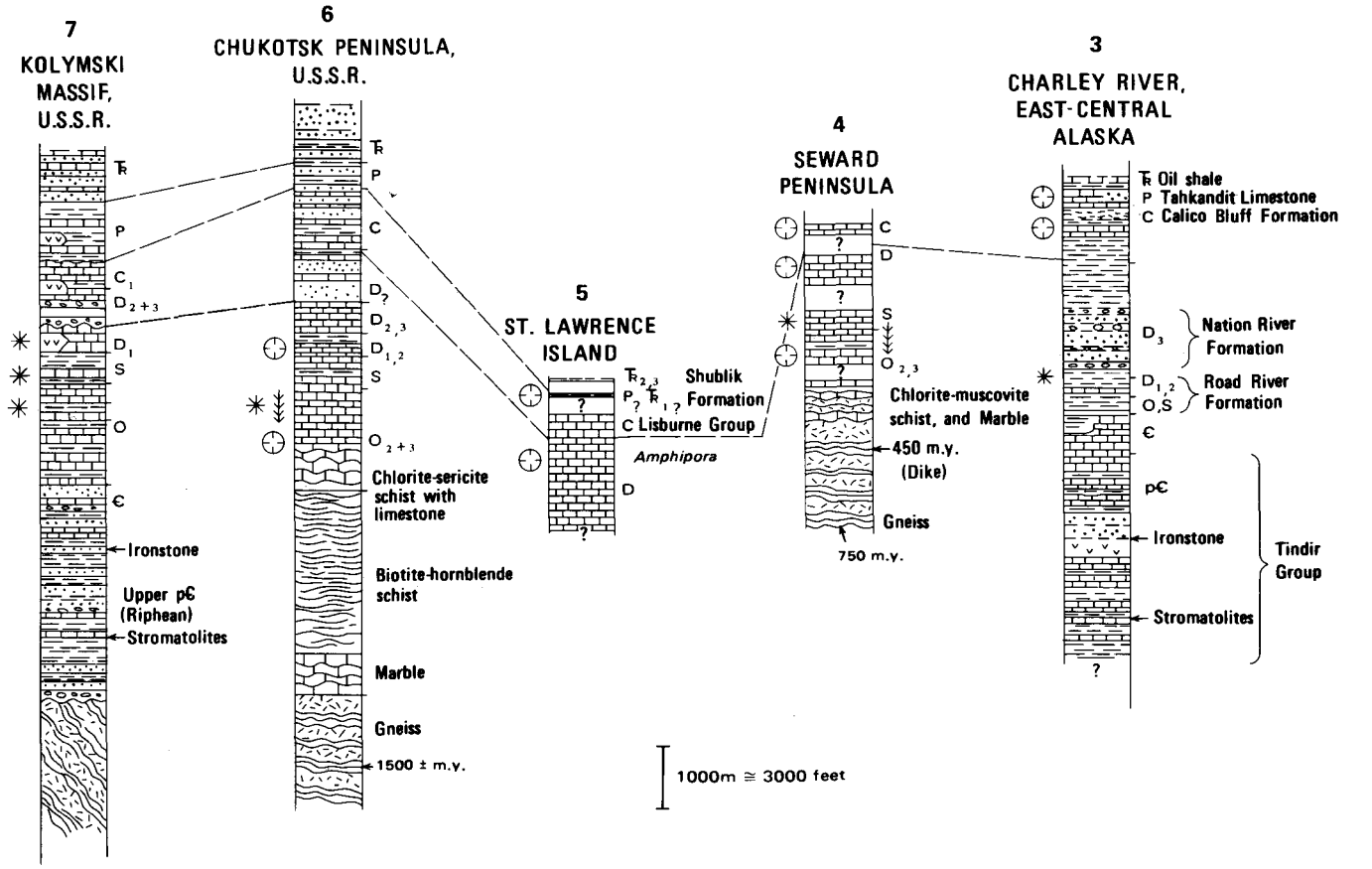


FIGURE 4.—Preliminary correlation of the Paleozoic rocks across the central parts of northeastern U.S.S.R. and Alaska. See figure 1 for location of numbered sections and figure 3 for explanation of symbols.

parts of the massive Devonian limestone in the central Brooks Range, the Skajit Limestone, may represent patch reefs. In the Franklinian geosyncline in the Arctic Islands of Canada there are thick coral reefs reported in the Middle Devonian (Eifelian) Blue Fiord Formation (Kerr, 1967) and in the Silurian Read Bay Formation (Douglas and others, 1963, p. 11). These reefs may have continued west around the Canada basin (figs. 2 and 5), and their equivalents in arctic Alaska, particularly in the southeastern Brooks Range (Dutro, 1970), may be some of these massive partly recrystallized carbonate rocks.

The Carboniferous strata of northern Alaska are part of a northward-directed transgressive cycle (Armstrong and Mamet, 1970) that should have preserved any coral reefs. However, there are essentially no known organic reefs, coral or otherwise, in the Carboniferous strata of northern Alaska (Armstrong, 1974). There are instead numerous biostromal beds composed mainly of colonial corals that occur the full length of the Brooks Range. A good example of this is at a locality 6 miles south of Cape Lisburne. Here a well-bedded, 75-foot-thick limestone composed of Late Mississippian lithostrotionellid corals, according to Armstrong, most closely approaches a reeflike structure. The environment in which the individual coral colonies and communities are thought to have developed is in front of and behind oolite banks (Armstrong and Mamet, 1970).

Permian rocks in northern Alaska and in its interior are mostly clastic deposits shed from a northern source. Corals in the strata are generally small nondissepimented types characteristic of a nearshore facies (Rowett, 1974). In the Permian of the Alaska Range, Wrangell Mountains, and southeastern Alaska, the corals are large solitary species or compound phaceloid species, both dissepimented. Tabulate corals are also common. According to Rowett, these indicate a comparatively deeper water environment. This accords with the concept that the northern and central parts of Alaska in the late Paleozoic were shelf areas and that southern Alaska

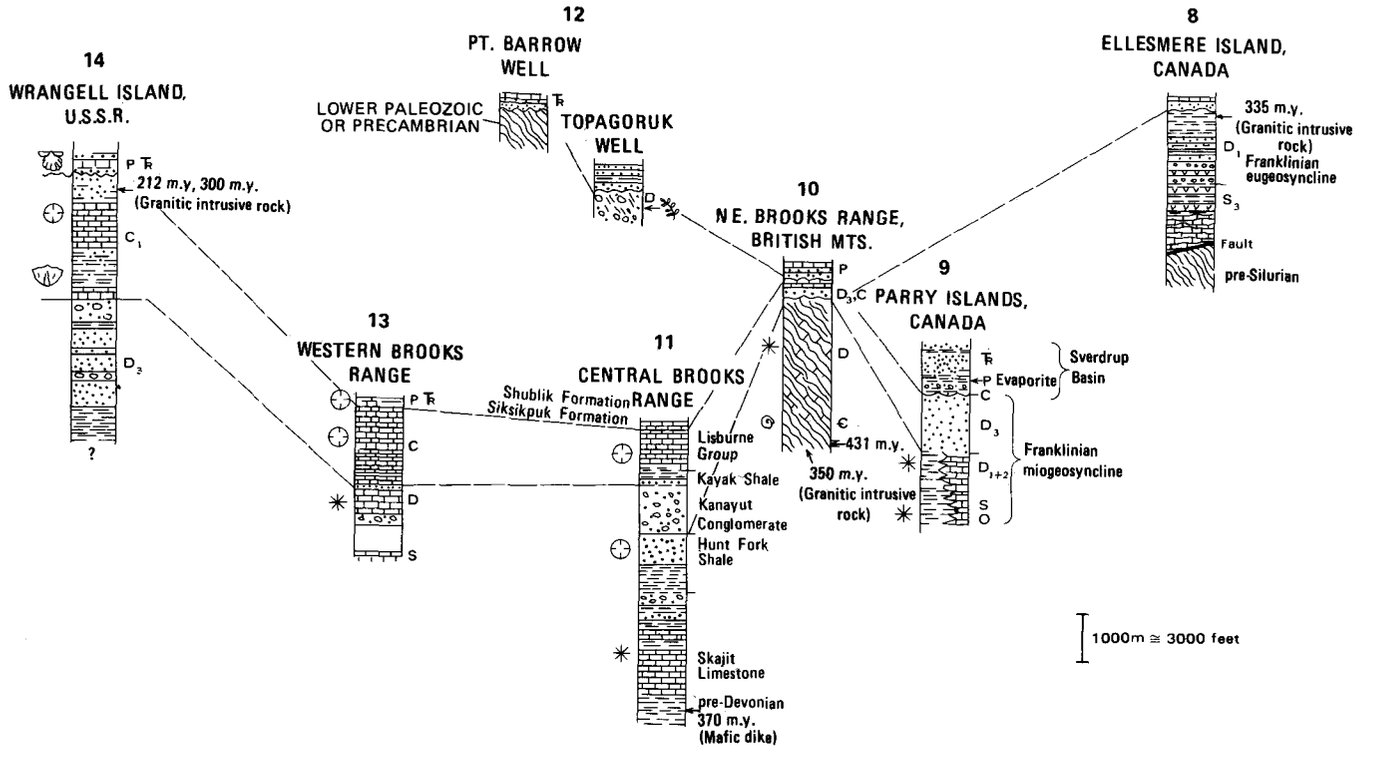


FIGURE 5.—Preliminary correlation of the Paleozoic rocks around the Canada basin. See figure 1 for location of numbered sections and figure 3 for explanation of symbols.

was an oceanic area that received geosynclinal sedimentation as it had in the early Paleozoic (fig. 6).

CONCLUSIONS AND FUTURE WORK

Preliminary correlations of Alaskan Paleozoic rocks that are based mainly on reconnaissance field and paleontological studies lead me to the following paleogeographic reconstructions. In the early Paleozoic the southern parts of Alaska and Northeast U.S.S.R. were oceanic areas that received geosynclinal accumulations of sediment and volcanic rock (figs. 2 and 3). Coral- and stromatoporoid-rich limestones in close association with volcanic rocks represent reefs and reef-related deposits that accumulated around volcanic islands. Another oceanic area rimmed the northern margin of Alaska, Arctic Islands of Canada, and Northeast U.S.S.R. (figs. 2 and 5). Separating the two oceanic areas was a narrow continental shelf area that received mainly carbonate sediments and, although now broken in places by Mesozoic basins, may have originally extended rather continuously from the North American craton to the Kolymski Massif of Northeast U.S.S.R. (figs. 2 and 4). Reef or reef-breccia deposits in a nonvolcanic carbonate-clastic rock facies are distributed around the margins of this continental shelf.

In the Late Devonian the circumarctic area was affected by a major orogeny that deformed and uplifted parts of the belt of geosynclinal sediments lying along the margin of the Canada basin. During the late Paleozoic, successor-basin deposits developed on a broad shelf that covered the roots of the middle-Paleozoic foldbelt (fig. 6). Corals in these shelf deposits of arctic Alaska form biostromal carbonate rocks or occur as abraded fossils in clastic nearshore sediments. On the other hand, in southern parts of Alaska there are thick upper Paleozoic volcanic sequences interlayered with limestones rich in corals. These appear to represent in large part reef or reef-related deposits developed around volcanic islands as in the earlier Paleozoic.

If the main elements of this paleogeography are correct, then it should be possible to verify it by a study of faunal provinces, especially if the fossils that are used are corals or other types whose distribution was strongly controlled by their environment. Preliminary correlations of corals and various other shelly fossils show a gross similarity of faunas in different areas of Northeast U.S.S.R. (including Chukotsk Peninsula and the Kolymski massif) on the one hand and North America on the other (Nikolaev and Rzhonsnitskaya, 1967; Oradovskaya,

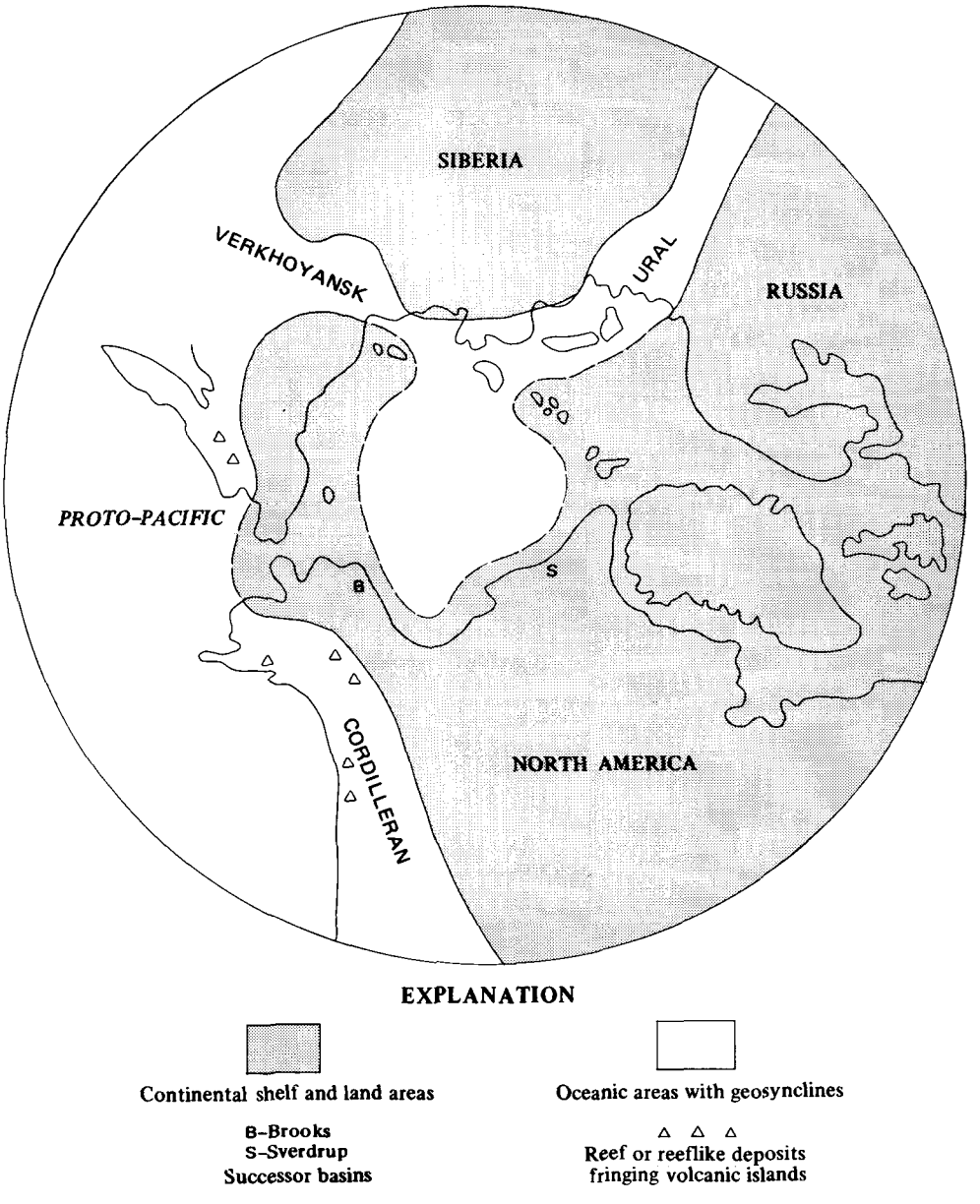


FIGURE 6.—Late Paleozoic paleogeography.

1970; Ross and Ingham, 1970). These faunas also broadly resemble those in the Siberian platform (Dubatolov, 1969; Oradovskaya, 1970). However, within the framework of the theory of plate tectonics and continental drift, various positions of a boundary separating western North America from Eurasia have been suggested in the Bering Sea region and in Northeast U.S.S.R. (Churkin, 1972). The geologic history of Northeast U.S.S.R. seems to indicate that there was a major seaway, perhaps of oceanic proportions, that separated the Siberian platform from the Kolymski massif during the early Paleozoic (fig. 2). Deposits of geosynclinal proportions developed along the margins of the seaway that separated these subcontinents and they were deformed into fold belts in the late Paleozoic and, especially, in the Mesozoic as the seaways closed between the leading edges of the approaching Eurasian and North American continental plates (Churkin, 1972).

Detailed descriptions and comparisons of corals and associated fossils from different parts of the Arctic will not only help to establish detailed stratigraphic correlations but could help test the various paleogeographic reconstructions. The succeeding chapters in this volume summarize our knowledge of

Alaskan corals and show their gross similarities to corals from neighboring parts of the U.S.S.R. and Canada. This is done in anticipation of future paleontological studies that can be applied to solving some of the major geologic problems in the Arctic.

REFERENCES CITED

Armstrong, A. K., 1970a, Mississippian rugose corals, Peratrovich Formation, west coast, Prince of Wales Island, southeastern Alaska: U.S. Geol. Survey Prof. Paper 534, 44 p., 13 pls., 30 figs.

——— 1970b, Carbonate facies and the lithostrotionid corals of the Mississippian Kogruk Formation, DeLong Mountains, northwestern Alaska: U.S. Geol. Survey Prof. Paper 664, 38 p., 14 pls., 37 figs.

——— 1974, Carboniferous corals of Alaska, a preliminary report: U.S. Geol. Survey Prof. Paper 823–C, 13 p.

Armstrong, A. K., and Mamet, B. L., 1970, Biostratigraphy and dolomite porosity trends of the Lisburne Group, *in* Adkinson, W. L., and Brosgé, M. M., eds. Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Am. Assoc. Petroleum Geologists, Pacific Sec. p. N1–N15, 12 figs.

Bogdanov, N. A., 1963, Tektonicheskoe razvitie v Paleozoe Kolymskogo massiva i vostochnoi Arktiki [Tectonic development of the Kolyma massif and eastern Arctic in the Paleozoic]: Akad. Nauk SSSR Geol. Inst. Trudy, no. 99, 235 p.

Bond, G. C., 1969, Permian volcanics, volcaniclastics, and limestones in the Cordilleran eugeosyncline, east-central Alaska Range, Alaska: Madison, Wisconsin Univ. Ph.D. dissert.

Cady, W. M., Wallace, R. E., Hoare, J. M., and Webber, E. J. 1955, The central Kuskokwim region, Alaska: U.S. Geol. Survey Prof. Paper 268, 132 p.

Churkin, Michael, Jr., 1969, Paleozoic tectonic history of the Arctic basin north of Alaska: Science, v. 165, p. 549–555.

——— 1970, Fold belts of Alaska and Siberia and drift between North America and Asia, *in* Adkison, W. L., and Brosgé, M. M., Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Am. Assoc. Petroleum Geologists, Pacific Sec., p. G1–G17.

——— 1972, Western boundary of the North American continental plate in Asia: Geol. Soc. America Bull., v. 83, p. 1027–1036.

——— 1973, Paleozoic and Precambrian rocks of Alaska and their role in its structural evolution: U.S. Geol. Survey Prof. Paper 740, 64 p.

Churkin, Michael, Jr., and Brabb, E. E., 1967, Devonian rocks of the Yukon-Porcupine Rivers area and their tectonic relation to other Devonian sequences in Alaska, *in* Oswald, D. H., ed., International symposium on the Devonian system, Calgary, 1967 [Proc.]; Calgary, Alberta Soc. Petroleum Geologists, v. 2, 227–258. [1968]

Churkin, Michael, Jr., Eberlein, G. D., Hueber, F. M., and Mamay, S. H., 1969, Lower Devonian land plants from graptolitic shale in southeastern Alaska: Paleontology, v. 12, pt. 4, p. 559–573.

Douglas, R. J. W., Norris, D. K., Thorsteinsson, R., and Tozer, E. T., 1963, Geology and petroleum potentialities of northern Canada: Canada Geol. Survey Paper 63–31, 28 p.

Dubatolov, V. N., 1969, Tabulyaty i biostratigrafiya Nizhnego Devona Severo-Vostoka SSSR [Tabulates and biostratigraphy of the Lower Devonian of Northeast USSR]: Akad. Nauk SSSR Sibirsk. Otdeleniye Geologiya i Geofizika, no. 70, 179 p.

Dutro, J. T., Jr., 1956, Annotated bibliography of Alaskan Paleozoic paleontology: U.S. Geol. Survey Bull. 1021–H, p. 253–287.

——— 1970, Pre-Carboniferous carbonate rocks, northeastern Alaska, *in* Adkison, W. L., and Brosgé, M. M., eds., Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Am. Assoc. Petroleum Geologists, Pacific Sec., p. M1–M7.

Eberlein, G. D., and Churkin, Michael, Jr., 1970, Paleozoic stratigraphy in the northwest coastal area of Prince of Wales Island, southeastern Alaska: U.S. Geol. Survey Bull. 1284, 67 p.

Egiazarov, B. Kh., and others, 1965, Geologiya i poleznye iskopaemye Koryakskogo nagor'ya [Geology and mineral resources of the Koryak Upland]: Nauchno-Issled. Inst. Geologii Arktiki Trudy, v. 148, 342 p.

Fritts, C. E., 1970, Geology and geochemistry of the Cosmos Hills—Ambler River and Shungnak quadrangles, Alaska; Alaska Div. Mines and Geology Geol. Rept. 39, 69 p.

Harker, Peter, and McLaren, D. J., 1950, *Sciophyllum*, a new rugose coral from the Canadian Arctic: Canada Geol. Survey Bull. 15, p. 29–34, 1 pl.

Hayasaka, Ichirô, 1936, On some North American species of *Lithostrotionella*: Taihoku Imp. Univ. Mem., v. 13, no. 5, Geology no. 12, p. 47–73, pls. 11–17.

Kerr, J. W., 1967, Devonian of the Franklinian miogeosyncline and adjacent Central Stable Region, Arctic Canada, *in* Oswald, D. H., ed., International Symposium on the Devonian System, Calgary, 1967 [Proc.]: Calgary, Alberta Soc. Petroleum Geologists, v. 1, p. 677–692. [1968]

Krasniy, L. E., ed., 1966, Geologicheskoe stroenie Severo-Zapadnoi chasti tikhookeanskogo podvizhnogo poyasa [Geological structure of the northwestern part of the Pacific mobile belt]: Moscow, Vses. Nauchno-Issled. Geol. Inst. Nedra, 516 p.

Meek, F. B., 1867, Remarks on the geology of the valley of Mackenzie River, with figures and descriptions of fossils from that region, in the museum of the Smithsonian Institution, chiefly collected by the late Robert Kennicott, Esq.: Chicago Acad. Sci. Trans., v. 1, p. 61–114, 5 pls.

Nikolaev, A. A., and Rzhonsnitskaya, M. A., 1967, Devonian of northeastern USSR, *in* Oswald, D. H., ed., International symposium on the Devonian System, Calgary, 1967 [Proc.]: Calgary, Alberta Soc. Petroleum Geologists, v. 1, p. 483–502. [1968]

Oradovskaya, M. M., 1970, Stratigrafiya Ordovika i Silura Chukotskogo Poluostrova [Ordovician and Silurian stratigraphy of the Chukotsk Peninsula]: Akad. Nauk SSSR Doklady, v. 191, p. 190–193.

Peive, A. V., 1969, Okeanicheskaya kora geologicheskogo proshlogo [Oceanic crust in the geologic past]: Geotektonika, no. 4, p. 5–23.

Reiser, H. N., 1970, Northeastern Brooks Range—a surface expression of the Prudhoe Bay section, *in* Adkison, W. L., and Brosgé, M. M., eds., Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Am. Assoc. Petroleum Geologists, Pacific Sec. p. K1–K13.

Ross, R. J., Jr. and Ingham, J. K., 1970, Distribution of the

Toquima-Table Head (Middle Ordovician White Rock) faunal realm in the Northern Hemisphere: Geol. Soc. America Bull., v. 81, p. 393–408.

Rowett, C. L., 1969, Upper Paleozoic stratigraphy and corals from east-central Alaska Range, Alaska: Arctic Inst. North America Tech. Paper 23, 120 p., 13 pls., 20 figs.

——— 1974, Stratigraphic distribution of Permian corals in Alaska: U.S. Geol. Survey Prof. Paper 823–D, 17 p., 3 pls.

Tailleur, I. L., Brosgé, W. P., and Reiser, H. N., 1967, Palinspastic analysis of Devonian rocks in northwestern Alaska, *in* Oswald, D. H., ed., International Symposium on the Devonian System, Calgary, 1967 [Proc.]: Calgary, Alberta Soc. Petroleum Geologists, v. 2, p. 1345–1361 [1968].

Ordovician, Silurian, and Devonian Corals of Alaska

By WILLIAM A. OLIVER, JR., CHARLES W. MERRIAM, *and* MICHAEL CHURKIN, JR.

PALEOZOIC CORALS OF ALASKA

GEOLOGICAL SURVEY PROFESSIONAL PAPER 823-B

Outline of the stratigraphic setting for the corals, review of previous coral studies, and annotated lists of corals identified from various Alaska localities

CONTENTS

ILLUSTRATIONS

[Plates follow index]

TABLES

ORDOVICIAN, SILURIAN, AND DEVONIAN CORALS OF ALASKA

By WILLIAM A. OLIVER, JR., CHARLES W. MERRIAM, and MICHAEL CHURKIN, JR.

ABSTRACT

Corals are common in Ordovician, Silurian, and Devonian rocks from Alaska, but few have been described or illustrated. Most of the known occurrences of corals are in carbonate rocks, either in an east-west belt of shelf facies across central Alaska that persisted from pre-Ordovician to Middle Devonian time or in a more southerly volcanic graywacke belt of geosynclinal facies that includes significant limestone units in southeastern Alaska. Corals occur in other areas but are less well known.

Annotated lists of corals summarize most collections made by U.S. Geological Survey geologists in the last 15 years. Many of the corals are illustrated.

INTRODUCTION

Few descriptions or illustrations of Ordovician, Silurian, or Devonian corals from Alaska have been published. The occurrences of many genera have been recorded in lists of fossils, but these are so scattered in the stratigraphic, structural, and general geologic literature and are by so many different geologists as to be almost useless to the person interested in corals. This paper is a review or summary of what is known about corals from Alaska and is based on collections made by many geologists but examined and identified by Merriam (southeastern Alaska) and Oliver (the rest of Alaska). The occurrences are placed in a broad stratigraphic-structural framework by Churkin.

We have two goals: (1) to provide a basis for the analysis of coral assemblages by field geologists working in Alaska and (2) to provide data for coral specialists who are interested in the geographic distribution of particular taxa. To achieve these goals we have a general introduction and discussion of the time-space framework in which the coralline facies developed, and two sections on corals consisting of lists and discussions of their probable age and significance. Many of the taxa are illustrated so that other specialists will have some record of what a given generic or specific name means to us and can make comparisons with corals from other regions. Not all taxa are illustrated; in general, we illustrate that material which we judge to be most interesting or important or most in need of documentation. But, many important forms are not illustrated because the Alaska material is too poorly preserved or because of space limitations. The corals of southeastern Alaska are being monographed by Merriam and are underrepresented here because they will be available in a much more complete form. The other coral assemblages are not being studied at present, and this may be the only record of their existence for many years.

We are indebted to the numerous geologists who made the collections and did much of the field research on which this review is based. We would particularly like to thank J. T. Dutro, Jr., who helped throughout the preparation period and who critically read the whole manuscript; many of his suggestions are incorporated in this paper.

STRATIGRAPHIC SETTING

ORDOVICIAN

Ordovician rocks in Alaska can be separated into three generalized facies belts (fig. 7). Known Ordovician corals are mostly from the carbonate belt, although they are also known in the shale-chert facies. Moderately large generic assemblages are known only from the Seward Peninsula and east-central Alaska (fig. 7, areas 1 and 5). Central Alaska collections are small and contain few taxa.

The Ordovician section in the Seward Peninsula (fig. 7, area 1; fig. 8), although interrupted by numerous thrust faults, has been subdivided into several units of limestone that are locally interbedded with argillaceous and dolomitic limestone (Sainsbury, 1969a). Rich Upper Ordovician coral assemblages, discovered by Sainsbury in the Don River area, include abundant colonial corals—*Agetolites, Calapoecia, Catenipora, Cyathophylloides, Mesofavosites, Rhaphidophyllum, Tollina,* and others— and the solitary streptelasmatid *Bighornia* (table 2). These corals are associated with other shallow marine invertebrates including labechiid stromatoporoids, gastropods, pelecypods, ostracodes, and brachiopods.

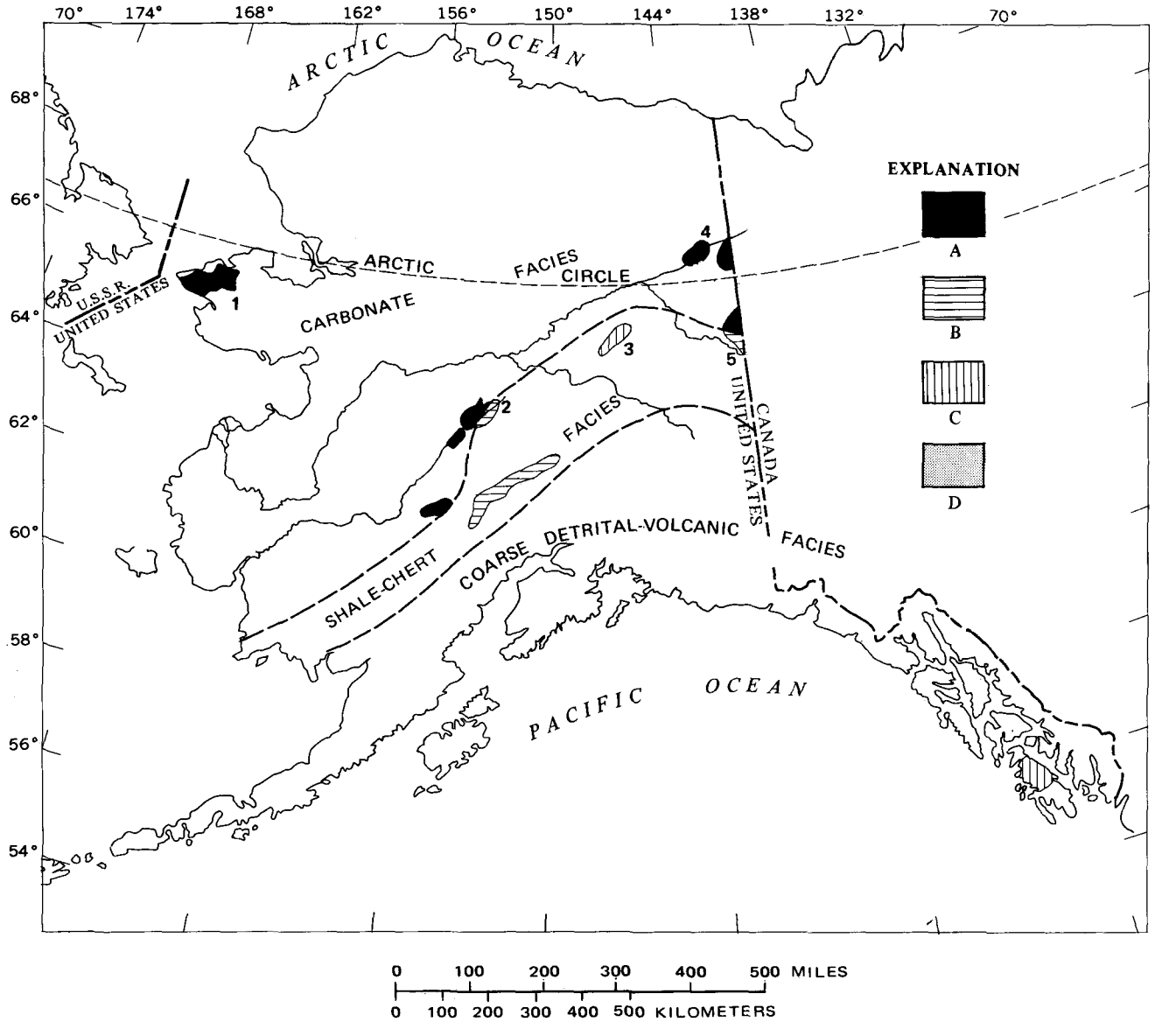


FIGURE 7.—Index map showing location of Ordovician collection areas in Alaska. 1, Seward Peninsula; 2, Lake Minchumina area, southwestern Alaska; 3, Fairbanks-Rampart area; 4, east-central Alaska, Porcupine River area; and 5, east-central Alaska, Yukon-Nation Rivers area. A, principally limestone and dolomite; B, shale and chert, some sandstone; C, volcanic rocks, graywacke, conglomerate, shale, and chert, locally thick limestone; and D, limestone in mainly siliceous detritial-volcanic sequences.

Middle(?) or Upper Ordovician rocks in the same general area include *Labyrinthites* and *Reuschia*.

In east-central Alaska, in the section that is exposed in the lower ramparts of the Porcupine River (fig. 7, area 4; fig. 8), *Tetradium*, *Calapoecia*, and *Saffordophyllum* occur together in a very fine grained limestone that also is reported to have gastropods and trilobites of Middle(?) Ordovician age (Kindle, 1908, p. 323). *Bighornia*, *Deiracorallium*, and other genera have been recognized from presumed Upper Ordovician rocks in the same area. Farther south, in the Jones Ridge section (fig. 7, area 5; fig. 8), near the Yukon River, a small collection of corals including *Calapoecia*, *Catenipora*, and *Grewingkia* was made from a thin limestone in a shale and chert unit directly overlying the upper member of a Cambrian and Ordovician limestone (Jones Ridge Limestone). Silicified brachiopods and trilobites closely associated with the corals resemble forms from the late Middle or early Late Ordovician of Percé, Quebec, and the classical Caradocian section of Girvan, Scotland (Ross and Dutro, 1966). The corals suggest a Late Ordovician age (table 3). The general affinities of the Upper Ordovician

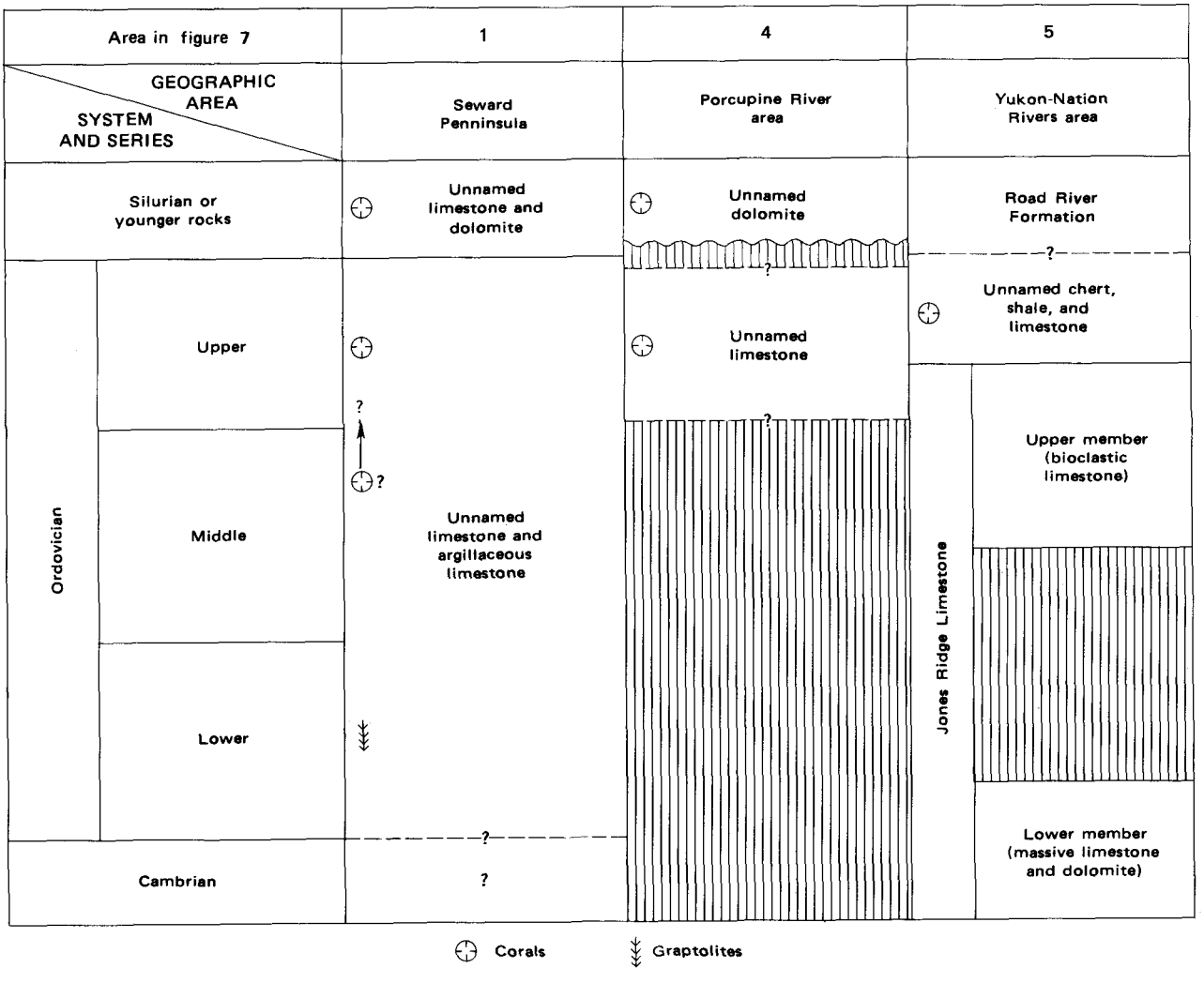


FIGURE 8.—Correlation chart of Ordovician formations and other units cited in text. Approximate positions of coral assemblages are shown. Other symbols mark positions of fossils other than corals on which age determinations have been based. Sources of information are the authorities cited in the text, the coral data, and others as noted here: Seward Peninsula—Sainsbury (1969a) and Sainsbury, Dutro, and Churkin (1971); Porcupine River area—Brosgé, Reiser, Dutro, and Churkin (1966); and Yukon-Nation Rivers area—Churkin and Brabb (1965) and Brabb (1967).

corals in both these areas are with the Bighorn-Red River fauna that is widespread in western North America and the Canadian Arctic. This fauna has been discussed by Nelson (1959) and Flower (1961, p. 15–18).

In central Alaska a few Ordovician corals are known from the Lake Minchumina area and from the Fairbanks-Rampart area (fig. 7, areas 2 and 3).

In contrast to the predominantly carbonate rock facies in the interior and western parts of Alaska, a thick geosynclinal sequence of graywacke, argillaceous rock, and conglomerate rich in volcanic detritus and interlayered with pillow lavas, tuffs, and breccias is exposed in southeastern Alaska (Eberlein and Churkin, 1970). Limestone is rare in the Ordovician part of this sequence; it occurs only as a fine-grained dark rock interlayered with graptolitic shale and chert and as nonfossiliferous boulders in conglomerates rich in volcanic rock fragments. No Ordovician corals are presently known from this sequence.

SILURIAN

Silurian rocks (figs. 9, 10) closely parallel the pattern of sedimentary facies established in Ordovician time, and there is little physical evidence of a pronounced break in sedimentation across the Ordovician-Silurian boundary anywhere in Alaska (Churkin, 1971). Silurian corals have been reported from widely separated limestone outcrops in the interior and western parts of Alaska, mostly from the carbonate facies belt. Corals here are mainly tabulates and include varied favositids, halysitids,

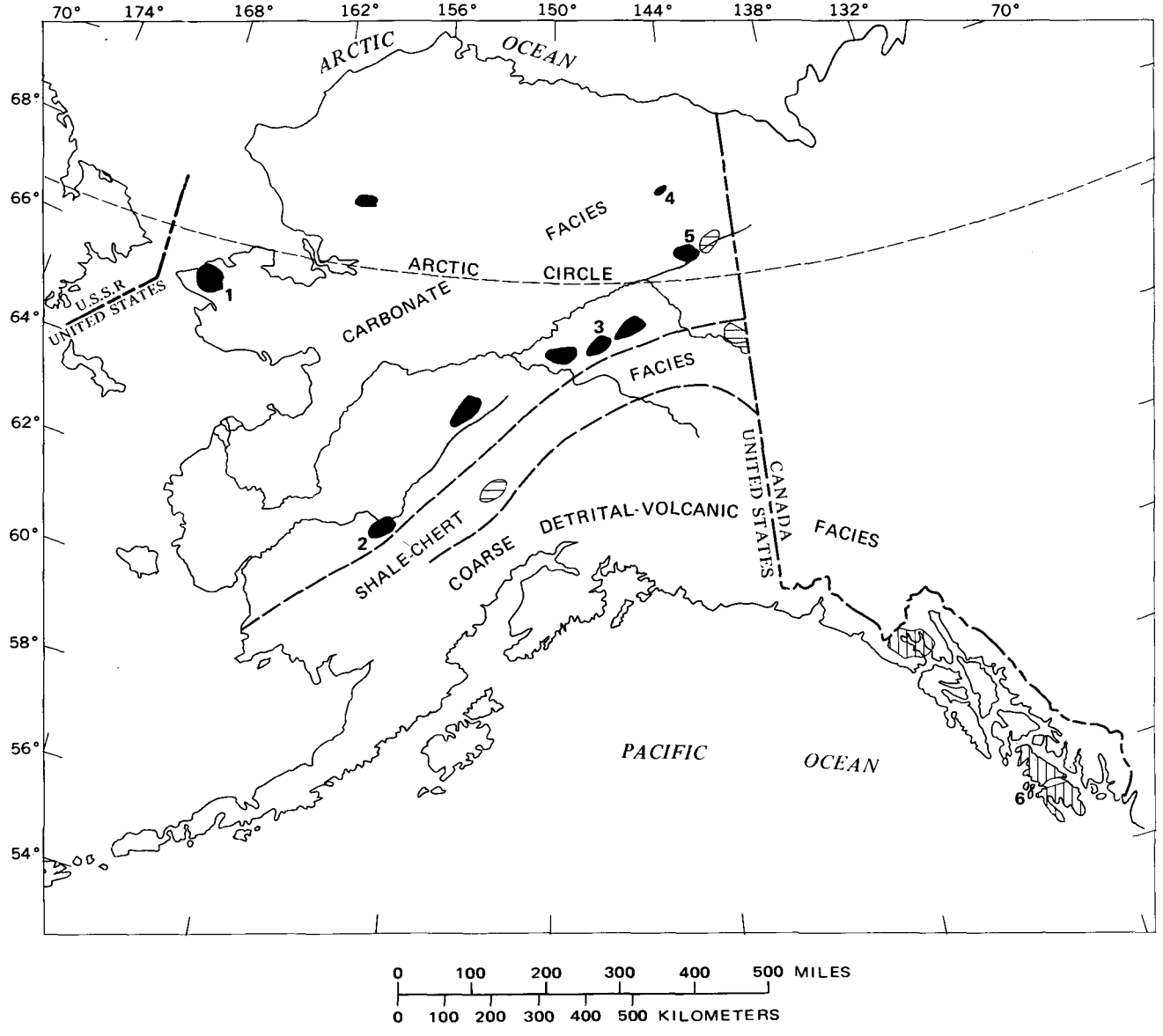


FIGURE 9.—Index map showing location of Silurian collection areas in Alaska. 1, Seward Peninsula; 2, southwestern Alaska, middle Kuskokwim area; 3, Fairbanks-Rampart area; 4, eastern Brooks Range; 5, Porcupine River area; and 6, southeastern Alaska. See figure 7 for explanation of patterns.

and *Multisolenia*. Heliolitids are less common. The variety of rugosans is indicated in tables 4–6, but few specimens are available and the numerical superiority of tabulate specimens in all studied assemblages is impressive.

In the Seward Peninsula (fig. 9, area 1; fig. 10) Silurian coral faunas occur in carbonate rocks that overlie the Ordovician succession of faunas without any apparent stratigraphic break. Coral faunas, however, seem to be late Middle and Late Silurian in age as they include species of *Contortophyllum*, *Helioplasmolites*, and *Pachyfavosites*, along with many other genera (table 4).

Only two collections are available from east-central Alaska (fig. 9, area 5; fig. 10) but these include 13 genera and suggest a Middle Silurian age (table 6).

Smaller collections are available from several additional areas in central Alaska (fig. 9, areas 2–4; fig. 10; table 5 and discussions).

In southeastern Alaska the Silurian coral faunas (fig. 9, area 6; fig. 10) that occur in high calcium limestones are generally better preserved and far richer in numbers of genera and species than are the other assemblages (see section by Merriam). They are part of the volcanic-graywacke province

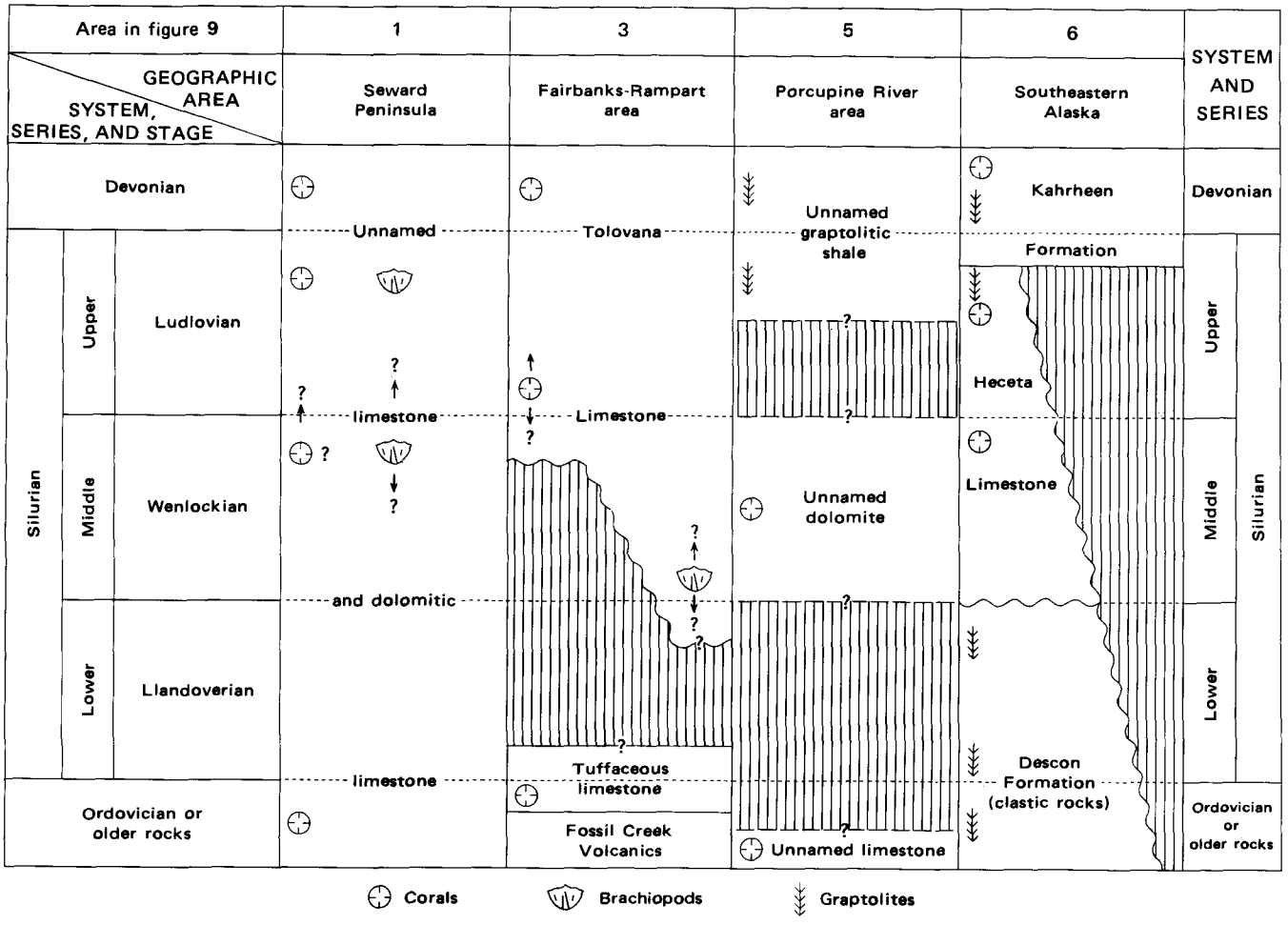


FIGURE 10.—Correlation chart of Silurian formations and other units cited in text. Approximate positions of coral assemblages are shown. Other symbols mark positions of fossils other than corals on which age determinations have been based. Sources of information are the authorities cited in the text, the coral data, and others as noted here: Seward Peninsula—Sainsbury (1969a) and Sainsbury, Dutro, and Churkin (1971); Fairbanks-Rampart area—Chapman, Weber, and Taber (1971; written commun., 1971, 1972); J. T. Dutro, Jr. (oral commun., 1972), and Churkin, (herein); Porcupine River area—Churkin and Brabb (1968); and southeastern Alaska—Eberlein and Churkin (1970) and Ovenshine and Webster (1970).

that extends discontinuously along the eastern Pacific margin from as far south as northern California. Within this province, carbonate rocks are subordinate to siliceous clastic rocks largely of volcanic derivation; in many places, however, thick limestones rich in corals occur in the section. The best known of these is a sequence of predominantly massive and thick-bedded, fine-grained limestone (Heceta Limestone) on the west side of Prince of Wales Island. The limestone on Heceta Island is over 10,000 feet thick and ranges in age from late Early Silurian to Late Silurian, based on graptolites, conodonts, and shelly fossils (Eberlein and Churkin, 1970; Ovenshine and Webster, 1970).

Corals from the Heceta Limestone are listed in table 19. *Zelophyllum* and *Salairophyllum* are present in beds that yield the large *Kirkidium alaskense* (Kirk and Amsden). The ramose stromatoporoid *Amphipora* also occurs in the Heceta Limestone (pl. 22, figs. 4–7). Some of the Rugosa are characteristic of other coral-bearing limestones in southeastern Alaska and are considered to be of Late Silurian (Ludlovian) age. Massive colonial genera are uncommon.

The Lower Silurian is represented in southeastern Alaska by a volcanic-terrigenous rock sequence containing numerous graptolite faunas.

DEVONIAN

In the northern and east-central parts of Alaska, Middle and less common Lower Devonian sections of mainly limestone and dolomite are part of an early

Paleozoic cycle of nearly continuous sedimentation that started in the latest Precambrian or Cambrian. Other areas of predominantly carbonate rocks are in the Seward Peninsula and the Kuskokwim River areas. Upper Devonian rocks in northern Alaska are predominantly clastic, whereas the whole Devonian sequence in south-central and southeastern Alaska is a complex of detrital and volcanic rocks (figs. 11, 12).

Coral collections are available from most of the known Devonian areas and facies. The largest assemblages of species are from carbonate rocks in both the carbonate belt and the volcanic-graywacke belt of southeastern Alaska.

More than 80 collections containing corals have been examined from the Brooks Range (fig. 11, areas 1–4; fig. 12). These are individually small but collectively include large numbers of species and specimens (tables 7–10). Upper Lower and Middle Devonian assemblages predominate in the Cosmos Hills (area 2) and are certainly present in the western Brooks Range (area 1). Notable are species of *Acanthophyllum, Dendrostella, Diplochone* and other cystimorphs, *Pseudotryplasma, Taimyrophyllum,* and *Tryplasma.* Upper Devonian assemblages are known in the western Brooks Range (area 1) but predominate in the central and eastern Brooks Range (area 3). *Disphyllum, Hexagonaria, Tabulophyllum,* and various phillipsastraeids are prominent in these areas. A variety of tabulate and other rugose corals are present in all assemblages, but heliolitoidids are unknown from these areas.

A geosyncline sequence including rocks of Cambrian through Devonian age has been recently recognized in the northeastern Brooks Range (area 4) (Dutro, 1970; Dutro and others, 1972). Limestone occurs in various parts of the sequence, but up to now corals have been collected from only the Devonian part (table 10).

Corals of Devonian age occur in east-central Alaska (fig. 11, areas 5, 6; fig. 12) where a fauna characterized by the colonial corals *Xystriphyllum, Peneckiella,* and *Spongophyllum* (tables 11, 12) has been found in thin limestone formations (Salmontrout Limestone; limestone and shale member of McCann Hill Chert). These corals are considered to be late Early Devonian (Emsian) or early Middle Devonian (Eifelian) based on the corals and associated shelly faunas, particularly tentaculitids, ostracodes, trilobites, and conodonts (Churkin and Brabb, 1968). The corals occur directly above Lower Devonian graptolitic shale containing *Monograptus yukonensis* and monograptids of the *M. hercynicus* type. Outside Alaska, the corals seem to have their closest affinities with Asiatic Russian species described as Middle Devonian by Soshkina (1952) and Bulvanker (1958), especially those from the Kuznetsk Basin, and are similar to those of Middle Devonian age in the Yukon Territory, Canada (Crickmay, 1960; Lenz, 1961; Pedder, 1964).

South and west of the Brooks Range and east-central areas, Devonian corals are known and listed from several areas, mostly within the carbonate belt (fig. 11, areas 8–13; fig. 12). Known assemblages are relatively small (tables 13–17). Tabulate corals are most numerous and varied in the collections, although this may be due to collecting bias. Most significant are local *Dendrostella* and *Sociophyllum* assemblages; *Heliolites* occurs in two of the areas.

Devonian corals are best known in southeastern Alaska (fig. 11, area 14; fig. 12) where a fairly continuous succession of faunas range in age from early Middle to Late Devonian (see section by Merriam). Possibly the oldest coral fauna in this area occurs in bioclastic limestone breccias and conglomerates that are interbedded with conglomerate rich in volcanic graywacke, and graptolite-bearing and vascular plant-bearing shale (Karheen Formation) (Churkin and others, 1969). Most of the corals are tabulates including *Favosites, Thamnopora, Striatopora,* and *Syringopora.* Rugose corals in the fauna include *Pseudomicroplasma, Disphyllum,* and the large *Pseudotryplasma altaica* (Dybowski). The close association of *Monograptus yukonensis* and *M. pacificus* that identifies the youngest zone of *Monograptus* suggests a Pragian (Siegenian to early Emsian) age—late Early Devonian or possibly earliest Middle Devonian (Churkin and others, 1970). At one locality the presence of a compound coral resembling *Taimyrophyllum* from the Great Basin and western Canada is of special interest because it seemingly occurs below *Monograptus yukonensis.*

Middle Devonian strata north of these graptolite localities have yielded the rugose coral genera *Digonophyllum, Acanthophyllum, Hexagonaria,* and *Dendrostella. Dendrostella* in the collection from Alaska resembles typical *D. rhenana* (Frech) from the Rhine Valley Givetian and forms from the Hume and Nahanni Formations of western Canada described by Pedder (1464).

Middle Devonian stratigraphy and coral faunas of southeastern Alaska are best known in the vicinity of Craig on the west side of Prince of Wales Island

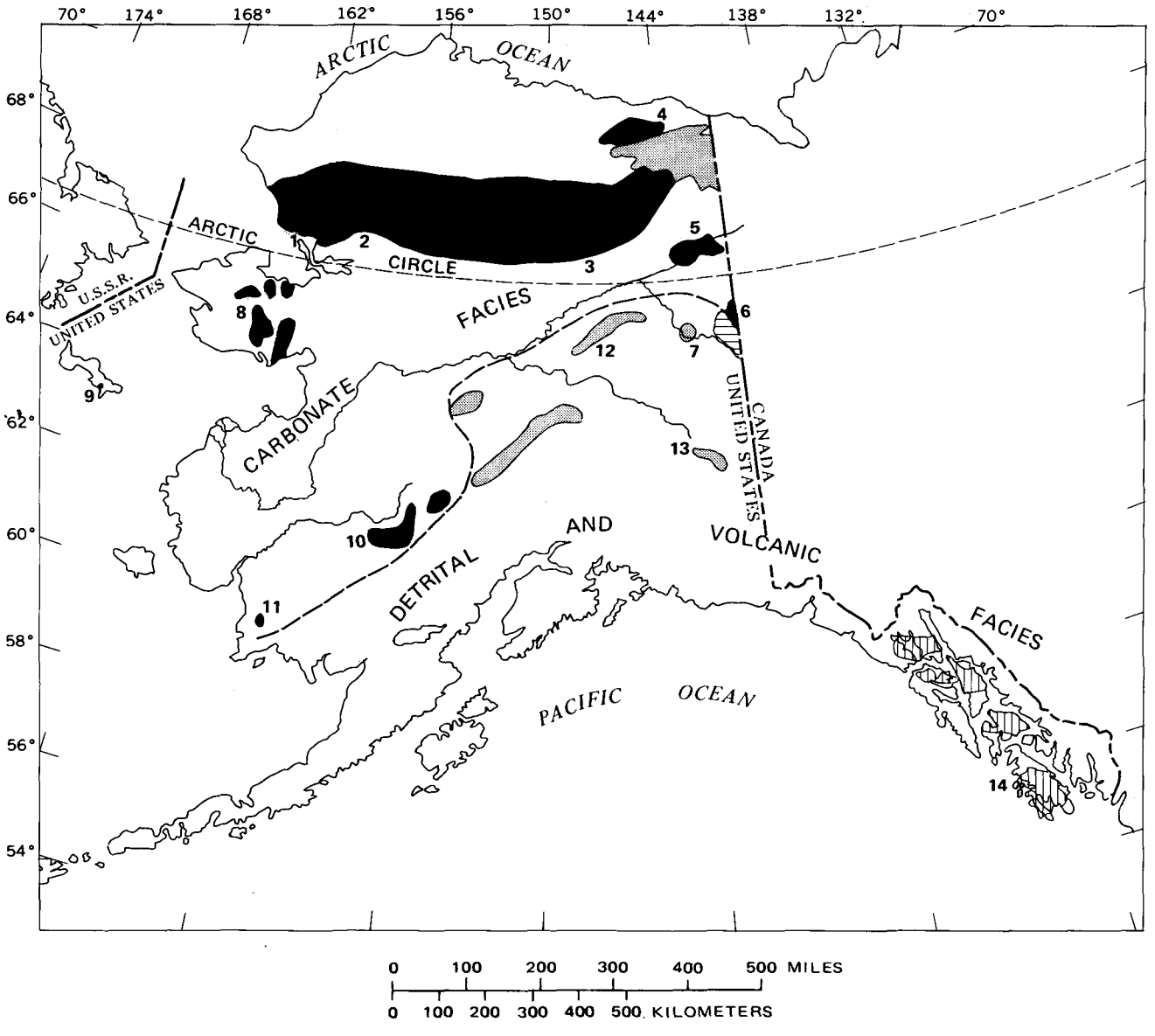


FIGURE 11.—Index map showing location of Devonian collection areas in Alaska. 1, western Brooks Range; 2, Cosmos Hills area; 3, central and eastern Brooks Range; 4, Shublik Mountains; 5, Porcupine River area; 6, Yukon-Nation Rivers area; 7, Woodchopper area; 8, Seward Peninsula; 9, St. Lawrence Island; 10, southwestern Alaska, middle Kuskokwim River area; 11, southwestern Alaska, Goodnews area; 12, Fairbanks-Rampart area; 13, eastern Alaska Range; and 14, southeastern Alaska. See figure 7 for explanation of patterns.

(Eberlein and Churkin, 1970). Here the presence of *Stringocephalus* was recorded by Kirk (1927, p. 219) in a 1,000 foot thick relatively pure limestone (Wadleigh Limestone). The beds below *Stringocephalus* have yielded rugose corals of the families Digonophyllidae (*Digonophyllum*, *Mesophyllum*, and *Arcophyllum*) and Ptenophyllidae (*Acanthophyllum*). Also present are colonial Rugosa of the genera *Australophyllum*, *Xystriphyllum*, and *Loyolophyllum*. Abundant Rugosa in parts of the same limestone are large subcylindrical members of a new genus belonging to the *Acanthophyllum* group. None of these corals from southeastern Alaska seems conspecific or very closely related to Hume or Great Basin species. A large complex *Arcophyllum* is quite similar to *A. dachsbergi* (Vollbrecht) of middle Middle Devonian age in the Eifel district of Germany. These strata range upward from the Eifelian Stage into the *Stringocephalus*-bearing Givetian. *Sociophyllum* occurs high in the section, presumably below the top of the Middle Devonian.

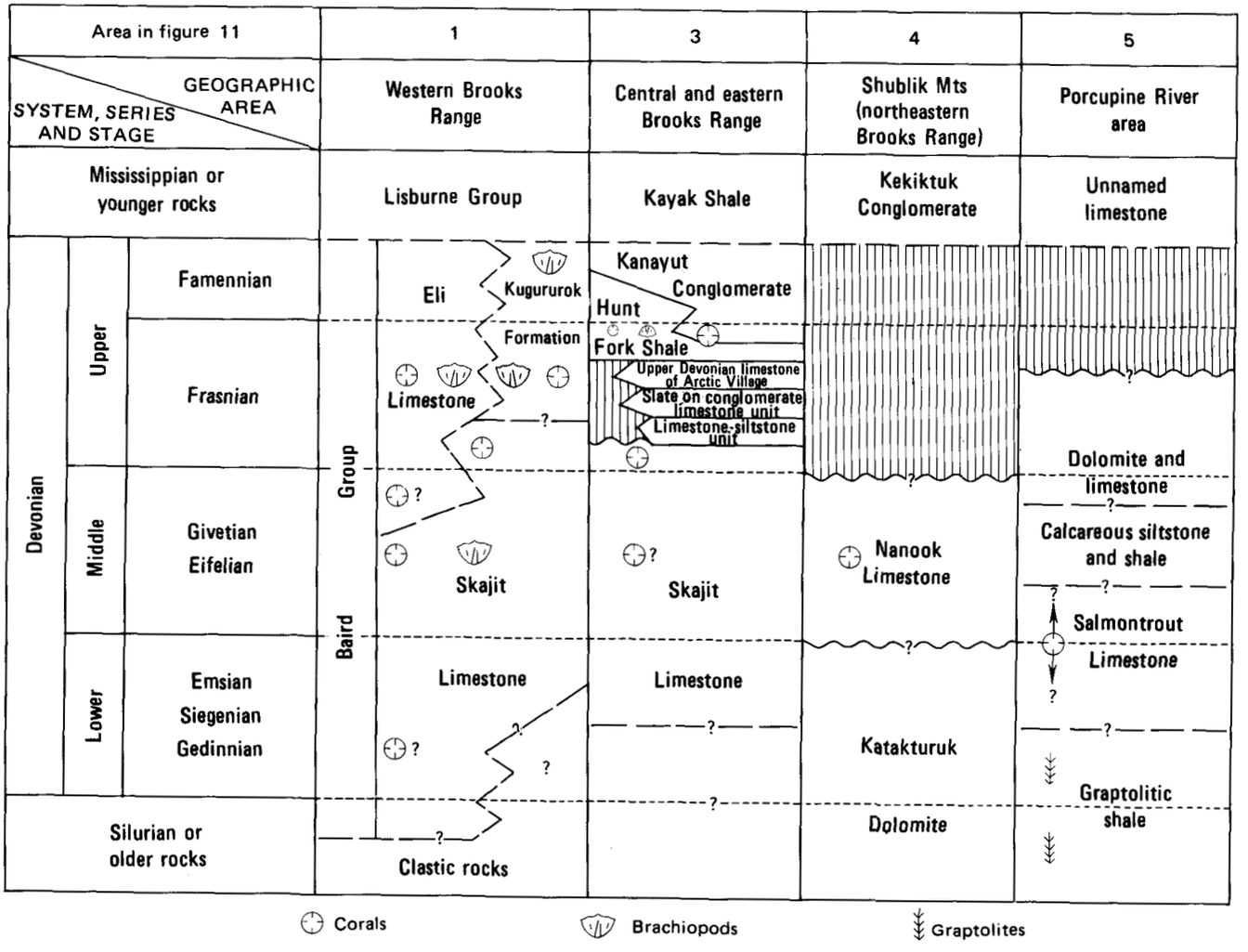


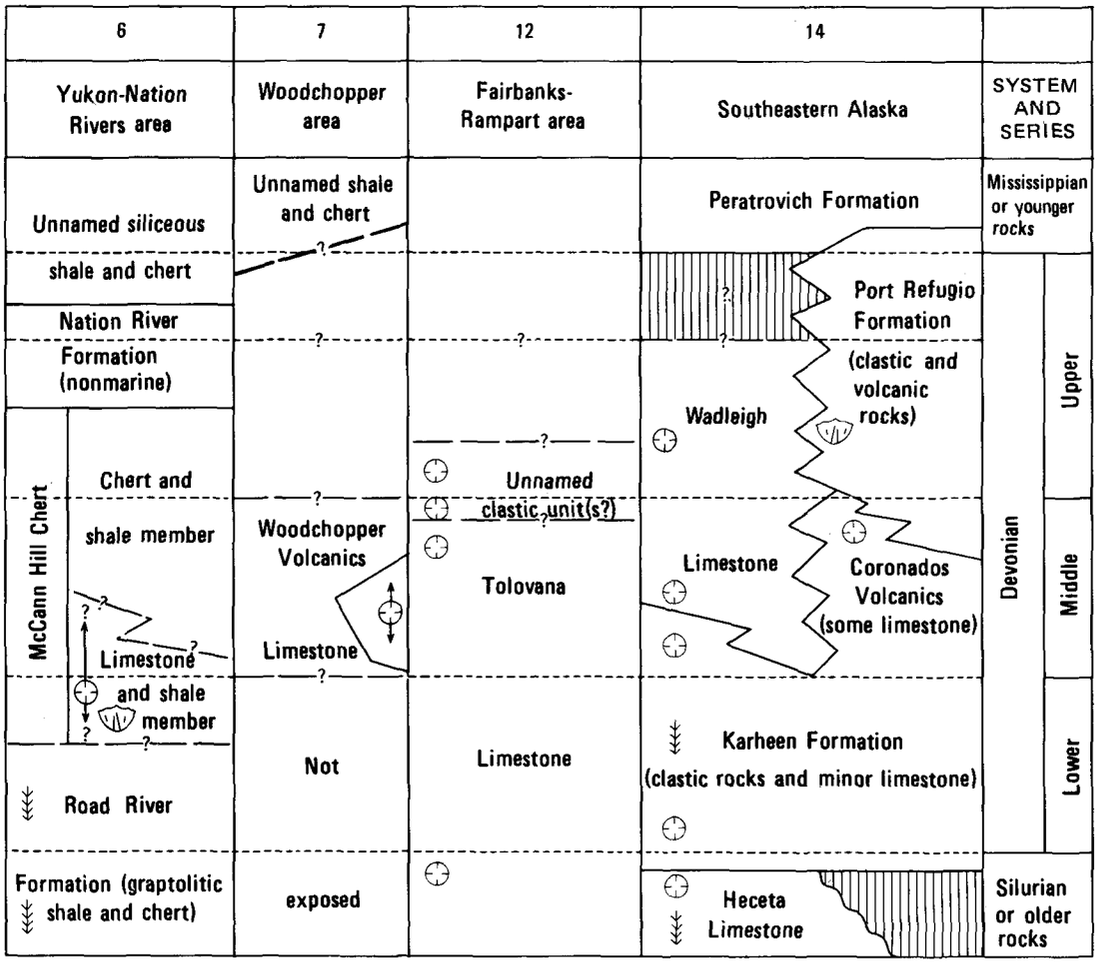
FIGURE 12.—Correlation chart of Devonian formations and other units cited in text. Approximate positions of coral assemblages are shown. Other symbols mark positions of fossils other than corals on which age determinations have been based. Sources of information are the authorities cited in the text, the coral data, and others as noted here: Area 1—Tailleur, Brosgé, and Reiser (1968) and Tailleur (written commun., 1972); area 3—Brosgé, Dutro, Mangus,

Of the more diagnostic colonial Rugosa in the Hume, Nahanni, and Great Basin coral faunas, the genus *Utaratuia* has not been found in southeastern Alaska, and *Sociophyllum* is known only from scrappy material at a single locality.

Colonial Rugosa of Late Devonian (Frasnian) age are well represented in the upper part of the Wadleigh Limestone near Craig, southeastern Alaska. These cosmopolitan faunas comprise diverse Phillipsastraeidae, such as *Phillipsastraea, Pachyphyllum, Peneckiella,* and *Macgeea.* A very large *Pseudamplexus* by itself might be regarded as considerably older and probably represents a homeomorph. Tabulate corals occur throughout the Devonian limestone of southeastern Alaska and include: *Alveolites, Coenites, Favosites, Heliolites, Parastriatopora, Syringopora,* and *Thamnopora.* These tabulates, although generally quite abundant, well preserved, and associated with massive stromatoporoids and *Amphipora,* are unstudied and provide a rich field for research.

PREVIOUS CORAL STUDIES

The first corals from Alaska to be described or illustrated were two Devonian species from the Porcupine River area (east-central Alaska) in Meek (1867). No further descriptions or illustrations appeared until 1937, and the first systematic study of any lower or middle Paleozoic coral assemblage from Alaska is only now in progress. The meager record of descriptions and illustrations of Alaska Ordovician, Silurian, and Devonian corals is summarized in the following paragraphs.



and Reiser (1962), Gryc, Dutro, Brosgé, Tailleur, and Churkin (1968), and Brosgé (written commun., 1972); area 4—Dutro (1970; oral commun., 1972); area 5—Churkin and Brabb (1968); areas 6 and 7—Churkin and Brabb (1965, 1968) and Brabb and Churkin (1969); area 12—Chapman, Weber, and Taber (1971); and area 14—Eberline and Churkin (1970).

Meek (1867) described two new species from the Devonian of the Porcupine River, Alaska. The specimens were subsequently redescribed or illustrated by Bassler (1937), Smith (1945), and Stumm (1951, 1955). The "Porcupine River" locality of Meek is apparently the Ramparts area in the northern Black River quadrangle (66°58′N., 142°45′W.), although Meek's coordinates do not quite agree with this. No newer specimens from this locality are included in the present study, and Meek's species have not been recognized in any of the other collections. The two species are as follows:

1. *Cyathophyllum arcticum* Meek
   Prismatophyllum quadrigeminum arcticum (Meek), Smith
   Hexagonaria arctica (Meek), Stumm

The lectotype (selected by Smith, 1945, p. 47) and two paralectotypes are in the U.S. National Museum of Natural History. The lectotype (USNM 140317) is clearly labeled Porcupine Valley. Early numbers and labels of the paralectotypes are confused, but Smith (p. 47, expl. pl. 99) can be interpreted as indicating that the specimen sectioned by him (USNM 14553a and British Museum Natural History R28674, R29959–61) is from the Porcupine locality also, while the other (USNM 14553b) is from a Canadian locality. The two Porcupine River specimens may not be conspecific because the lectotype has thicker and shorter(?) septa, more complete tabulae, and a narrower dissepimentarium than the paralectotype. The Canadian paralectotype (USNM 14553b) is very similar to the lectotype.

2. *Paleocyclus kirkbyi* Meek
   P. kirkbyi Meek, Bassler

Microcyclus? kirkbyi (Meek), Stumm

This must be judged principally by the original illustrations because the specimens have not been found (see also Bassler, 1937, p. 190, who apparently did not find them either). However, two specimens of *Microcyclus* from Devonian rocks near Norman Wells, Northwest Territories, Canada (USNM 139062), are smaller than Meek's specimen but otherwise look very much like the illustrations. These Canadian specimens support the probability that Meek's form is a Devonian *Microcyclus* rather than a Silurian *Paleocyclus*.

Meek (1867) also cited three additional species from the Porcupine Valley, Alaska; *Zaphrentis mcfarlanei* Meek, *Z. recta* Meek, and *Favosites polymorpha* Goldfuss. However, the illustrated specimens are from Anderson River, Canada, and we have not found any Alaska specimens in the type lots.

Smith (1945, expl. pl. 23) cited Meek's illustrated specimen of *Smithia verrilli* Meek as from the Porcupine Valley, but this is clearly an error as he gives the coordinates for Anderson River, Canada, and cites Anderson River in the text. Both Meek and the USNM label give Anderson River.

Oliver (1964) described and illustrated *Rhizophyllum* sp. B from Upper Silurian rocks and *R.* sp. A from Lower or Middle Devonian rocks in southeastern Alaska.

Bolton (1965, p. 21–22, pl. 7, fig. 4) briefly mentioned and illustrated *Labyrinthites* (*Labyrinthites*) sp. from Seward Peninsula Middle(?) or Upper Ordovician rocks (table 1).

Churkin and Brabb (1968, pls. 2 and 3) published two plates of illustrations of corals from east-central Alaska. These included one probable Silurian and seven Lower or Middle Devonian specimens from the Porcupine Valley and two Lower or Middle Devonian specimens from the Yukon Valley near the Canadian border. All of these are discussed in the section by Oliver.

Churkin, Eberlein, Hueber, and Mamay (1969, pl. 100) illustrated four corals from Noyes Island, southeastern Alaska.

Fritts (1970, figs. 7A, B, 8A, B) illustrated four corals from dolomitic limestone of Early or Middle Devonian age in the Cosmos Hills, north-central Alaska. These are listed with revised identifications in table 8.

Oliver, Merriam, and Churkin (1973) published six plates of corals in a preliminary version of this paper. These included Ordovician corals from the Don River area and east-central Alaska and Silurian and Devonian corals from southeastern Alaska. This work has been expanded, updated, and incorporated into the present report.

Merriam is preparing a monograph on certain Silurian and Devonian assemblages from southeastern Alaska. These are the first significant systematic studies of lower or middle Paleozoic corals from Alaska to be published.

Chudinova (in Chudinova, Churkin, and Eberlein, 1973) described five species of *Syringopora* and *Syringoporella* from Devonian rocks in southeastern Alaska.

ANNOTATED LISTS OF CORALS IDENTIFIED FROM VARIOUS ORDOVICIAN, SILURIAN, AND DEVONIAN ROCK UNITS IN ALASKA, EXCLUSIVE OF SOUTHEASTERN ALASKA

By WILLIAM A. OLIVER, JR.

The following annotated lists are an updated summary of more than 50 internal reports on several hundred lower and middle Paleozoic coral collections of the U.S. Geological Survey. The collections were mostly made by Survey geologists, but none was made by the author. The original identifications and reports were made by the author between 1957 and 1971, but all those noted here have been reexamined and updated for the purpose of this summary.

Most of the identifications are at the generic level, partly because of poor preservation in many areas but also because these assemblages are essentially unknown, undescribed, and usually are too small for valid comparisons with described material from western Canada or the eastern U.S.S.R. Where more detailed analyses have been made, this is indicated in the discussions or by species-level identifications or comparisons.

Generic level taxonomy is in an unsatisfactory state in many of the groups represented here, and some of my "genera" are certainly too inclusive. *Disphyllum* and *Hexagonaria* are particularly in need of revision, and both are used here in a very broad way. *"Macgeea"* may include some broken *Thamnophyllum*.

All collections are cataloged in either the U.S. Geological Survey Cambrian-Ordovician (–CO) or Silurian-Devonian (–SD) catalogs. For convenience the field numbers are also given. Most of these consist of a series of numbers and letters as follows: two digits indicate the year, the letter A stands for Alaska, two letters indicate the collector, and the following digits (and letters) the individual collection for that year and collector. The collections are located only by latitude and longitude, but more descriptive information is available in the catalogs

and in the fieldbook files of the Geological Survey. Illustrated specimens are deposited in the U.S. National Museum of Natural History (USNM) and are assigned USNM numbers in the plate explanations. Other specimens are in the collections of the U.S. Geological Survey, Washington, D.C.

The general geographic framework used is that of Dutro (1956) and is indicated in text figures 7, 9, and 11. Sparse coral listings in pre-1955 publications are cited in Dutro (1956). Earlier coral collections are not included here unless they have been restudied in connection with recent projects.

Illustrated taxa are indicated by circles in the tables.

I wish to thank all the geologists who collected and submitted the corals from Alaska on which this review is based. Many of the collections were accompanied by information on the field setting of the corals that I have freely used. The following were particularly helpful in answering questions regarding stratigraphy and structure, for critically reviewing pertinent parts of the manuscript, and for making suggestions for improvement: E. E. Brabb, W. P. Brosgé, R. M. Chapman, Michael Churkin, Jr., J. M. Hoare, D. H. Richter, I. L. Tailleur, F. R. Weber, U.S. Geological Survey, and C. E. Fritts, Alaska Geological Survey.

I am indebted to J. T. Dutro, Jr., for critically reading the whole manuscript and making many helpful suggestions and for answering innumerable questions about the geology of Alaska, not only during the preparation of this paper but also during the many years that I have been identifying corals from Alaska.

Almost all the thin sections were prepared by William C. Pinckney, Jr.

ORDOVICIAN CORALS OF ALASKA

SEWARD PENINSULA

The greatest number and variety of known Ordovician corals in Alaska are from the Teller 1:250,000 quadrangle in the western Seward Peninsula (fig. 7, area 1; fig. 8). The geology and stratigraphy of this area have been described by Sainsbury (1969a) and Sainsbury, Dutro, and Churkin (1971) and mapped by Sainsbury (1969b, 1972). Preliminary lists of corals prepared by Oliver are included in the first three of these publications.

A lower assemblage (table 1) contains only *Labyrinthites* (*Labyrinthites*) sp. (identified, discussed, and illustrated by Bolton, 1965, p. 21–22, pl. 7, fig. 4) and *Reuschia* sp. Bolton considered the *Labyrinthites* to be of Middle Ordovician age but did not discuss this assignment. Sainsbury (1969a, p. 30–31; in Sainsbury and others, 1971, p. 56) considered the field evidence to indicate a Middle Ordovician age, but the fossils on which this determination was based were not associated with the corals. *Labyrinthites* occurs in both Middle and Upper Ordovician rocks (Bolton, 1965, p. 23); *Reuschia* is uncommon but previously known only from the Upper Ordovician (and Lower Silurian(?)). I conclude that the assemblage is late Middle to early Late Ordovician in age but almost certainly older than the Late Ordovician assemblage discussed in the next paragraph.

TABLE 1.—*Middle or Upper Ordovician corals, Seward Peninsula*

[⊕, illustrated on pl. 1]

	USGS coln. No.			
	5517-CO	5518-CO	5514-CO	4280-CO
Labyrinthites (Labyrinthites) sp.	+	----	----	⊕
Reuschia sp.	+	+	+	----

A second and much larger assemblage of corals is known from several collections. For convenience it is termed the *Catenipora* assemblage because specimens of one or more species of this genus occur in all known collections. The assemblage includes several elements of the Bighorn–Red River fauna of western and arctic North America, and several of the genera (marked * on table 2) are thought to be limited to rocks of Late Ordovician or younger age on a worldwide basis. With the present data Sainsbury's suggestion (in Sainsbury and others, 1971, p. 56–57) that these corals might be late Middle Ordovician seems untenable.

TABLE 2.—*Upper Ordovician corals, Seward Peninsula*

[*, limited to rocks of Late Ordovician or younger age. ⊕ illustrated on pl 1, 2, or 3]

	USGS coln. No.									
	4407-CO	6025-CO	6747-CO	6746-CO	6026-CO	6748-CO	6749-CO	5513-CO	5516-CO	5515-CO
**Agetolites* sp.	--	--	--	⊕		--	--	--	--	--
**Bighornia* sp.	--	--	--	+		--	--	--	--	--
Calapoecia sp.	--	--	--	--		--	--	--	--	+
**Catenipora* sp.	--	--	+	--		--	--	--	--	--
**C.* sp. cf. *C. rubra* Sinclair and Bolton	--	--	--	--		--	⊕	+	--	?
**C.* sp. cf. *C. robustus* (Wilson)	--	--	--	--		--	--	--	⊕	--
C. sp. C	⊕	+	--	+		--	--	+	--	+
C. sp. D	--	+	--	+		+	+	--	⊕	+
C. sp. E	--	--	--	--		--	--	--	⊕	+
**C.* sp. cf. *C. jacovikii*	--	+	--	--		--	+	+	--	--
**Cyathophylloides* sp. A	⊕	--	--	+		--	⊕	+	--	--
**Mesofavosites* sp	--	--	--	⊕		--	--	--	--	--
Palaeofavosites sp.	--	--	--	+		--	--	--	--	--
**Pycnolithus?* sp. A	⊕	--	--	--		--	--	--	+	+
Rhaphidophyllum sp. A	?	+	--	--		--	⊕	--	--	+
Tollina sp	--	--	--	⊕		--	+	--	--	--
Trabeculites sp.	+	--	--	--		--	--	--	--	--

LAKE MINCHUMINA AREA

A single small collection from Lake Minchumina area, southwestern Alaska, contains *Saffordophyllum*. The collection could be of either Middle or Late Ordovician age (USGS coll. 3856–CO, Mount McKinley D–5 quad.). "The fossils came from a limestone lens, less than 2 ft. thick, from a lithologic unit which is primarily buff-weathering, light gray, medium to fine grained, fairly massive quartzite and medium light gray slate." (F. R. Weber, written commun., 1972).

FAIRBANKS-RAMPART AREA

In the White Mountains north of Fairbanks (fig. 7, area 3), the 2,500-foot Tolovana Limestone (see Silurian and Devonian discussions below) is above the Fossil Creek Volcanics, reportedly of Ordovician age (see fig. 10). The massive limestone and dolomite of the Tolovana is directly underlain by several feet of poorly exposed tuffaceous carbonate rock containing tabulatomorph corals in growth position (Michael Churkin, Jr., R. M. Chapman, and F. R. Weber, field observations, 1968). The tuff grades downward into a thick conglomerate made of volcanic and plutonic rock boulders which in turn lies on a section, thousands of feet thick, of siliceous clastic rocks and pillow lavas, the Fossil Creek Volcanics proper (Chapman, Weber, and Taber, 1971).

Two collections from the tuffaceous limestone contain the following corals (⊕ illustrated on pl. 4):

	USGS colln. No.	
	7092–CO	7093–CO
Chaetetipora sp. cf. *C. ellesmerensis* Norford	⊕	⊕
Palaeofavosites sp.	--	+
Calapoecia sp.	⊕	--
Cerioid rugose coral (new genus?)	--	+

Norford (1971) described *C. ellesmerensis* and listed associated corals that are collectively of undoubted Late Ordovician age. The collections from the tuffaceous limestone are of this age also as indicated by the presence of *Calapoecia*.

EAST-CENTRAL ALASKA

A few Ordovician corals (table 3) are known from both the Porcupine River area and the Yukon-Nation Rivers area (fig. 7, areas 4 and 5; fig. 8). Most of these are clearly Late Ordovician in age. Collections 6275–CO and 7091–CO may be Middle Ordovician, but both taxa in 6275–CO are similar and possibly conspecific with corresponding forms in 7089–CO, and a Late Ordovician age for this collection too seems most likely. The assemblage contains characteristic elements of the Bighorn–Red River fauna of the Great Basin and Western Canada, as was briefly noted by Oliver (in U.S. Geological Survey, 1962, p. A52). Collection 7094–CO contains only *Sarcinula* and may be Early Silurian in age, but Late Ordovician seems much more likely based on the field relationships. The Ordovician stratigraphy of these areas has been reviewed by Churkin and Brabb (1965) and Brabb (1967). Part of the area is included on the map by Brabb (1970).

TABLE 3.—*Middle(?) and Upper Ordovician corals, east-central Alaska*

[⊕, illustrated on pl. 5]

	USGS colln. No.						
	Yukon-Nation Rivers area		Porcupine River area				
	D1071–CO	4387–CO	7031–CO	7089–CO	6275–CO	7091–CO	7094–CO
Bighornia sp.	--	--	⊕	+	--	--	--
Calapoecia sp.	--	+	--	--	--	+	--
Catenipora sp.	--	+	--	+	--	--	--
Deiracorallium sp.	--	--	⊕	?	--	--	--
Grewingkia sp.	⊕	?	--	--	--	--	--
Palaeofavosites sp	--	--	--	⊕	?	--	--
Saffordophyllum sp.	--	--	--	--	--	+	--
Sarcinula sp.	--	--	--	--	--	--	⊕
Tetradium sp.	--	--	--	+	⊕	--	--

SILURIAN CORALS OF ALASKA

The largest known Alaska assemblage of Silurian corals is from southeastern Alaska. Parts of this assemblage are being described by Merriam and are summarized in his section of this paper. Other known large Silurian assemblages are from east-central Alaska and the Seward Peninsula. These and other smaller assemblages are discussed here.

SEWARD PENINSULA

A sequence of collections made in the Don River area by J. T. Dutro, Jr., and Michael Churkin, Jr., contains the most varied assemblage of Silurian corals known from the study area (fig. 9, area 1; fig. 10). The geology of the area and the measured section from which most of the collections came were described and diagrammed by Sainsbury, Dutro, and Churkin (1971). Preliminary lists of corals were included, but these are here extended and modified, and several of the corals illustrated on plates 6–9.

The collections listed in table 4 are Silurian; corals from the Ordovician part of the measured section are listed and discussed in the Ordovician part of this section.

TABLE 4.—*Middle*(?) *and Upper Silurian corals, Seward Peninsula*

[⊕, illustrated on pl. 6, 7, 8, or 9. The location of the measured section and of the two additional collections is shown in Sainsbury, Dutro, and Churkin (1971, fig. 2). See Sainsbury, Dutro, and Churkin (1971, fig. 3) for location of field numbers]

	USGS colln. No.										
	Don River measured section, oldest → youngest										
	8337–SD	8338–SD	8339–SD	8340–SD	8341–SD	8342–SD	8343–SD	8344–SD	8345–SD	7593–SD	7731–SD
Field No.	19	20	21	22	23	24	25	26	27	(4)	(2)
Alveolites sp.	--	--	--	--	+	--	--	--	--	+	--
Aulopora sp.	--	--	--	--	--	--	--	--	+	--	--
Halysitidae	--	+	+	+	+	--	+	--	--	--	+
Catenipora sp.	--	+	--	--	--	--	--	--	--	--	?
Cystihalysites sp.	--	--	+	⊕	--	--	--	--	--	--	--
Favosites sp.	--	--	--	--	--	--	--	--	+	--	--
Mesofavosites sp. A	--	--	⊕	--	+	--	--	--	--	--	--
M. sp. B	+	⊕	+	+	+	--	+	+	--	--	--
Multisolenia sp. A	--	--	--	+	+	--	⊕	⊕	--	+	⊖
Pachyfavosites sp. A	--	--	--	--	--	--	--	+	+	⊕	--
Palaeofavosites sp. A	⊕	--	--	--	--	--	--	--	--	--	--
P. sp. B	⊕	--	--	--	--	--	--	--	--	--	--
Parastriatopora sp. A	--	--	--	+	--	--	--	+	--	⊕	--
Syringopora sp.	--	--	--	+	?	--	--	--	+	--	+
cf. *Syringoporinus* sp.	--	--	--	--	--	--	--	--	--	--	⊕
Thecostegites? sp.	--	--	--	--	--	--	--	+	--	--	--
Helioplasmolites sp.	--	--	--	--	+	--	--	--	--	--	--
Stelliporella sp.	--	--	--	--	--	--	⊕	--	--	--	--
Amplexoides sp.	--	--	--	--	--	+	--	--	--	--	--
Contortophyllum sp.	--	--	--	--	⊕	--	--	⊕	--	--	⊕
cf. *Craterophyllum* sp.	--	--	--	--	--	--	--	+	--	--	--
Cyathactis sp. B	--	--	--	--	--	--	--	⊕	--	+	--
Cystiphyllum sp.	--	--	--	--	+	--	--	--	--	⊕	--
Entelophyllum? sp.	--	--	--	--	⊕	--	--	--	--	--	--
Lamprophyllum sp.	--	--	--	--	--	--	--	--	--	--	⊕
"*Nipponophyllum*" sp cf. *N. aseptatum* Ivanvosky.	--	--	--	--	--	--	⊕	--	--	--	--
cf. *Miculiella* sp.	--	--	--	--	--	--	--	--	--	⊕	--
Tryplasma sp.	--	--	--	--	--	--	--	--	--	⊕	--

The lowest two collections (8337–SD and 8338–SD) are dated as Silurian on the presence of *Pentamerus* sp. and *Conchidium*? sp. as noted below. The highest collection (8345–SD) also contains Silurian brachiopods, including *Atrypa* sp., "*Camarotoechia*" sp. cf. "*C.*" *winiskensis* Whiteaves, and *Strophonella* sp. (J. T. Dutro, Jr., written commun., 1972).

The presence of *Pachyfavosites* and *Contortophyllum* and of a *Thecostegites*-like form in the upper two collections (8344–SD and 8345–SD) strongly suggests a Ludlovian age. *Helioplasmolites* and *Contortophyllum* in collection 8341–SD indicate a probable early Ludlovian age. None of the lower collections contains particularly diagnostic genera, but the presence of *Mesofavosites* sp. B throughout the whole sequence suggests that the lower collections may not be much older than the upper ones. Pentamerid brachiopods in the lower two collections are late Wenlockian or Ludlovian in age, according to J. T. Dutro, Jr., and A. J. Boucot (in Sainsbury and others, 1971, p. 56). These supplement the coral data and makes it very likely that the listed corals are all late Wenlockian (?) and Ludlovian in age.

Two other collections (7593–SD and 7731–SD) are not from the measured section but are from less than a mile away. These collections contain many of the same taxa and are probably of the same age.

SOUTHWESTERN ALASKA

Three collections from the middle Kuskokwim area (fig. 9, area 2) are small but contain some taxa not known elsewhere in Alaska. One collection (6452–SD) from the northwest part of the Lime Hills quadrangle contains *Ketophyllum* sp., *Lykocystiphyllum*? sp., and three additional solitary rugosans that have not been generically identified (pl. 11). The collection is probably Wenlockian or Ludlovian in age.

A second collection (8927–SD) contains cylindrical fragments of *Microplasma*? sp. (pl. 11). These have the characters of typical Gotland *Microplasma*, but the identification is queried because the growth form is not known. The fragments are dated as Late Silurian on the presence of a large *Kirkidium* and other brachiopods (J. T. Dutro, Jr., oral commun., 1972).

The third collection (6449–SD), from the western part of the McGrath quadrangle, is a problem in that it includes apparent Ordovician elements in addition to Silurian ones:

1. *Favosites* s. s. sp.
2. *Syringopora* sp.
3. *Holacanthia*? sp.
4. *Catenipora* sp.
5. *Brachylasma*? sp.
6. *Tollina* sp.
7. *Trabeculites* sp.

Forms 1–3 are indicative of Silurian age and 4 is of a morphology common in the Silurian and uncommon in the Ordovician. Form 5 is closest to a species described from Llandoverian Age rocks. Forms 6 and 7 represent Upper Ordovician taxa, but neither appears conspecific with any forms assigned to the same genera in my Alaska Ordovician lists, so possibly they are holdovers into the Silurian. If the collection is considered as a unit, an Early Silurian (Llandoverian) age seems most likely, although a Late Ordovician age cannot be completely ruled out. Possibly, however, the collection is mixed either through sedimentary reworking or through collecting across an unrecognized stratigraphic break.

Additional small collections that are not listed either here or in the Devonian discussion contain miscellaneous favositids and *Syringopora*? sp. and may be of either Silurian or Devonian age.

FAIRBANKS-RAMPART AREA

Five small collections (table 5), from the Livengood quadrangle, comprise the known Silurian corals from the Fairbanks-Rampart area (fig. 9, area 3; fig. 10). All five are from the lowest part of the Tolovana Limestone, most of which is of Devonian age (see "Devonian Corals"). The collections are from similar basal beds in the formation in a relatively small area and are considered to be of the same approximate age for this reason. Four of the collections are clearly Silurian because of the presence of *Halysites* and *Mesofavosites* or probable *Heliolites* associated with a halysitid. *Mesofavosites* sp. cf. *M.* sp. B is very similar to a form common in the Seward Peninsula Silurian already discussed. There it is part of a large assemblage of probable late Wenlockian(?) or Ludlovian Age. Two of the collections (8300–SD and 8302–SD) contain *Pentamerus* or *Pentameroides* which indicate a late Llandoverian to Wenlockian Age (J. T. Dutro, Jr., written commun., 1972). The combination of brachiopods and corals makes a Wenlockian Age seem most likely.

TABLE 5.—*Middle(?) Silurian corals, Fairbanks-Rampart area*

[⊕, illustrated on pl. 10]

	USGS colln. No.				
	8300–SD	8301–SD	8302–SD	8920–SD	8921–SD
Catenipora? sp.	--	--	--	--	+
Favosites sp.	--	+	--	--	--
Halysites sp.	?	--	+	--	--
Heliolites? sp.	--	--	--	--	+
Mesofavosites sp.	--	--	--	⊕	--
M. sp. cf. *M.* sp. B	+	--	--	--	--
Palaeofavosites sp.	--	--	--	⊕	--
Undetermined rugosan	--	+	--	--	--

EASTERN BROOKS RANGE

Only one Silurian coral collection is available from the Brooks Range (fig. 9, area 4). This is small and contains only two forms (8913–SD; pl. 10, figs. 1, 2, and 7):

Striatopora sp.
Stauria sp.

The Silurian age is based on the presence of a colonial rugose coral assigned to *Stauria*. This has a wide dissepimentarium (unlike the type species) but is very similar to the type in all other morphologic details. The most likely age range is Ludlovian.

PORCUPINE RIVER AREA

Two collections (table 6) from southeast of the extensive area of Devonian collections discussed below and close to the international boundary contain a varied assemblage of Silurian corals (fig. 9, area 5; fig. 10). The two collections are from a sequence of cherty limestone and calcilutite containing interbedded dolomite (Brosgé and Reiser, 1969, map unit SO 1). Collection 8083–SD was collected from beds 100 to 200 feet stratigraphically higher than 8086–SD. The corals indicate a Wenlockian Age (Middle Silurian), probably early Wenlockian, by comparison with similar corals described from the U.S.S.R. (see Ivanovsky, 1965, and 1969 for summary).

Churkin and Brabb (1968, p. 240, pl. 3, fig. 2a, b) illustrated one probable Silurian coral from this area as "New genus and species similar to Silurian coral from Masket Shale of Nevada." Lavrusevich (1967) named and described the genus as *Maikottia* at almost the same time; he based his work on Late Silurian corals from the Tadzhikistan S.S.R. The Alaska coral is a float specimen (collected near beds containing Late Silurian and earliest Devonian graptolites) that Churkin and Brabb compared to an undescribed form from Silurian rocks in Nevada. Based on their comparison and on the Tadzhikistan occurrence, the age of the Alaska *Maikottia* sp. is probably also Late Silurian.

TABLE 6.—*Middle Silurian corals, Porcupine River area*

[⊕, illustrated on pls. 12, 13]

	USGS colln. No.	
	8083–SD	8086–SD
Catenipora sp.	+	--
Favosites sp.	+	--
Halysites sp.	+	--
Heliolites sp.	+	--
Aphyllum sp.	--	⊕
Cyathactis sp. A	⊕	?
Holacanthia sp.	⊕	--
cf. *Palaeophyllum* sp.	⊕	--
Ptychophyllum? sp.	+	--
Pycnactis? sp.	--	⊕
Rhabdacanthia sp.	⊕	--
Tabularia sp.	⊕	--
Zelophyllum sp.	--	⊕

DEVONIAN CORALS OF ALASKA

Gryc, Dutro, Brosgé, Tailleur, and Churkin (1968) provided an excellent summary of the Devonian stratigraphy and history of Alaska. Several

TABLE 7.—*Lower(?), Middle, and Upper Devonian corals, western Brooks Range*

[⊕, illustrated on pl. 14 or 15. Collections are grouped stratigraphically in accordance with field observations of I. L. Tailleur (written commun., 1972). See fig. 12]

	USGS colln. No.																			
	Skajit(?) Limestone													Eli Ls.		Kugururok Fm.				
	7169–SD	8788–SD	7989–SD	7995–SD	7993–SD	8789–SD	8790–SD	8795–SD	8794–SD	8793–SD	8798–SD	8796–SD	8797–SD	7168–SD	7986–SD	7988–SD	8299–SD	7991–SD	7990–SD	8914–SD
Amphipora sp.	--	--	--	?	+	--	--	+	+	--	--	--	+	--	+	--	+	--	+	--
Alveolites sp.	--	--	--	--	--	--	--	+	--	--	--	--	--	+	--	--	--	--	--	--
Auloporoids	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--
Cladopora sp.	--	+	+	--	--	+	+	--	--	--	--	--	--	+	?	+	+	--	--	--
Favosites sp.	--	--	--	--	--	--	--	+	--	--	--	--	--	+	--	--	--	--	--	--
Syringopora sp. A	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thamnopora sp.	--	+	--	--	--	⊕	+	+	--	+	+	--	+	?	+	--	+	--	--	--
Acanthophyllum sp.	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	?	--	--	--	--
Cystimorph, solitary	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cystimorph, phaceloid	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cf. *Dendrostella* sp. (not *rhenana*)	--	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--
Disphyllum sp.	--	⊕	--	+	--	⊕	--	--	--	--	+	--	--	--	--	+	--	--	--	?
D. sp. cf. *D. catenatum* Smith	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--
Macgeea sp.	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Peneckiella sp.	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	--	--
Pseudotryplasma sp. cf. *P. altaicus*	--	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--
Tabulophyllum sp.	--	?	+	--	--	--	--	--	--	--	--	--	--	--	--	⊕	--	--	+	+
Taimyrophyllum sp. A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--
Tryplasma sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--

papers in the Proceedings of the Geological Seminar on the North Slope of Alaska (Adkison and Brosgé, 1970) provide useful syntheses of the structural and stratigraphic framework for the northern Alaska coral assemblages.

BROOKS RANGE

WESTERN BROOKS RANGE

The geologic setting of the corals in the western Brook Range (fig. 11, area 1; fig. 12) is described as follows (I. L. Tailleur, written commun., 1972):

The Devonian System in the Delong and Baird Mountains is represented by carbonate rocks assigned to the Baird Group and clastic rocks assigned to the Endicott Group (Tailleur, Brosgé, and Reiser 1968, p. 1349–1354; Brosgé and Tailleur, 1971, p. 73–75). Relations between the groups have been obscured by intense structural foreshortening. The depositional regime seems to have consisted of a clastic wedge (Endicott Group) derived from a tectonic land lying to the north and a broad, carbonate bank (Baird Group) that persisted off shore to the south. The stratigraphy of the Baird Group, which has yielded most of the coral collections, is poorly known. It locally encompasses Lower, Middle and Upper Devonian rocks, and in one section near the base of the Baird Group, Ludlovian brachiopods have been identified (J. T. Dutro, Jr., written communication, 1968). The Baird Group is conformably overlain by carbonate rocks of the Mississippian Lisburne Group.

The presence of *Acanthophyllum*, cystimorphs, a *Dendrostella*-like form, *Pseudotryplasma*, *Taimyrophyllum*, and *Tryplasma* suggests that at least five of the collections (table 7) are Middle Devonian or even Early Devonian in age. Five other collections having *Macgeea*, *Peneckiella*, and *Tabulophyllum* are more likely Frasnian, although these genera are known to occur also in Middle Devonian rocks elsewhere. The coral collections are from the Baird Group. Most of the corals suggestive of Middle Devonian age are from the Skajit Limestone, whereas most of those suggestive of the Frasnian are from the Skajit, Eli, and Kugururok Formations, in accordance with interpretations shown in figure 12 (and in Tailleur and others, 1968, fig. 7). The apparent occurrences of *Taimyrophyllum* sp. A and *Acanthophyllum*? sp. in the Eli and Kugururok are anomalous.

COSMOS HILLS AREA

A limestone-dolomite unit of Devonian age, referable to the Baird Group, has been mapped along the south edge of the Brooks Range, particularly in the Cosmos Hills and Jade Mountains in the southern part of the Ambler River (1:250,000) quadrangle (fig. 11, area 2) (Patton and others, 1968; see also Fritts, 1970, who covers part of this area in greater detail). These rocks are mostly of Early and Middle Devonian age (Emsian, Eifelian, and Givetian?), as indicated by *Emmonsia*, *Diplochone*, *Pseudotryplasma*, and *Taimyrophyllum* in various collections. Late Devonian rocks are probably included in some places (J. T. Dutro, Jr., oral commun., 1972), but of the corals, only the possible *Smithiphyllum* in one collection is suggestive of the Frasnian. Older Devonian (pre-Emsian) or even Silurian faunas may

TABLE 8.—*Lower(?) and Middle Devonian corals, Cosmos Hills area*

[⊕, illustrated on pl. 14 or 15]

	USGS colln. No.																
	Jade Mountains							Cosmos Hills[1]									
	7983–SD	7982–SD	7981–SD	6667–SD	6668–SD	7985–SD	6669–SD	8742–SD	6462–SD	8740–SD	8741–SD	7471–SD	7659–SD	6460–SD	7980–SD	8738–SD	6461–SD	8739–SC	7996–SD
Amphipora sp.	--	--	--	--	+	?	+	--	--	--	--	--	--	--	--	--	--	+	+
Alveolites sp.	+	--	+	--	--	--	--	--	--	--	--	--	+	+	--	?	--	--	--
Auloporoids	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--
Cladopora sp.	--	--	?	--	+	--	--	--	--	--	--	--	--	+	--	--	--	--	--
Emmonsia sp.	--	--	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--
Favosites sp.	--	--	+	--	--	--	--	--	--	+	+	--	--	+	--	+	--	--	--
cf. *Roemeria* sp.	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Syringopora sp. A	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	+	--	--	--
S. sp.	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--
Thamnopora sp.	--	+	+	+	+	--	+	--	+	--	--	+	--	--	--	?	--	--	--
Cystimorph, solitary	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diplochone sp.	--	--	--	--	--	⊕	--	--	--	--	--	--	--	--	--	--	--	--	--
Pseudotryplasma sp. cf. *P. altaica*	--	--	?	--	--	--	--	--	--	--	--	--	+	?	--	+	+	--	--
cf. *Smithiphyllum* sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	+
Taimyrophyllum sp. A	--	--	--	--	--	--	--	--	--	--	--	--	⊕	+	⊕	?	--	--	--
Tryplasma sp.	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

[1] All collections except 8742–SD and 7996–SD, which may be stratigraphically higher, are apparently from the same carbonate unit (I. L. Tailleur, written commun., 1972); see distribution of collections on map by Patton, Milley, and Tailleur (1968).

be represented by collection 7983–SD (with *Tryplasma*). Corals in this group of collections are poorly preserved and species-level comparisons are made in only a few cases (table 8).

CENTRAL AND EASTERN BROOKS RANGE

The stratigraphy of this area (fig. 11, area 3; fig. 12) was described by Brosgé, Dutro, Mangus, and Reiser (1962), who included preliminary lists of corals (identified by me) and brachiopods in their report. Parts of the area are on geologic maps by Brosgé and Reiser (1964, 1965, 1971). The rocks are dominantly clastic, and tabulates are the most common corals. Among the Rugosa, phillipsastraeids are relatively common. This family is generally limited to rocks of Frasnian age in North America. Pre-Devonian corals are known from only one locality in this area.

The Skajit Limestone is of Early(?), Middle(?), and Late Devonian age. Several collections are almost certainly Frasnian, although most of the studied collections cannot be so restricted; none is definitely Middle Devonian.

Four units overlying the Skajit also contain corals and are of Frasnian age. These are, in ascending order: (1) limestone-siltstone (locally absent), (2) slate-conglomerate-limestone, (3) Upper Devonian limestone of Arctic Village, and (4) Hunt Fork Shale (W. P. Brosgé, written commun., 1972; Brosgé and Reiser, 1965; Brosgé and Tailleur, 1971, table 1). In table 9 the coral collections are grouped according to their source unit as indicated by Brosgé.

The four Frasnian rock units are overlain by the Kanayut Conglomerate of probable Late Devonian age (fig. 12; Brosgé and others, 1962, p. 2182). Because a single specimen of *Phillipsastraea* sp. was collected from a thin bed of sandy limestone in this formation a Frasnian Age is suggested for at least this part of it (6417–SD).

An apparent fault block of limestone in the Kanayut Conglomerate yielded one collection containing the following corals (6434–SD):

Thamnopora sp.
Disphyllum?
Hexagonaria sp. A

This collection is Middle or Late Devonian, but more likely the latter as the *Hexagonaria* is very similar to and probably conspecific with specimens from the Upper Devonian limestone of Arctic Village.

A second collection from the same(?) fault block is apparently Silurian in age and includes the only pre-Devonian corals known from the Brooks Range (see "Silurian Corals.")

SHUBLIK MOUNTAINS, NORTHEASTERN BROOKS RANGE

The above collections are all from the "southern belt" of Brosgé, Dutro, Mangus, and Reiser (1962). Four collections (table 10) containing corals are available from the "northern belt." These are from the Nanook Limestone in the Shublik Mountains (fig. 11, area 4; fig. 12) (Dutro, 1970) and are Middle(?) Devonian in age.

EAST-CENTRAL ALASKA

PORCUPINE RIVER AREA

The geology and stratigraphy of this area (fig. 11, area 5; fig. 12) have been described by Churkin and Brabb (1968). The largest and most varied coral

TABLE 9.—*Middle(?) and Upper Devonian corals, central and eastern Brooks Range*

[⊕, illustrated on pl. 14 or 15. Units are listed from oldest to youngest (left to right). See fig. 12]

USGS colln. No. — Skajit Limestone

	6406–SD	6419–SD	6432–SD	6412–SD	6429–SD	6439–SD	6418–SD	5727–SD	6440–SD	6430–SD	6422–SD
Amphipora sp.	--	+	--	--	--	--	--	--	--	--	+
Alveolites sp.	--	+	--	--	--	--	--	--	--	--	--
Aulopora sp.	--	--	--	--	--	--	--	--	--	--	--
Aulocystis sp.	--	--	--	--	--	--	--	--	--	--	--
Cladopora sp.	+	--	+	--	--	--	--	--	--	+	--
Favosites sp.	--	--	?	--	+	--	--	+	+	--	--
Pachyfavosites? sp.	--	--	--	--	--	--	--	--	--	--	--
Syringopora sp.	--	--	--	--	--	--	--	--	--	--	--
Thamnopora sp.	--	+	--	+	--	+	--	--	--	?	+
"*Breviphyllum*" sp.	--	--	--	--	--	--	--	--	--	--	--
Disphyllum sp.	--	--	--	--	--	--	+	--	--	--	--
Charactophyllum sp.	--	--	--	--	--	--	--	--	--	--	--
Hexagonaria sp. A	--	--	--	--	--	--	--	--	--	--	--
H. sp.	--	--	--	--	--	--	--	--	--	+	--
Macgeea sp.	--	+	--	--	--	--	--	--	--	--	--
Phillipsastraea sp.	--	--	--	--	--	--	--	--	--	--	--
Smithiphyllum sp.	--	--	--	--	--	--	?	--	--	--	--
Tabulophyllum sp.	--	--	--	--	--	--	--	--	--	--	--
Thamnophyllum sp.	--	+	--	--	--	--	--	--	--	--	+

USGS colln. No. — Limestone-siltstone unit

	7469–SD	6402–SD	6403–SD	6411–SD	6421–SD	6438–SD	7467–SD	7468–SD	6395–SD
Amphipora sp.	--	+	--	--	--	--	--	+	--
Alveolites sp.	--	--	+	--	+	--	--	--	+
Aulopora sp.	--	--	--	--	+	--	--	--	--
Aulocystis sp.	--	--	--	--	--	--	--	--	--
Cladopora sp.	--	--	--	+	+	+	--	--	--
Favosites sp.	--	--	--	--	--	--	--	--	--
Pachyfavosites? sp.	--	--	--	--	--	--	--	--	--
Syringopora sp.	--	--	--	--	--	--	--	--	--
Thamnopora sp.	+	--	--	--	--	--	+	+	--
"*Breviphyllum*" sp.	--	--	--	--	--	--	--	--	--
Disphyllum sp.	--	--	--	--	--	--	--	--	--
Charactophyllum sp.	--	--	--	--	--	--	--	--	--
Hexagonaria sp. A	--	--	--	--	--	--	--	--	--
H. sp.	--	--	--	--	--	--	--	--	+
Macgeea sp.	+	+	--	+	--	--	--	--	--
Phillipsastraea sp.	--	--	--	--	--	--	--	--	--
Smithiphyllum sp.	--	--	--	--	--	--	--	--	--
Tabulophyllum sp.	--	--	--	--	--	--	--	--	--
Thamnophyllum sp.	--	--	--	--	--	--	--	--	--

USGS colln. No. — Slate-conglomerate-limestone unit

	6398–SD	6399–SD	6400–SD	6401–SD	6396–SD	6425–SD	6408–SD	6413–SD	6414–SD	6415–SD	6416–SD	6407–SD	6426–SD
Amphipora sp.	--	--	--	--	+	+	--	--	--	+	--	--	--
Alveolites sp.	+	--	--	+	--	--	--	--	--	--	--	--	--
Aulopora sp.	--	--	--	--	--	--	--	--	--	--	--	--	--
Aulocystis sp.	--	--	--	--	+	--	--	--	--	--	--	--	--
Cladopora sp.	--	+	+	+	--	--	--	--	--	--	--	--	--
Favosites sp.	--	--	--	--	--	--	--	--	--	--	--	--	--
Pachyfavosites? sp.	--	--	--	--	--	--	--	--	--	--	--	--	--
Syringopora sp.	--	--	--	--	--	--	+	+	--	--	--	--	--
Thamnopora sp.	+	+	--	+	+	+	+	+	+	--	--	--	+
"*Breviphyllum*" sp.	--	--	--	+	--	--	--	--	--	--	--	--	--
Disphyllum sp.	--	--	--	--	--	+	+	⊕	--	+	--	+	+
Charactophyllum sp.	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexagonaria sp. A	--	--	--	--	--	--	+	--	--	--	--	--	--
H. sp.	--	--	--	--	--	--	--	--	--	--	--	--	--
Macgeea sp.	+	--	--	--	--	--	--	--	--	--	--	--	--
Phillipsastraea sp.	--	--	--	+	--	--	--	--	--	+	+	--	--
Smithiphyllum sp.	+	--	--	--	--	--	--	--	--	--	--	--	--
Tabulophyllum sp.	--	--	--	--	--	--	+	--	--	--	--	--	--
Thamnophyllum sp.	?	+	--	?	--	--	--	--	--	--	+	?	--

USGS colln. No. — Upper Devonian limestone of Arctic Village; Hunt Fork Shale

	Upper Devonian limestone of Arctic Village				Hunt Fork Shale						
	8791–SD	8792–SD	8910–SD	8911–SD	6394–SD	6409–SD (6424–SD)	6423–SD	6420–SD	6410–SD	6436–SD	6427–SD
Amphipora sp.	--	--	+	--	--	--	--	--	--	--	--
Alveolites sp.	--	--	--	--	+	--	+	--	--	--	+
Aulopora sp.	--	--	--	--	--	--	--	--	--	+	--
Aulocystis sp.	--	--	--	--	--	--	--	--	--	--	--
Cladopora sp.	--	--	--	--	--	+	--	+	--	--	--
Favosites sp.	--	--	--	--	--	--	--	--	--	--	--
Pachyfavosites? sp.	--	⊕	--	--	--	--	--	--	--	--	--
Syringopora sp.	--	--	+	--	--	--	--	--	--	--	--
Thamnopora sp.	--	+	+	+	--	+	+	--	--	+	--
"*Breviphyllum*" sp.	--	--	--	--	--	--	--	--	--	--	--
Disphyllum sp.	--	--	⊕	--	?	+	--	--	--	--	--
Charactophyllum sp.	--	--	--	--	--	--	--	--	+	--	--
Hexagonaria sp. A	+	⊕	--	--	--	--	--	--	--	--	--
H. sp.	--	--	--	--	--	--	--	--	--	?	--
Macgeea sp.	--	--	--	--	+	--	--	--	+	--	+
Phillipsastraea sp.	--	--	--	+	--	--	--	+	--	--	--
Smithiphyllum sp.	--	--	--	--	--	--	--	--	+	--	--
Tabulophyllum sp.	--	--	--	--	--	--	--	--	--	--	--
Thamnophyllum sp.	--	--	--	--	--	+	--	--	--	--	--

TABLE 10.—*Middle(?) Devonian corals from the Nanook Limestone, Shublik Mountains*

	USGS colln. No.			
	8303–SD	8915–SD	8916–SD	8917–SD
Amphipora sp.	+	--	--	--
Favosites sp.	+	+	+	+
Syringopora sp.	--	--	+	+
S. sp. cf. *S.* sp. A	+	--	--	--
Thamnopora sp.	+	--	--	--
Hexagonaria sp.	+	--	--	--
cf. *Pseudamplexus* sp.	--	--	+	+

assemblage is that of the Salmontrout Limestone of Emsian or Eifelian Age. Churkin (in Churkin and Brabb, 1968) illustrated a number of corals from this formation (1968, pl. 2, figs. 3–5; pl. 3, figs. 1, 3–5) and listed more (1968, table III, p. 240). The identifications were by Churkin but partly based on my earlier identifications of the similar McCann Hill Chert corals. I have reexamined all the coral thin sections Churkin used in that report. My revised identifications, using the same nomenclature as for the following McCann Hill lists, are given in table 11 with the corresponding Churkin identification and illustration where appropriate. No illustrations of Salmontrout corals are included in this summary, but several of the listed forms are illustrated from the McCann Hill Chert assemblage.

Churkin and Brabb (1968, p. 237–239) and Churkin and Carter (1970, p. 55–56) discussed the age of the Salmontrout Limestone and concluded that it was entirely Early Devonian, principally on the basis of an analysis of the tentaculitids and its position directly above lowermost Devonian graptolitic shale. The corals are most similar to Asiatic Russian species considered to be Eifelian (Middle Devonian) by Soshkina (1952) and Bulvanker (1958). In North America, the closest similarities are with Middle Devonian corals from western Canada. The corals then, suggest an early Middle Devonian age for the Salmontrout Limestone, but Early Devonian corals from surrounding areas are not well enough known for this to be definitive.

A few additional data are available from just east of the area of the Salmontrout Limestone. *Xystriphyllum*? sp. cf. F. *schluteri* is present in collection 8079–SD, and probable *Amphipora* are known from two collections (8072–SD and 8084–SD). A fourth collection (8087–SD) contains *Heliolites* sp. (pl. 13, figs. 8, 9) and *Pachyfavosites* sp. This could be either Late Silurian or Devonian, but Brosgé and Reiser (1969, map unit Dls) consider it to come from the same rock unit as 8079–SD and to be Devonian.

Southwest of the Salmontrout area, in the Black River 1:250,000 quadrangle, two more collections add different taxa:

USGS colln. 6456–SD: *Hexagonaria* sp. (pl. 18, figs. 10, 11)

7394–SD: *Amphipora* sp.
Thamnopora sp.
Disphyllum sp.

The two localities are plotted on the geologic map of this area (Brabb, 1970).

YUKON-NATION RIVERS AND WOODCHOPPER AREAS

The stratigraphy of these areas (fig. 11, areas 6, 7; fig. 12) was discussed by Churkin and Brabb (1965) and is shown on a geologic map by Brabb and Churkin (1969). Most of the Devonian corals come from two units: (1) the limestone and shale member (250 ft thick) that forms the lower part of the McCann Hill Chert in the triangular area formed

TABLE 11.—*Lower or Middle Devonian corals from the Salmontrout Limestone, Porcupine River area*

[Churkin's list and cited illustrations are from Churkin and Brabb (1968). See discussion in text]

Oliver list	Churkin list	Churkin illustrations
Favosites sp. A	Part *Favosites* sp., corallites <1 mm	----------
F. sp. B	*F.* sp., corallites biomodal	----------
Fasciphyllum sp. (phaceloid)	*Fasciphyllum* sp	----------
Hexagonaria sp.	*Hexagonaria* sp	Pl. 3, fig. 1a, b
Spongophyllum sp. C	*Spongophyllum halysitoides* Etheridge	Pl. 3, fig. 4a, b
	Utaratuia cf. *U. laevigata*	Pl. 3, fig. 5a, b
Utaratuia sp.	*U.* cf. *U. laevigata*, corallites >5 mm	----------
Xystriphyllum sp. cf. *Stenophyllum devonicum* Bulvaker.	*Xystriphyllum* sp	----------
X. sp. cf. *Stenophyllum gorskii* Bulvanker	*X.* sp. cf. *Fasciphyllus submassivum* Bulvanker	----------
X. sp. B	*X.* sp	----------
X. sp. E	*X.* sp. cf. *Stenophyllum devonicum* Bulvanker	Pl. 2, fig. 3a, b
X.? sp. cf. *Fasciphyllum schluteri* Soshkina	"*Fasciphyllum*" sp. cf. *F. schluteri* Soshkina	Pl. 3, fig. 3a, b
New genus A (astreoid ptenophyllid) sp. A	*Billingsastraea* sp	Pl. 2, figs. 4a, b, 5a, b
New genus A sp. B	Not listed or illustrated	----------

by the Yukon and Nation Rivers and the international boundary (fig. 11, area 6) and (2) bioclastic limestone (a few hundred feet thick) interbedded with the Woodchopper Volcanics exposed along the Yukon River, 65 miles west of the international boundary (fig. 11, area 7).

The McCann Hill assemblage is characterized by species of *Xystriphyllum, Spongophyllum, "Fasciphyllum,"* and *Acanthophyllum* and is very similar to the Salmontrout fauna of the Porcupine River area. Churkin and Brabb (1965) and Churkin and Carter (1970, p. 56) suggested that the fauna is Emsian (late Early Devonian) in age, but the closest affinities of the corals are to species described from units considered Eifelian (Middle Devonian) in age by Soviet paleontologists, as noted by Oliver (in U.S. Geological Survey, 1964, p. A133). Most of the comparable U.S.S.R. corals are from faunas described from the Kuznetsk Basin by Bulvanker (1958) and considered Eifelian by her and by Hill (1967) in her general review of U.S.S.R. coral faunas. Some similarities with Canadian Middle Devonian corals can also be noted. In any case the assemblage is probably older than most of the Brooks Range Devonian assemblages.

Corals from limestones associated with the Woodchopper Volcanics (table 12) are mostly tabulates and only a few solitary rugosans. However, the presence of *Acanthophyllum* (*Acanthophyllum*) sp. and *Plasmophyllum* (*Mesophyllum*) sp. indicates an Early or Middle Devonian age. Some of the *Favosites* in this unit are similar to ones from the McCann Hill Chert, and I conclude that the Woodchopper limestone corals are approximately the same age as the McCann Hill corals.

A small collection from the unit mapped as Devonian limestone (Brabb and Churkin, 1969) includes *Aulocystis* sp. and *Thamnopora* sp. and may be part of the same Woodchopper associated unit (7188–SD; 63AGs501; 63°31.7′N., 142°53.7′W.).

SEWARD PENINSULA

Devonian and probable Devonian collections from the Seward Peninsula (fig. 11, area 8) are few, small, and mostly consist of thamnoporoid corals or *Amphipora,* generally not in close association. Only four collections are listed and discussed.

One collection (8297–SD) from the north-central part of the Teller quadrangle is probably of Middle or Early Late Devonian (Frasnian) age:

Alveolites sp.
Thecostegites sp. (pl. 20, figs. 13, 14).

Farther east, just southeast of the Darby Mountains in the Solomon quadrangle, three small collections (table 13) include a variety of tabulate corals and branching stromatoporoids that are of the same general age.

ST. LAWRENCE ISLAND

Devonian rocks have been recognized here (fig. 11, area 9) only recently (Patton and Dutro, 1969) and are considered a continuation of the Seward Peninsula belt (J. T. Dutro, Jr., oral commun., 1972). Several collections from the eastern end of the island contain *Amphipora, Favosites,* and *Thamnopora* and are probably Middle Devonian or Frasnian in age. The rocks are dolomitized, and preservation of the fossils is poor.

SOUTHWESTERN ALASKA

In this large region, Devonian corals are listed only from small areas southeast of the middle Kuskokwim River in the McGrath and Sleetmute quadrangles (fig. 11, area 10) and near Kuskokwim Bay in the Goodnews quadrangle (fig. 11, area 11). The largest assemblage of collections (table 14) is from the southwestern part of the McGrath quadrangle. Identified forms are listed and are Middle Devonian in age if they can be considered as a unit.

Collection 7698–SD is dated on the basis of *Antherosalpinx* sp., a commensal "worm" associated with *Favosites* (pl. 20, figs. 1, 2). This type of "worm" tube is elsewhere known only from rocks of Emsian and Eifelian Age (Sokolov, 1962; Oekentorp, 1969).

Southwest of the McGrath area, in the southeastern part of the Sleetmute quadrangle, three small collections (table 15) are Devonian or probably Devonian. Two of these contain *Dendrostella* and are most likely Givetian in age. The third collection includes *Parastriatopora* and could be either Silurian or Devonian. Cady, Wallace, Hoare, and Webber (1955) reported Devonian corals from the Holitna Group in this same general area.

One hundred and eighty miles west-southwest of this area, near Kuskokwim Bay, Hoare (1961, p. 598: Hoare and Coonrad, 1961, loc. 25) reported Devonian corals from a small area south of the Kanektuk River (Goodnews quad.) (fig. 11, area 11). These were originally assigned to the Devonian and identified by J. M. Berdan (written commun. to J. M. Hoare, 1950) as a disphyllid having horseshoe dissepiments and *Cladopora* sp. I have reexamined the collection and would now list the forms as:

Cladopora sp.
Thamnophyllum sp.

The age is Middle or Late Devonian, probably Frasnian.

TABLE 12.—*Lower or Middle Devonian corals, Yukon-Nation Rivers area*

[⊕ illustrated on pl. 16–19]

	USGS colln. No.																															
	Corals from McCann Hill Chert																								Limestone associated with Woodchopper Volcanics							
	Monument 104 Funnel Creek area				Jones Ridge area								McCann Hill to Montauk Bluff area						Nation River area				Tindir Creek area										
	6441–SD	6442–SD	6443–SD	6444–SD	6825–SD	7172–SD	7178–SD	7177–SD	7176–SD	7175–SD	6320–SD	7174–SD	7173–SD	6455–SD	7185–SD	7181–SD	7180–SD	6829–SD	6830–SD	6824–SD	6823–SD	6822–SD	6445–SD	7179–SD	6826–SD	7183–SD	7184–SD	7182–SD	7186–SD	6454–SD	7187–SD	6447–SD	6446–SD	6831–SD	6828–SD
Alveolites sp.	--	?	+	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	+	--	--	+	--
Aulocystis sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	?	--	--	--	--
Cladopora sp.	--	--	+	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--	+	--	--	+	--	--	--	--
Favosites sp.	?	+	--	--	--	--	--	--	--	--	--	--	--	--	+	--	+	--	--	--	--	⊕	--	--	--	--	+	⊕	--	--	?	--	--	+
F. sp. A	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	⊕	+	--	--	--	+	cf.	--	--	--	--	--	--	?	--	--	--
F. sp. B	--	--	?	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	?	--	--	--	--	--	--	+	--	--	--	--	--	--	--
F. sp. C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	⊕	--	--	--	--	--	--	--	--	--	--
F. sp. D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	+	--	--	--	--
Echyropora? sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	⊕	--	⊕	--	+	+	--	--	--	--	--	--	--	--	--	--	--
Thamnopora sp.	?	--	+	--	--	--	--	?	+	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	+	--	--	--	--	+	--	--	+	--
Acanthophyllum (*Acanthophyllum*) sp.	--	--	--	--	--	--	⊕	--	--	--	--	--	--	⊕	--	--	--	--	+	--	--	--	--	--	--	--	+	--	⊕	--	--	--	--	--
Cyathophyllum (*Peripaedium*) sp. cf. *Keriophyllum* sp. F. McLaren	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexagonaria sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	⊕	--	--	--	--	--	+	--	--	--	+	--	--	--	--	--	--	--
Peneckiella sp. A (cerioid)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	⊕	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Plasmophyllum (*Mesophyllum*) sp.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	⊕	--	--	--	--
Spongophyllum sp. A	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	--	⊕	⊕	--	+	--	+	--	+	--	--	--	--	--	--	--	--	--	--
S. sp. B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	⊕	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Syringazon (s. l.) sp.	--	--	--	--	--	--	--	--	--	--	⊕	--	+	--	--	--	--	--	--	--	--	--	--	--	+	?	--	--	--	--	--	--	--	--
Xystriphyllum sp. cf. *Stenophyllum devonicum* Bulvanker	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--
X. sp. cf. *Stenophyllum gorskii* Bulvanker	--	--	--	+	--	--	+	--	--	+	--	--	--	--	--	--	+	+	--	⊕	--	--	--	+	--	--	--	--	--	--	--	--	--	--
X. sp. B	--	--	--	--	--	--	--	--	--	+	--	--	--	--	--	--	⊕	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
X.? sp. cf. *Fasciphyllum schluteri* Soihkina	--	--	--	--	⊕	+	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 13.—*Devonian corals, Seward Peninsula*

	USGS colln. No.		
	8731–SD	8732–SD	8733–SD
Amphipora sp.	+	--	+
Idiostroma? sp.	--	--	+
Cladopora sp.	+	--	--
Syringopora sp. A	--	+	--
Thamnopora sp.	+	?	?

TABLE 14.—*Middle*(?) *Devonian corals, McGrath quadrangle*

[⊕, illustrated on pl. 20 or 21]

	USGS colln. No.							
	5592–SD	7691–SD	7692–SD	7693–SD	7695–SD	7696–SD	7698–SD	7699–SD
Alveolites sp.	--	--	--	+	--	--	--	+
Cladopora sp.	--	--	--	+	--	--	--	--
Favosites sp.	--	+	+	+	+	+	⊕	+
Heliolites sp.	--	--	--	--	--	--	⊕	--
Pachyfavosites sp.	--	⊕	--	--	--	--	--	⊕
Syringopora sp.	--	--	--	--	+	--	--	--
Thamnopora sp.	--	--	--	+	?	--	--	+
Grypophyllum sp.	--	--	--	+	--	--	--	--
cf. *Neostringophyllum* sp.	⊕	--	--	--	--	--	--	--
cf. *Siphonophrentis* sp.	--	--	--	--	--	--	--	+
Sociophyllum sp. cf. *S. glomerulatum* (Crickmay)	--	--	--	--	⊕	--	--	+

TABLE 15.—*Middle Devonian corals, Sleetmute quadrangle*

[⊕, illustrated on pl. 20, figs. 9, 10]

	USGS colln. No.		
	6448–SD	6450–SD	6451–SD
Auloporoid coral	--	--	+
Favosites sp.	+	--	+
Parastriatopora sp.	⊕	--	--
Dendrostella sp. cf. *D. rhenana* (*Frech*)	--	+	+

FAIRBANKS-RAMPART AREA

The Tolovana Limestone in this area (fig. 11, area 12; fig. 12) is mostly of Devonian age but includes some Silurian in some areas (J. T. Dutro, Jr., oral commun., 1972; see under "Silurian Corals.") Several collections (table 16) containing *Dendrostella* sp. cf. *D. rhenana* and *Amphipora* sp. are probably of Givetian Age. One collection contains *Amphipora* and a distinctive phaceloid cystimorph of a type that has been erroneously referred to *Pseudomicroplasma* by some authors. For convenience, the Tolovana collections are grouped as the *Dendrostella* assemblage and the *"Pseudomicroplasma"* assemblage in table 16. Numerous additional Tolovana collections (not listed) contain only *Amphipora* or *Favosites* or *Heliolites* and are probably Devonian also.

TABLE 16.—*Middle Devonian corals, Fairbanks-Rampart area*

[⊕, illustrated on pl. 20 or 21. D, *Dentrostella* assemblage; P, *"Pesudomicroplasma"* assemblage; S, *Sociophyllum* assemblage; A, *Alveolites* assemblage. See text]

	USGS colln. No.								
	Tolovana Limestone							Clastic unit(s)	
	D						P	S	A
	6383–SD	7341–SD	6457–SD	6458–SD	8918–SD	8922–SD	6433–SD	8717–SD	8919–SD
Amphipora sp.	+	+	+	+	--	--	+	--	--
Alveolites sp.	--	--	--	--	--	--	--	--	+
Cladopora sp.	--	--	--	--	--	--	--	+	--
Heliolites sp	--	--	--	--	--	--	--	⊕	--
Syringopora sp.	--	--	--	--	--	+	--	+	--
Thamnopora sp.	--	--	--	--	--	--	--	+	+
Dendrostella sp. cf *D. rhenana* (Frech)	+	+	⊕	⊕	+	+	--	--	--
Grypophyllum sp.	--	--	--	--	--	--	--	+	--
"Pseudomicroplasma" sp.	--	--	--	--	--	--	⊕	--	--
Sociophyllum sp. cf. *S. glomerulatum* (Crickmay).	--	--	--	--	--	--	--	+	--

A much larger and more diverse coral assemblage is known from an unnamed clastic unit in the same area. This is termed the *Sociophyllum* assemblage. It has no significant corals in common with the Tolovana Limestone, although *Favosites, Cladopora,* and *Thamnopora* probably do appear in both units. This assemblage is Middle Devonian and probably Givetian in age. Much of the field work in this area has been done by F. R. Weber, who considers the clastic unit to be "probably slightly younger than the Tolovana" (written commun., 1972; Chapman, Weber, and Taber, 1971).

A fourth Devonian assemblage from this area is higher stratigraphically but from the same or another clastic unit. Locally at least this contains abundant *Alveolites* (8919–SD) and few other corals (*Alveolites* assemblage in table 16). Poorly preserved brachiopods are probably of Frasnian Age (J. T. Dutro, Jr., oral commun., 1972).

EASTERN ALASKA RANGE

Three collections (table 17) from the eastern Alaska Range are probably of Middle Devonian age.

TABLE 17.—*Middle*(?) *Devonian corals, eastern Alaska Range*

	USGS colln. No.		
	8102–SD	8729–SD	8730–SD
Amphipora sp.	+	--	--
Alveolites? sp.	--	+	--
Cladopora sp.	--	+	--
Favosites sp.	--	?	+
Thamnopora sp.	--	+	+
Acanthophyllum sp.	--	+	--

These are from lenses of massive recrystallized limestone within a polymetamorphic terrane of phyllite, metaconglomerate, quartz mica schist, micaceous quartzite, and minor greenstone in an area north of the Denali fault (fig. 11, area 13) (Neal Matson, written commun., 1970; D. H. Richter, written commun., 1972).

LOCALITY DATA

The basic locality data for all the collections listed in this part of the paper are given below. Catalog and field numbers are listed by geologic period and geographic area in the same order as they are treated in the text. All quadranges are in the Alaska 1:250,000 series. Most of the collections were made by U.S. Geological Survey geologists. In these, the collector is indicated by the field number in accordance with the following abbreviations. Collectors not employed by the Survey are credited in footnotes on the individual lists.

Ba	E. E. Brabb	Mt	J. B. Mertie, Jr.
Be	W. P. Brosgé	P	L. M. Prindle
Bk	J. O. Berkland	Pa	W. W. Patton, Jr.
Bo	A. L. Bowsher	Rb	F. R. (Robinson) Weber (also Wr)
Ch	R. M. Chapman	Rh	D. H. Richter
Cn	Michael Churkin, Jr.	RJ	R. J. Ross, Jr.
Du	J. T. Dutro, Jr.	Rr	H. N. Reiser
Gk	Donald Grybeck	Sn	C. L. Sainsbury
Hp	D. M. Hopkins	Tb	Bond Taber
Hr	J. M. Hoare	Te	R. L. Taylor
Km	L. B. Kellum	Tr	I. L. Tailleur
Mm	T. P. Miller	Wr	F. R. Weber
Mn	N. A. Matson, Jr.		

Collections of Ordovician corals

USGS colln. No.	Field No.	Latitude north	Longitude west
SEWARD PENINSULA, TELLER QUADRANGLE			
[*, locality show on map in Sainsbury, Dutro, and Churkin (1971, p. 53)]			
4280–CO	63ASn860	65°33′	167°18′
4407–CO	63ASnDR1	65°29.2′	166°54.3′
*5513–CO	65ASnPG4	65°29.7′	166°58.6′
5514–CO	65ASn53	65°30.5′	167°01.8′
*5515–CO	65ASn64	65°29.3′	166°56.6′
*5516–CO	65ASn78	65°24.1′	166°57.6′
*5517–CO	65ASn85	65°34.1′	166°59.3′
*5518–CO	65ASn278	65°33.9′	166°55.9′
6025–CO	66ASn371	65°30.0′	166°30.8′
6026–CO	66ASn442	65°29.8′	166°56′
*6746–CO	68ADu16		
*6747–CO	68ADu17	Same as 6746 but stratigraphically higher.	
6748–CO	68ADu28	65°29.5′	166°56.6′
6749–CO	68ADu29	65°29.4′	166°56.6′
LAKE MINCHUMINA AREA, MOUNT McKINLEY QUADRANGLE			
3856–CO	59ARb86	65°53.0′	152°09.6′

Collections of Ordovician corals—Continued

USGS colln. No.	Field No.	Latitude north	Longitude west
FAIRBANKS-RAMPART AREA, LIVENGOOD QUADRANGLE			
[These two collections are probably from the same site]			
7092–CO	09AP87	65°37′	147°21′
7093–CO	68ACn1751	65°37′20″	147°21′12″
EAST-CENTRAL ALASKA			
Charley River quadrangle			
D1071–CO	62RJR–4	65°06′	141°03′
4387–CO	63ABa3333M	65°06.3′	141°01.0′
Black River quadrangle			
7031–CO	61ABa1493	66°34.3′	142°33.8′
7089–CO	64ADu44	66°59.9′	143°05.4′
7091–CO	41AMt39	Approximately the same as 7089.	
7094–CO	[1]25504–3	66°50.0′	141°13.6′
Coleen quadrangle			
6275–CO	67ARr445	67°12.5′	141°17.7′

[1] Collected by geologists of the Standard Oil Company of California.

Collections of Silurian corals

USGS colln. No.	Field No.		Latitude north	Longitude west
SEWARD PENINSULA, TELLER QUADRANGLE				
Don River measured section				
[Measured section and additional collection sites are shown in Sainsbury, Dutro, and Churkin (1971, fig. 2)]				
8345–SD	68ADu 27	Top	65°30.0′	166°55.7′
8344–SD	68ADu 26			
8343–SD	68ADu 25			
8342–SD	68ADu 24			
8341–SD	68ADu 23			
8340–SD	68ADu 22			
8339–SD	68ADu 21			
8338–SD	68ADu 20			
8337–SD	68ADu 19	Base	65°29.6′	166°55.8′
Additional collections				
7593–SD	65ASn 79		65°29.4′	166°55.2′
7731–SD	66ASn 444C		65°29.2′	166°56.2′
SOUTHWESTERN ALASKA				
McGrath quadrangle				
6449–SD	[1]FET 1690		62°32.5′	154°51′
8927–SD	65AHr37		62°07.5′	155°01.7′
Lime Hills quadrangle				
6452–SD	[1]WCG 215		61°45.2′	155°44′

[1] Collected by geologists of Union Oil Co.

FAIRBANKS-RAMPART AREA			
Livengood quadrangle			
8300–SD	68AGk431	65°32′30″	147°31′36″
8301–SD	68ACh323f	65°27′10″	147°44′00″
8302–SD	68ACh296f	65°32′07″	147°31′42″
8920–SD	68ACn1861B	65°33′50″	147°30′02″
8921–SD	68ACn1861C	Same site but approx 50 feet stratigraphically higher.	

Collections of Silurian corals—Continued

USGS colln. No.	Field No.	Latitude north	Longitude west
EASTERN BROOKS RANGE, ARCTIC QUADRANGLE			
8913–SD	[2]256009–9	68°09′	144°17.3′
PORCUPINE RIVER AREA, COLEEN QUADRANGLE			
8083–SD	67ABe 367-B	67°05.8′	141°01.5′
8086–SD	67ABe 367		

[2] Collected by geologists of the Standard Oil Company of California.

Collections of Devonian corals

USGS colln. No.	Field No.	Latitude north	Longitude west
BROOKS RANGE			
Western Brooks Range			
De Long Mountains quadrangle			
8299–SD	68ATr182.4	68°15′	162°04.5′
Noatak quadrangle			
7169–SD	[1]Babcock 22423	67°15′	162°34′
8788–SD	66ABe228	67°37′	162°17′
Misheguk Mountain quadrangle			
7991–SD	66ATr151	68°14.5′	161°10′
7990–SD	66ATr141	68°14′	159°29.5′
*8914–SD	[2]17334–53–54	68°27.9′	160°53.1′
Baird Mountains quadrangle			
7989–SD	66ATr103	67°49.5′	161°55.5′
8793–SD	66ARr60	67°22′	161°53′
7986–SD	66ARr158	67°47.5′	161°52′
7988–SD	66ARr158A		
8798–SD	66ATr48	67°21.9′	161°51.8′
8796–SD	66ARr86	67°22′	161°50′
8797–SD	66ARr89	67°24′	161°40′
7995–SD	66ARr111	67°40.5′	161°22.5′
7993–SD	66ATr109.5	67°40′	161°21′
8794–SD	66ARr69	67°32′	161°19′
8789–SD	66ARr185A	67°41.5′	161°11′
8790–SD	66ARr185B		
8795–SD	66ARr73	67°36.5′	161°04′
7168–SD	[1]Babcock 22820	67°28′	160°53′

[1] Collected by Bear Creek Mining Co. geologists.
[2] Collected by geologists of the Standard Oil Company of California.

Cosmos Hills area (Ambler River quadrangle)[1]

Jade Mountains

7983–SD	66APa99	67°14.2′	158°07.7′
7982–SD	66APa98	67°15.0′	158°06.3′
7981–SD	66APa97	67°14.8′	158°05.8′
6667–SD	[2]Babcock 120	67°14.4′	158°05.2′
6668–SD	[2]Babcock 119	67°15.6′	158°04.3′
7985–SD	66ATr18	67°15.4′	158°00.0′
6669–SD	[2]Babcock 117	67°15.2′	158°00.7′
Cosmos Hills[3]			
8742–SD	[4]69A34b	67°04.0′	157°15.2′
6462–SD	[2]Lehner	67°01.2′	157°03.2′
8740–SD	[4]69A12f	67°00.9′	157°01.6′
8741–SD	[4]69A13g	67°03.2′	156°56.7′
7471–SD	65ABe74A	67°03.1′	156°53.6′
7659–SD	65ABe66	67°02.7′	156°53.7′
6460–SD	[2]Read A		
7980–SD	66ABe104		
8738–SD	[4]69A6		

Collections of Devonian corals—Continued

USGS colln. No.	Field No.	Latitude north	Longitude west
BROOKS RANGE—Continued			
Cosmos Hills area (Ambler River quadrangle)—Continued			
Cosmos Hills—Continued			
6461–SD	[2]Read B	67°01.9′	156°54.5′
8739–SD	[4]69A10b	67°02.0′	156°51.0′
7996–SD	65AMm34	67°00.9′	156°02′

[1] Most of these collection localities are marked on the published geologic map of this quadrangle (Patton and others, 1968).
[2] Babcock, Read, and Lehner collections were made by Bear Creek Mining Co. geologists.
[3] All except 8742–SD and 7996–SD, which may be higher stratigraphically, apparently are from the same carbonate unit (I. L. Tailleur, written commun., 1972).
[4] Collections of 69A series were made by C. E. Fritts of the Alaska Geological Survey and are marked (without numbers) on Fritts' map (1970, fig. 4a).

Central and eastern Brooks Range (Arctic, Chandalar, Christian, Philip Smith Mountains, and Wiseman quadrangles)

Skajit Limestone

[1]6406–SD	59ARr597	67°56′	149°24′
[1]6419–SD	60ARr397	67°53′	148°52′
[1]6432–SD	60ABe411	67°52′	148°42′
6412–SD	60ABe404	68°03′	148°11′
6429–SD	60ARr798	68°10.5′	147°20′
6439–SD	60ABe684	68°17.5′	147°10′
6418–SD	60ARr672	67°48′	146°40.5′
[2]5727–SD	60ARr782	68°04.5′	146°18′
[2]6440–SD	60ARr719	68°00.5′	146°15′
[2]6430–SD	60ARr785	68°11.5′	146°14′
[2]6422–SD	60ARr787	68°10.5′	146°08′
Unnamed limestone-siltstone unit			
[3,1]7469–SD	65ABe21	67°40′	151°59′
[1]6402–SD	59ABe523	67°46.5′	149°40′
[1]6403–SD	59ABe524	67°46.5′	149°40′
[1]6411–SD	60ABe394	67°59′	148°34′
[1]6421–SD	60ARr426	67°59.5′	148°29′
6438–SD	60ABe681	68°11′	147°05′
[3]7467–SD	65ABe29E	67°36.5′	151°53′
[3]7468–SD	65ABe29C		
[3]6395–SD	59ABe348	67°45′	150°45′
Slate-conglomerate-limestone unit			
[3]6398–SD	59ARr390	67°44′	150°12′
[3]6399–SD	59ARr439	67°46′	150°02′
[3]6400–SD	59ABe166(ARr173)	67°33′	152°03′
[3]6401–SD	59AKm40	67°34′	151°58′
[3]6396–SD	59ABe225	67°43′	151°32′
[2]6425–SD	60ABk203	68°09′	145°55′
[2]6408–SD	60ARr584	68°14′	145°53′
[2]6413–SD	60ABe549	68°12′	145°52′
[2]6414–SD	60ABe555	68°13′	145°50′
[2]6415–SD			
[2]6416–SD			
[2]6407–SD			
[2]6426–SD	60ABe557	68°12.5′	145°46′
Unnamed slate-sandstone unit			
6394–SD	59ABe360	67°42′	152°44′
6409–SD	60ARr420	68°04′	149°13′
(6424–SD)			
6423–SD	60ARr449	68°14′	148°59′
6420–SD	60ABe390	68°03′	148°56′
6410–SD	60ARr451	68°10.5′	148°39′
6436–SD	60ABe683	68°17′	147°05′
[2]6427–SD	60ABk202	68°08.5′	145°52′
Upper Devonian limestone of Arctic Village			
8791–SD	66ABe312B	68°12′	145°58′
8792–SD	66ABe312D		
8910–SD	[2]25576–7	68°10.7′	145°57.8′
8911–SD	[2]25576–11		

Collections of Devonian corals—Continued

USGS colln. No.	Field No.	Latitude north	Longitude west
BROOKS RANGE—Continued			
Central and eastern Brooks Range—Continued			
Kanayut Conglomerate			
[2]6417–SD	60ABe619	68°14.5′	144°54′
Fault block limestone in Kanayut Conglomerate			
[2]6434–SD	60ARr660	68°09′	144°18′
Shublik Mountains, northeastern Brooks Range (Mount Michelson quadrangle)			
8303–SD	68ARr4	69°31′25″	145°40′30″
8915–SD	69ADu28	69°31′38″	145°47′00″
8916–SD	69ADu29	69°31′55″	145°31′30″
8917–SD	69ARr43A		

[1] Locality shown on published map of Chandalar quadrangle (Brosgé and Reiser, 1964).
[2] Locality shown on open-file map of Arctic quadrangle (Brosgé and Reiser, 1965).
[3] Locality shown on open-file map of Wiseman and eastern Survey Pass quadrangles (Brosgé and Reiser, 1971).
[4] Questionably assigned to this unit.
[5] Collected by geologists of the Standard Oil Company of California.

EAST-CENTRAL ALASKA

Porcupine River area

Coleen quadrangle

[Localities plotted on map by Brosgé and Reiser (1969)]

8079–SD	67ARr464	67°13.3′	141°08.2′
8072–SD	67ARr442	67°13.5′	141°18′
8084–SD	67ABe411	67°01.5′	141°13.5′
8087–SD	67ABe417E	67°00.5′	141°20.5′
Black River quadrangle			
6456–SD	61ABa1463	66°29.8′	142°24.8′
7394–SD	61ABa1533	66°36.3′	142°49.8′

Yukon-Nation Rivers area (Charley River and Eagle quadrangles)

McCann Hill Chert

Monument 104-Funnel Creek area

6441–SD	60ABa83	64°59.7′	141°00.7′
6442–SD	60ABa84B	64°59.8′	141°00.8′
6443–SD	60ABa192	65°00.5′	141°02′
6444–SD	60ABa204	65°02.3′	141°03.7′

Jones Ridge area

6825–SD	62ABa2802	65°04.6′	141°01.8′
7172–SD			
7178–SD	63ABa3343D	65°04.8′	141°01.4′
7177–SD	63ABa3343C		
7176–SD	63ABa3343A		
7175–SD	63ABa3343		
6320–SD	62RJR17	65°06′	141°01.8′
7174–SD	63ABa3333P	65°06.3′	141°01.0′
7173–SD	63ABa3333N		

McCann Hill (105) to Mantauk Bluff

6455–SD	61ATe21	64°55.3′	141°00′
7185–SD	63ACn1514	64°57.2′	141°02.4′
7181–SD	63ABa3261D	64°57.2′	141°04.9′
7180–SD	63ABa3261C		
6829–SD	62ACn984	65°07′	141°23′
6830–SD	62ACn1032	65°07.8′	141°26.4′

Nation River area

6824–SD	62ABa2771H	65°16′	141°38.8′
6823–SD	62ABa2771G		
6822–SD	62ABa2771F		
6445–SD	60ABa632	65°16′	141°38.8′

Collections of Devonian corals—Continued

USGS colln. No.	Field No.	Latitude north	Longitude west
EAST-CENTRAL ALASKA—Continued			
Yukon-Nation Rivers area—Continued			
McCann Hill Chert—Continued			
Tindir Creek area			
7179–SD	62ABa2842	65°20.8′	141°03′
6826–SD	62ABa2842A		
[1]7183–SD	63ABa3521A	65°23.4′	140°59.8′
[1]7184–SD	63ABa3522	65°23.3′	140°59.7′
[1]7182–SD	63ABa3511	65°23.7′	140°59.7′

[1] Yukon Territory, Canada.

Limestone associated with the Woodchopper Volcanics

7186–SD	63ACn2001	65°27.3′	143°41.0′
6454–SD	61ABa1762	65°21.8′	143°35.7′
7187–SD	63ACn2013	65°21.6′	143°25.5′
6447–SD	60ABa1064	65°21.6′	143°25.5′
6446–SD	60ABa1063	65°21.9′	143°18.2′
6831–SD	62ACn321	65°21.9′	143°18.1′
6828–SD	62ACn453	65°21.8′	143°15′

SEWARD PENINSULA

Teller quadrangle

8297–SD	68ASn229A	65°	166°

Solomon quadrangle

8731–SD	70AMm199	64°52′	162°06′
8732–SD	70AMm202	64°51′	162°07′
8733–SD	70AMm206	64°37′	162°07′

SOUTHWESTERN ALASKA

McGrath (A–4, A–5) quadrangles

5592–SD	59ASn16	62°11′	154°54′
7691–SD	65AHr44	62°7.5′	155°5.6′
7692–SD	65AHr47–A	62°4.8′	155°7.6′
7693–SD	65AHr54	62°3.4′	155°8.4′
7695–SD	65AHr64	62°4.7′	155°9.4′
7696–SD	65AHr66	62°4.5′	155°9.4′
7697–SD	65AHr72	62°2.3′	155°12.3′
7698–SD	65AHr74	62°2.3′	155°13.0′
7699–SD	65AHr75–A	62°1.9′	155°13.6′

Sleetmute (A–3) quadrangle

[Collected by geologists of the Union Oil Co.]

6448–SD	FET 1633	61°6.4′	156°48.2′
6450–SD	WCG 186	61°6.7′	156°47.8′
6451–SD	WCG 187	61°6.5′	156°48′

Goodnews quadrangle

[Locality 25 on map by Hoare and Coonrad (1961)]

3000–SD	50AHr356	59°39′	160°52.5′

FAIRBANKS-RAMPART AREA

Livengood quadrangle

6383–SD	53ABo25	65°17′20″	148°09′
7341–SD	64AWr314		
8918–SD	71AWr189		
8922–SD	673Wr170		
6433–SD	60ATb178	65°05′35″	148°56′
8717–SD	70ACh313f	65°30′36″	148°33′10″
8919–SD	68ADu14	65°27′	148°45′

Kantishna River quadrangle

6457–SD	59AHp26	64°58′54″	150°08′42″
6458–SD	59AHp27	64°58′30″	150°11′13″

Collections of Devonian corals—Continued

USGS colln. No.	Field No.	Latitude north	Longitude west
	EASTERN ALASKA RANGE		
	Nabesna quadrangle		
8102–SD	67ARh245	62°53.6′	143°20.1′
8729–SD	70AMn103	62°41.4′	142°46.8′
8730–SD	70AMn104	62°41.3′	142°46.1′

SILURIAN AND DEVONIAN RUGOSE CORALS OF SOUTHEASTERN ALASKA

By C. W. MERRIAM

This section includes lists of rugose corals from the Silurian and Devonian rocks of the Alexander Archipelago, southeastern Alaska. Most of these corals occur in the two best Silurian and Devonian stratigraphic reference sections thus far investigated in the Alexander Archipelago, that of northern Heceta Island for the Silurian and that of the San Alberto Bay area for the Devonian (fig. 13). Table 18 shows proposed fossil zones in the northern Heceta Island Late Silurian reference column.

TABLE 18.—*Zonation of the northern Heceta Island Late Silurian reference section*

Formation	*Zonation*
Karheen Formation, lower part.	6. *Phaulactis* zone 5. *Atrypa-Isorthis* zone 4. *Atrypella* beds
Heceta Limestone, upper part.	3. *Conchidium alaskense* zone 2. *Pycinodesma* beds (*Amphipora* horizon) 1. *Brooksina- Harpidium* zone

The Devonian reference section of San Alberto Bay has recently been studied by Eberlein and Churkin (1970). This section extends from the westernmost and largest island of the Alberto Islands eastward across Wadleigh Island, traversing east-dipping strata which become younger to the east. All these Devonian beds are included by Eberlein and Churkin (1970) in the Wadleigh Limestone, which thus ranges upward in age from possible early Middle Devonian (early Eifelian) through the *Stringocephalus* zone (Givetian) to the upper Wadleigh of Frasnian Age. Rugose corals in the collections with *Stringocephalus* include *Acanthophyllum* sp. b and *Xystriphyllum* sp. m. The lowest exposed beds of this reference section contain *Arcophyllum* sp. a, cf. *A. dachshergi* (Vollbrecht), *Loyolophyllum* sp. a, and *Xystriphyllum*.

The lists of fossils in table 19 are a digest from tabulations in a monographic study I am making of southeastern Alaskan Silurian and Devonian Rugosa. These faunas comprise undescribed genera and many new species, the names being inappropriate for inclusion here. For some of the species names the informal letter designation is the first letter of the proposed new species name appearing in the larger unpublished report.

TABLE 19.—*Lists of Silurian and Devonian rugose corals from southeastern Alaska*

Late Silurian of Heceta, Tuxekan, and Prince of Wales Islands (fig. 13, S1):
- Heceta Limestone, upper part:
  - *Brooksina-Harpidium* zone:
    - *Zelophyllum* sp. w (pl. 22, figs. 1–3)
    - *Cystiphyllum* sp.
    - *Actinocystis*? sp. cf. *A. perfecta* Wedekind
    - New genus A of *Entelophyllum*-like coral sp. b (very narrow marginarium of small dissepiments)
    - *Rhizophyllum* sp. A, Oliver
    - *Tryplasma* sp. p (pl. 22, figs. 8, 9)
  - *Amphipora* horizon:
    - *Microplasma* sp. H
    - *Zelophyllum* sp.
  - *Conchidium alaskense* zone:
    - *Cystiphyllum* sp.
    - *Zelophyllum* sp.
    - *Fletcheria*? sp.
    - *Entelophyllum*? sp.
    - *Salairophyllum* sp. e
- Karheen Formation, lower part:
  - *Atrypa-Isorthis* zone:
    - *Hedströmophyllum* sp. H
    - *Cystiphyllum* sp.
  - *Phaulactis* zone:
    - *Phaulactis* sp. cf. *P. cyathophylloides* Ryder (pl. 22, figs. 11, 12)
    - *P.* sp. cf. *P. angusta* (Lonsdale) (pl. 22, fig. 10)
    - *P.* sp.

Silurian of Kuiu Island, northern part (fig. 13, S2):
- *Conchidium alaskense* zone:
  - *Zelophyllum* sp. W
  - *Microplasma* sp.
  - *Salairophyllum* sp. e (pl. 22, figs. 13–16)
- *Halysites-Petrozium* fauna:
  - *Zelophyllum* sp.
  - *Cystiphyllum* sp.
  - Lycophyllid coral
  - *Petrozium* sp. m (has strong columellar rod)

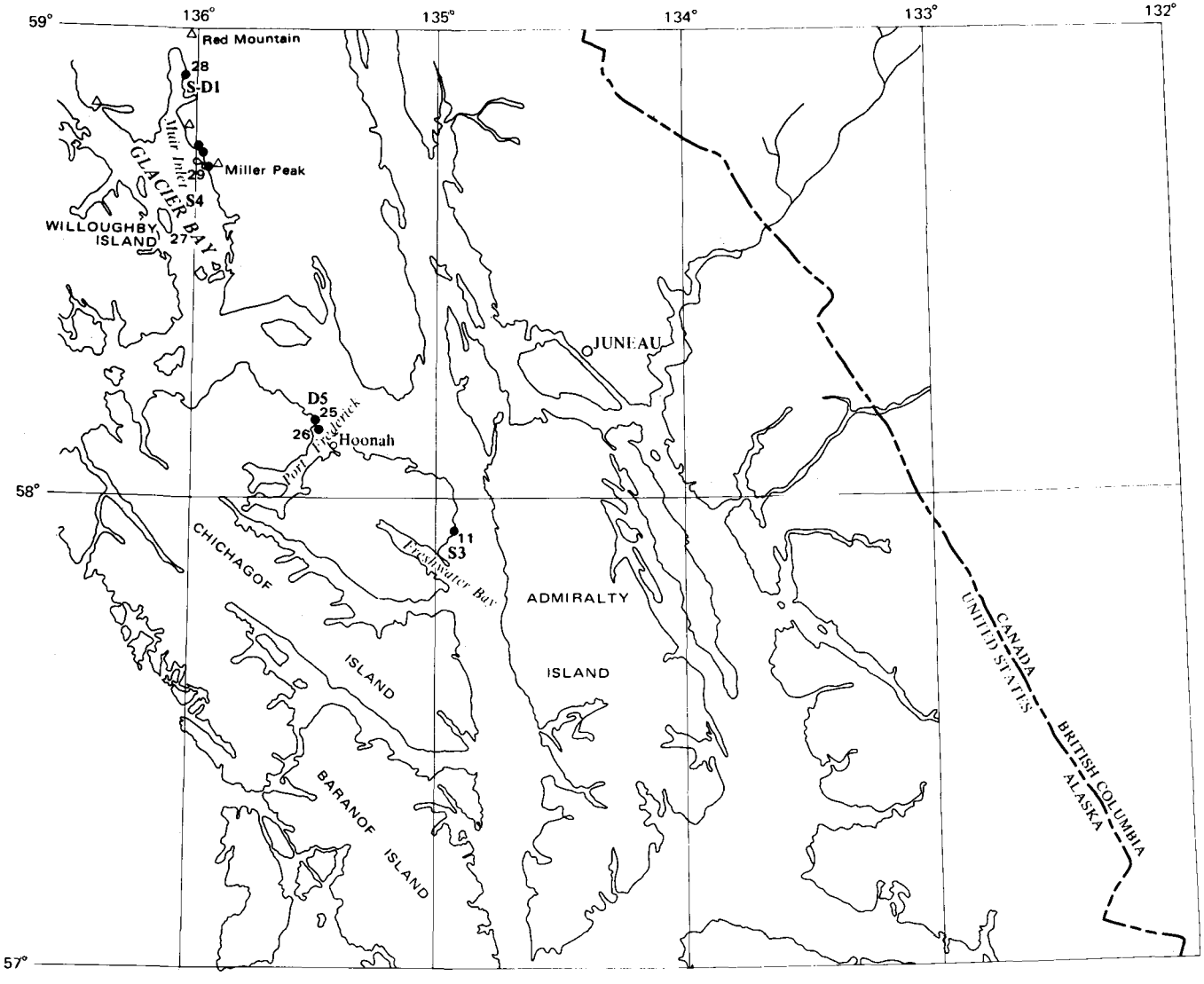
Silurian of False Bay area, Chicagof Island (fig. 13, S3):
- New genus A of *Entelophyllum*-like coral, sp. F (narrow marginarium of dissepiments). Not same species as at Heceta Island. Associated with *Amphipora*.

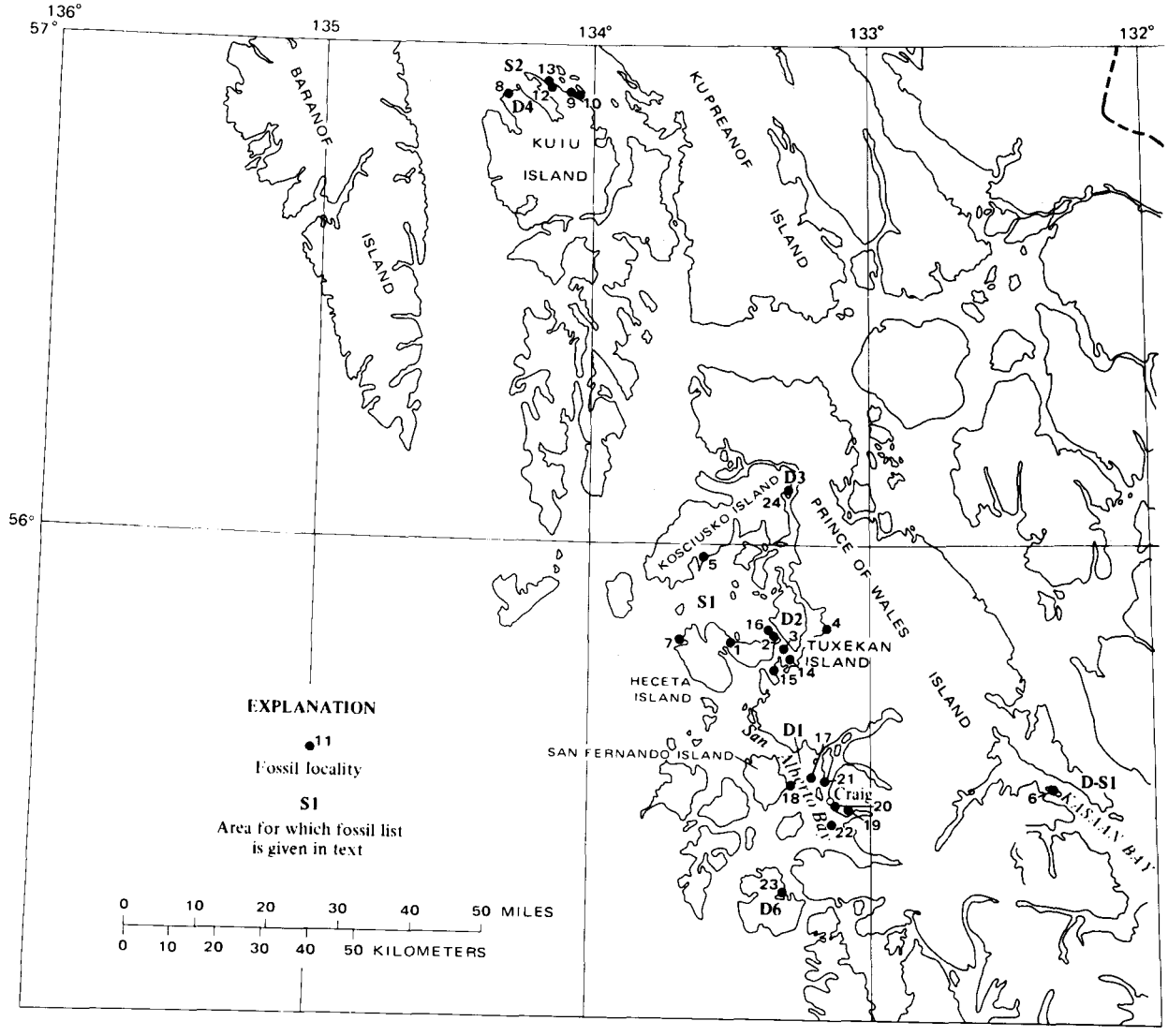
Silurian of Glacier Bay area (fig. 13, S4):
- *Tryplasma* or *Zelophyllum* sp.

Late Silurian or Early Devonian of Glacier Bay area (fig. 13, S–D1):
- Black Cap Limestone:
  - Lycophyllid coral

(Continued on p. 40)

I. Heceta Island–Tuxekan Island vicinity
  Silurian fossil localities (area S1)
    1. Marble Cove area, Heceta Island
    2. East Heceta area
    3. Ham Island, Karheen Passage
    4. Tuxekan Passage, east shore
    7. Northwest Heceta area, Cone Bay
  Devonian fossil localities (area D2)
    14. Small island having *Dentrostella* fauna at union of Karheen Passage and Tuxehan Passage
    15. Tonowek Bay
    16. Small island having *Hexagonaria* fauna at north entrance to Karheen Passage
II. Kosciusko Island area
  Silurian fossil localities (area S1)
    5. Vermont marble quarries northeast of Edna Bay
  Devonian fossil localities (area D3)
    24. El Capitan Passage near Devilfish Bay
III. Kasaan Bay area
  Devonian or Late Silurian fossil localities (area D-S1)
    6. Long Island
IV. San Alberto Bay area
  Devonian fossil localities (area D1)
  Devonian foatil localities (area D1)
    17. Alberto Islands
    18. Fern Point, San Fernando Island
    19. Sunny Hay Mountain, north of Port St. Nicholas
    20. Port Bagial
    21. Wadleigh Island, southern part





22. Coronados Islands

V. Port Refugio area
Devonian fossil localities (area D6)
23. Port Refugio

VI. Kuiu Island, northern part
Silurian fossil localities (area S2)
8. Mead Point area

9. 10. Small islets off north shore of Cornwallis Peninsula

VII. Northern Chicagof Island
Silurian fossil localities (area S3)
11. False Bay area
Devonian fossil localities (area D5)
25. Port Frederick area, Crist Point
26. Port Frederick area, Halibut Island

VIII. Glacier Bay area
Silurian fossil localities (area S4)
27. Willoughby Island
Silurian or Lower Devonian fossil localities (area S-D1)
28. Muir Inlet, east side
29. Sandy Cove and Miller Park

FIGURE 13.—Locality map of part of the Alexander Archipelago, southeastern Alaska, showing occurrences of Silurian and Devonian rugose corals and other fossils. Base from Buddington and Chapin (1929, pl. 2).

TABLE 19.—*Lists of Silurian and Devonian rugonse corals from southeastern Alaska*—Continued

Late Silurian or Devonian limestones containing *Hercynella, Amphipora,* and *Rhizophyllum* at Long Island, Kasaan Bay (fig. 13, D–S1):
- *Rhizophyllum* sp. B Oliver
- *Taimyrophyllum*? sp.
- *Pseudamplexus* sp. cf. *P. princeps* Etheridge
- Stauriid coral
- Cyathophylloid (indeterminate)

Devonian Rugosa of the Wadleigh Limestone, San Alberto Bay area (fig. 13, D1):
- Middle Devonian part of the Wadleigh Limestone:
  - Alberto Islands:
    - *Acanthophyllum* sp.
    - *A.* sp. b (pl. 24, figs. 3, 4)
    - *Mesophyllum* (*Arcophyllum*) sp. a cf. *A. dachsbergi* (Vollbrecht) (pl. 24, figs. 5, 6)
    - *Digonophyllum* sp. a
    - *Mesophyllum* sp. a
    - *Loyolophyllum* sp. a (pl. 23, figs. 4–6)
    - *Xystriphyllum* sp. a
    - *X.* sp. m (pl. 23, figs. 1–3)
    - *Australophyllum* sp. b
  - Sunny Hay Mountain:
    - *Taimyrophyllum* sp. n
    - New genus of *Acanthophyllum*-like coral
    - *Fasciphyllum*? sp.
- Upper Middle or Upper Devonian coral beds of San Alberto Bay area:
  - Fern Point, San Fernando Island:
    - Acanthophyllid sp. f (pl. 24, figs. 11, 12)
    - *Pseudamplexus* sp. cf. *P.* sp. w
    - *Lyrielasma* sp. f
- Upper Devonian part of the Wadleigh Limestone:
  - Wadleigh Island:
    - *Tabulophyllum* sp.
    - *T.* sp. c
    - *Pseudamplexus* sp. w (pl. 25, figs. 3, 4)
    - *Macgeea* sp. k (pl. 25, figs. 5–7)
    - *Phillipsastraea* sp.
    - *P.* (*Phillipsastraea*) sp. c (pl. 25, fig. 11)
    - *P.* (*Pachyphyllum*) sp. w (pl. 25, figs. 12, 13)
    - *Phacellophyllum* sp. t (pl. 25, fig. 8)
    - *Disphyllum*? sp.
    - *Sociophyllum* sp. b
  - Coronados Islands
    - *Tabulophyllum* sp. c (pl. 25, figs. 1, 2)
    - *Phacellophyllum* sp. t

Devonian Rugosa of Heceta and Tuxekan Islands (fig. 13, D2):
- Upper Devonian (Tonowek Narrows):
  - *Tabulophyllum* sp.
  - *Phacellophyllum* sp. t (pl. 25, figs. 9, 10)
- Middle Devonian of Heceta and Tuxekan Islands:
  - *Microplasma*? sp.
  - *Acanthophyllum* sp. a (pl. 24, figs. 1, 2)
  - *Digonophyllum* sp. b
  - *D.* sp. d
  - *D.* sp. k (pl. 24, figs. 9, 10)
  - *Hexagonaria* sp. k (pl. 23, figs. 7, 8)
  - *Lyrielasma*? sp.
  - *Lyrielasma* sp. k
  - *Dendrostella* sp. cf. *D. rhenana* (Frech) (pl. 23, figs. 9, 10)

TABLE 19.—*Lists of Silurian and Devonian rugonse corals from southeastern Alaska*—Continued

Devonian Rugosa of Kosciusko Island (fig. 13, D3):
- Devilfish Bay, El Capitan Passage:
  - *Breviphyllum* (emended) sp.

Devonian Rugosa of northern Kuiu Island (fig. 13, D4):
- *Breviphyllum* (emended) sp. cf. *B. lindströmi* (Frech)
- *Trapezophyllum* sp. k
- *Iowaphyllum* sp. cf. *I. johanni* (Hall and Whitfield)
- *Disphyllum* or *Acinophyllum*? sp.

Devonian of northern Chicagof Island (fig. 13, D5):
- Crist Point, Port Frederick:
  - *Disphyllum* sp. cf. *D. goldfussi* Geinitz

REFERENCES CITED

Adkison, W. L., and Brosgé, M. M., eds., 1970, Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Am. Assoc. Petroleum Geologists, Pacific Sec., variously paged.

Bassler, R. S., 1937, The Paleozoic rugose coral family Paleocyclidae: Jour. Paleontology, v. 11, p. 189–201.

Bolton, T. E., 1965, Ordovician and Silurian tabulate corals *Labyrinthites, Arcturia, Troedssonites, Multisolenia* and *Boreaster*: Canada Geol. Survey Bull. 134, p. 15–33, pls. 4–10.

Brabb, E. E., 1967, Stratigraphy of the Cambrian and Ordovician rocks of east-central Alaska: U.S. Geol. Survey Prof. Paper 559–A, 30 p.

——— 1970, Preliminary geologic map of the Black River quadrangle, east-central Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map. I–601, scale 1:250,000.

Brabb, E. E., and Churkin, Michael, Jr., 1969, Geologic map of the Charley River quadrangle, east-central Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I–573, scale 1:250,000.

Brosgé, W. P., Dutro, J. T., Jr., Mangus, M. D., and Reiser, H. N., 1962, Paleozoic sequence in eastern Brooks Range, Alaska: Am. Assoc. Petroleum Geologists Bull., v. 46, no. 12, p. 2174–2198.

Brosgé, W. P., and Reiser, H. N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I–375, scale 1:250,000.

——— 1965, Preliminary geologic map of the Arctic quadrangle, Alaska: U.S. Geol. Survey open-file map, scale 1:250,000.

——— 1969, Preliminary geologic map of the Coleen quadrangle, Alaska: U.S. Geol. Survey open-file map, scale 1:250,000.

——— 1971, Preliminary bedrock geologic map, Wiseman and eastern Survey Pass quadrangles, Alaska: U.S. Geol. Survey open-file map, 2 sheets, scale 1:250,000.

Brosgé, W. P., Reiser, H. N., Dutro, J. T., Jr., and Churkin, Michael, Jr., 1966, Geologic map and stratigraphic sections, Porcupine River Canyon, Alaska: U.S. Geol. Survey open-file map, 4 sheets, scale 1:63,360.

Brosgé, W. P., and Tailleur, I. L., 1971, Northern Alaska petroleum province: Am. Assoc. Petroleum Geologists Mem. 15, p. 68–99.

Buddington, A. F., and Chapin, Theodore, 1929, Geology and mineral deposits of southeastern Alaska: U.S. Geol. Survey Bull. 800, 398 p.

Bulvanker, E. Z., 1958, Devonskie chetyrekhluchevye korraly okrain Kuznetzkogo basseina [Devonian tetracorals from

areas bordering the Kuznetz basin]: Leningrad, Vses. Nauchno-Issled. Geol. Inst., 212 p., 93 pls.

Cady, W. M., Wallace, R. E., Hoare, J. M., and Webber, E. J., 1955, The central Kuskokwim region, Alaska: U.S. Geol. Survey Prof. Paper 268, 132 p.

Chapman, R. M., Weber, F. R., and Taber, Bond, 1971, Preliminary geologic map of the Livengood quadrangle, Alaska: U.S. Geol. Survey open-file map, scale 1:250,000.

Chudinova, I. I., Churkin, Michael, Jr., and Eberlein, G. D., 1974, Devonian syringoporoid corals from southeastern Alaska: Jour Paleontology, v. 48, no. 1, p. 125–134.

Churkin, Michael, Jr., 1971, Stratigrafia i Devona Alyaski i granitza Silura I Devona [Silurian and Devonian stratigraphy of Alaska and the Silurian-Devonian boundary]: Internat. Symposium on the Silurian and Devonian boundary and biostratigraphy of the Silurian, 3d, Leningrad, 1968, Trudy, tom 1, p. 253–271.

Churkin, Michael, Jr., and Brabb, E. E., 1965, Ordovician, Silurian, and Devonian biostratigraphy of east-central Alaska: Am. Assoc. Petroleum Geologists Bull., v. 49, no. 2, p. 172–185.

——— 1968, Devonian rocks of the Yukon-Porcupine Rivers area and their tectonic relation to other Devonian sequences in Alaska, *in* Oswald, D. H., ed., International symposium on the Devonian System, Calgary, 1967 [Proc.]: Calgary, Alberta Soc. Petroleum Geologists, v. 2, p. 227–258.

Churkin, Michael, Jr., and Carter, Claire, 1970, Devonian tentaculitids of east-central Alaska; systematics and biostratigraphic significance: Jour. Paleontology, v. 44, p. 51–68.

Churkin, Michael, Jr., Eberlein, G. D., Hueber, F. M., and Mamay, S. H., 1969, Lower Devonian land plants from graptolitic shale in southern Alaska: Palaeontology, v. 12, pt. 4, p. 559–573.

Churkin, Michael, Jr., Jaeger, Herman, and Eberlein, G. D., 1970, Lower Devonian graptolites from southeastern Alaska: Lethaia, v. 3, p. 183–202.

Crickmay, C. H., 1960, The older Devonian faunas of the Northwest Territories: Calgary, Alberta, Evelyn deMille Books, 21 p.

Dutro, J. T., Jr., 1965, Annotated bibliography of Alaska Paleozoic paleontology: U.S. Geol. Survey Bull. 1041–H, p. 253–287.

——— 1970, Pre-Carboniferous carbonate rocks, northeastern Alaska, *in* Adkison, W. L., and Brosgé, M. M., eds. Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Am. Assoc. Petroleum Geologists, Pacific Sec., p. M1–M17.

Dutro, J. T., Jr., Brosgé, W. P., and Reiser, H. N., 1972, Significance of recently discovered Cambrian fossils and reinterpretation of Neruokpuk Formation, northeastern Alaska: Am. Assoc. Petroleum Geologists Bull., v. 56, p. 808–815.

Eberlein, G. D., and Churkin, Michael, Jr., 1970, Paleozoic stratigraphy in the northwest coastal area of Prince of Wales Island, southeastern Alaska: U.S. Geol. Survey Bull. 1284, 67 p.

Flower, R. H., 1961, Montoya and related colonial corals: New Mexico Bur. Mines and Mineral Resources Mem. 7, 229 p., 52 pls.

Fritts, C. E., 1970, Geology and geochemistry of the Cosmos Hills—Ambler River and Shungnak quadrangles, Alaska: Alaska Div. Mines and Geology, Geol. Rept. 39, 69 p.

Gryc, George, Dutro, J. T., Jr., Brosgé, W. P., Tailleur, I. L., and Churkin, Michael, Jr., 1968, Devonian of Alaska, *in* Oswald, D. H., ed., International symposium on the Devonian System, Calgary, 1967 [Proc.]: Calgary, Alberta Soc. Petroleum Geologists, v. 1, p. 703–716.

Hill, Dorothy, 1967, The sequence and distribution of Ludlovian, Lower Devonian and Couvinian coral faunas in the Union of Soviet Socialist Republics: Palaeontology, v. 10, pt. 4, p. 660–693.

Hoare, J. M., 1961, Geology and tectonic setting of Lower Kuskokwim–Bristol Bay region, Alaska: Am. Assoc. Petroleum Geologists Bull., v. 45, no. 5, p. 594–611.

Hoare, J. M., and Coonrad, W. L., 1961, Geologic map of the Goodnews quadrangle, Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I–339, scale 1:250,000.

Ivanovsky, A. B., 1965, Drevneischie rugozy [The ancient Rugosa]: Moscow, Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki, 144 p., 39 pls.

——— 1969, Korally semeystv Tryplasmatidae i Cyathophylloididae (rugozy) [Coral families Tryplasmatidae and Cyathophylloididae (Rugosa)]: Moscow, Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki, 112 p. 21 pls.

Kindle, E. M., 1908, Geologic reconnaissance of the Porcupine Valley, Alaska: Geol. Soc. America Bull., v. 19, p. 315–338.

Kirk, Edwin, 1927, New American occurrences of *Stringocephalus*: Am. Jour. Sci., 5th ser., v. 13, p. 219–222.

Lavrusevich, A. I., 1967, [Late Silurian rugose corals from central Tadzhikistan]: Paleont. Zhur., 1967, no. 3, p. 16–23. (English translation by Am. Geol. Inst.)

Lenz, A. C., 1961, Devonian rugose corals of the lower Mackenzie Valley, Northwest Territories, *in* Raasch, G. O., ed., Geology of the Arctic: Toronto, Univ. Toronto Press, v. 1, p. 500–514.

Meek, F. B., 1867, Remarks on the geology of the valley of Mackenzie River, with figures and description of fossils from that region in the Museum of the Smithsonian Institution, chiefly collected by the late Robert Kennicott, esq.: Chicago Acad. Sci. Trans., v. 1, pt. 1, p. 61–114.

Nelson, S. J., 1959, Arctic Ordovician fauna—an equatorial assemblage?: Alberta Soc. Petroleum Geologists Jour., v. 7, no. 3, p. 45–47, 53.

Norford, B. S., 1971, Upper Ordovician corals *Chaetetipora* and *Sibirolites* from northern Ellesmere Island, District of Franklin: Canada Geol. Survey Bull. 197, p. 1–11.

Oekentorp, Klemmens, 1969, Kommensalismus bei Favositiden: Münster Forsch. zur Geologie u. Paläontologie, v. 12, p. 165–217.

Oliver, W. A., Jr., 1964, New occurrences of the rugose coral Rhizophyllum in North America, *in* Short papers in geology and hydrology: U.S. Geol. Survey Prof. Paper 475–D, p. D149–D158.

Oliver, W. A., Jr., Merriam, C. W., and Churkin, Michael, Jr., 1974, Ordovician, Silurian and Devonian corals of Alaska: Proceedings of 1st International Symposium on Fossil Corals, Novosibirsk, 1971. (In press.)

Ovenshine, A. T., and Webster, G. D., 1970, Age and stratigraphy of the Heceta Limestone in northern Sea Otter Sound, southeastern Alaska, *in* Geological Survey research 1970: U.S. Geol. Survey Prof. Paper 700–C, p. C170–C174.

Patton, W. W., Jr., Miller, T. P., and Tailleur, I. L., 1968, Regional geologic map of the Shungnak and southern part of the Ambler River quadrangles, Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I–554, scale 1:250,000.

Patton, W. W., Jr., and Dutro, J. T., Jr., 1969, Preliminary report on the Paleozoic and Mesozoic sedimentary sequence on St. Lawrence Island, Alaska, *in* Geological Survey research, 1969: U.S. Geol. Survey Prof. Paper 650–D, p. D138–D143, 5 figs.

Pedder, A. E. H., 1964, Correlation of the Canadian Middle Devonian Hume and Nahanni Formations by tetracorals: Palaeontology, v. 7, pt. 3, p. 430–451, pls. 62–73.

Ross, R. J., Jr., and Dutro, J. T., Jr., 1966, Silicified Ordovician brachiopods from east-central Alaska: Smithsonian Misc. Colln., v. 149, no. 7, 22 p.

Sainsbury, C. L., 1969a, Geology and ore deposits of the central York Mountains, western Seward Peninsula, Alaska: U.S. Geol. Survey Bull. 1287, 101 p.

——— 1969b, Geologic map of the Teller B–4 and southern part of the Teller C–4 quadrangles, western Seward Peninsula: U.S. Geol. Survey Misc. Geol. Inv. Map I–572, scale 1:63,360.

——— 1972, Geologic map of the Teller quadrangle, western Seward Peninsula, Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I–685, scale 1:250,000.

Sainsbury, C. L., Dutro, J. T., Jr., and Churkin, Michael, Jr., 1971 The Ordovician-Silurian boundary in the York Mountains, western Seward Peninsula, Alaska, *in* Geological Survey research, 1971: U.S. Geol. Survey Prof. Paper 750–C, p. C52–C57.

Smith, Stanley, 1945, Upper Devonian corals of the Mackenzie River region, Canada: Geol. Soc. America Spec. Paper 59, 126 p.

Sokolov, B. S., 1962, [On the widespread commensalism of the Devonian favositids]: Paleont. Zhur. 1962, no. 2, p. 45–48.

Soshkina, E. D., 1952, Opredelitel' devonskikh chetyrekhluchevykh korallov [Guide to Devonian tetracorals]: Akad. Nauk SSSR Paleont. Inst. Trudy, v. 39, 127 p.

Stumm, E. C., 1951, Type invertebrate fossils of North America (Devonian), Division 1, Unit 1F Tetracoralla, Part A: Wagner Free Inst. Sci., Philadelphia, Cards 1–88.

——— 1955, Type invertebrate fossils of North America (Devonian), Division 1, Unit 1F, Tetracoralla, Part C: Wagner Free Inst. Sci., Philadelphia, Cards 128–337.

Tailleur, I. L., Brosgé, W. P., and Reiser, H. N., 1968, Palinspastic analysis of Devonian rocks in northwestern Alaska, *in* Oswald, D. H., ed., International symposium on the Devonian system, Calgary, Alberta Soc. Petroleum Geologists, v. 2, p. 1345–1361.

U.S. Geological Survey, 1962, Synopsis of geologic, hydrologic, and topographic results: U.S. Geol. Survey Prof. Paper 450–A, 257 p.

——— 1964, Geological Survey research, 1964: U.S. Geol. Survey Prof. Paper 501–A, 367 p.

INDEX

[Italic page numbers indicate major references and descriptions]

PLATES 1-25

[Contact photographs of the plates in this report are available, at cost, from U.S. Geological Survey Library, Federal Center, Denver, Colorado 80225]

PLATE 1

Upper Ordovician corals from the Seward Peninsula

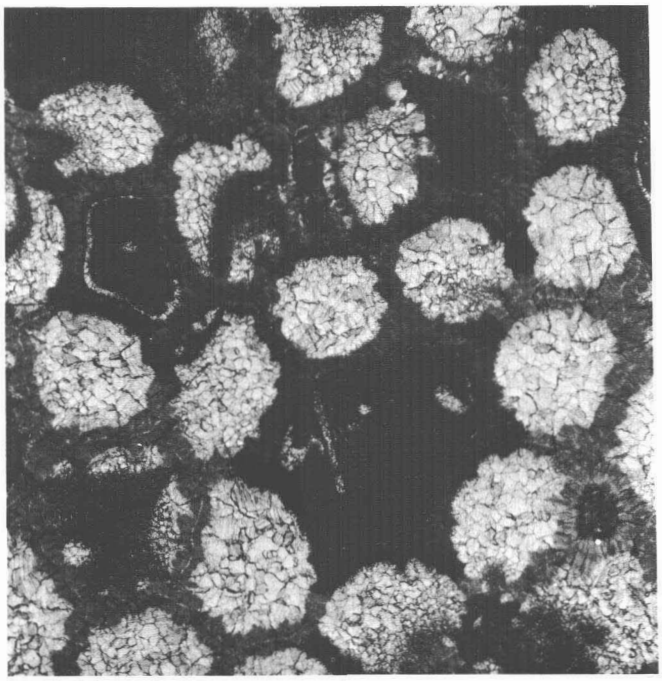
FIGURES 1, 2. *Tollina* sp., USNM 174699. Transverse and longitudinal thin sections, × 10. USGS colln. 6746–CO.

3, 4. *Pycnolithus*? sp. A, USNM 174700. Longitudinal and transverse thin sections, × 10. USGS colln. 4407–CO.

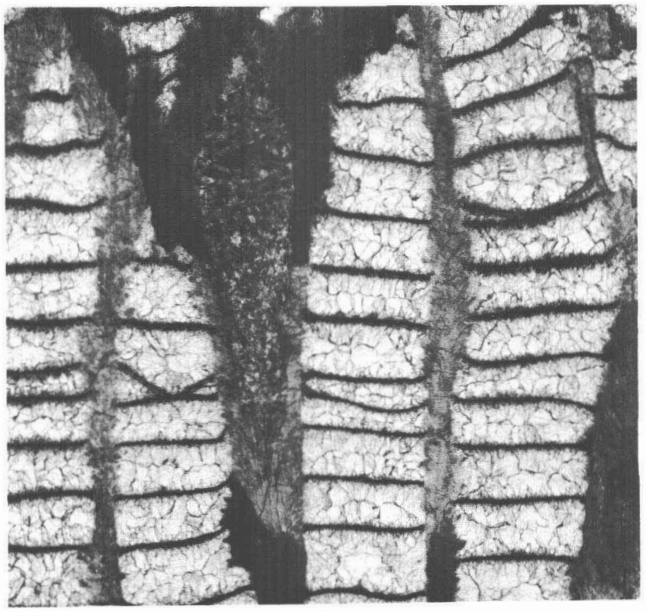
5, 6. *Mesofavosites* sp., USNM 172247. Transverse and longitudinal thin sections, × 5. USGS colln. 6746–CO.

Middle or Upper Ordovician coral from the Seward Peninsula

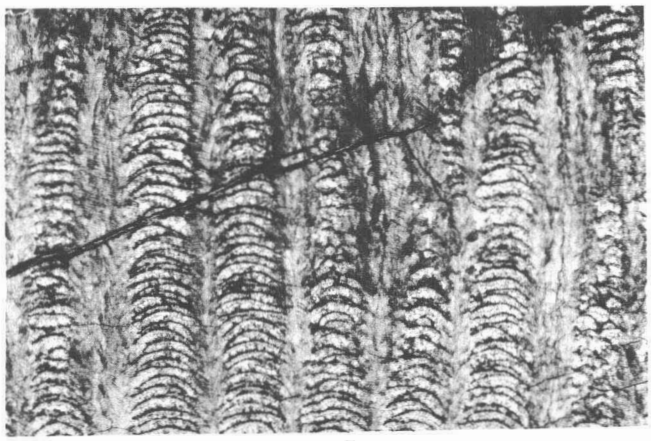
7. *Labyrinthites* (*Labyrinthites*) sp., USNM 174701. Transverse thin section, × 10. USGS colln. 4280–CO.



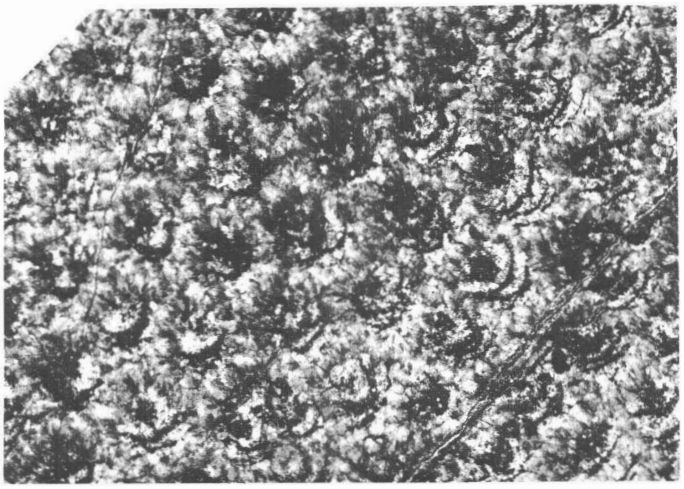
1



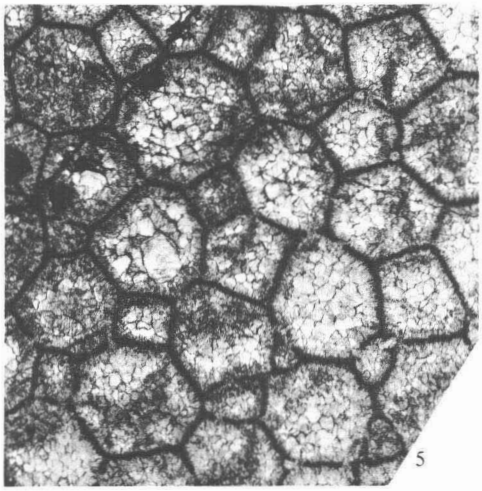
2



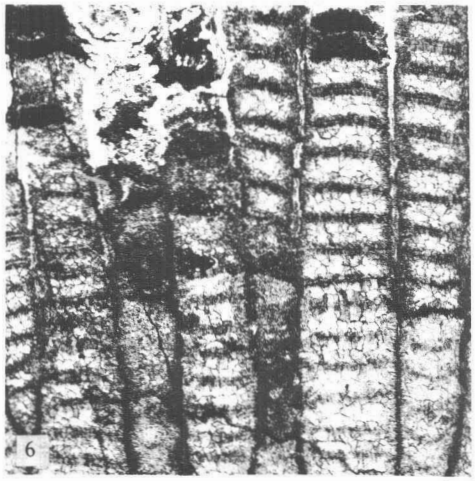
3



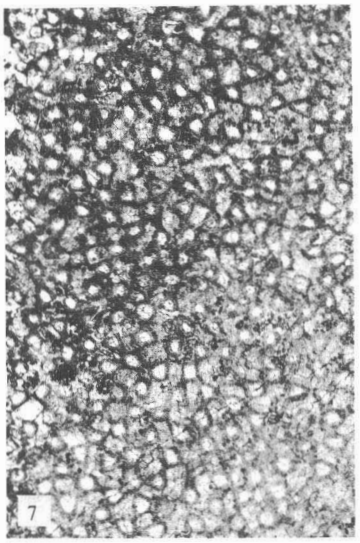
4



5



6



7

ORDOVICIAN CORALS, SEWARD PENINSULA

PLATE 2

Upper Ordovician corals from the Seward Peninsula

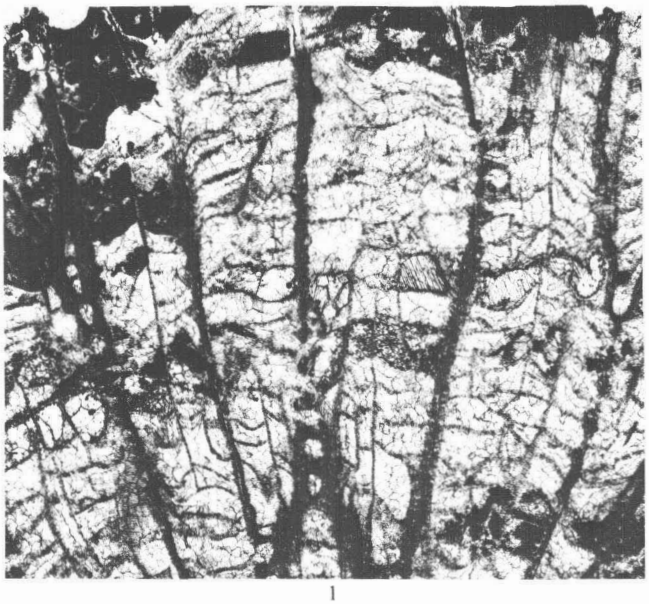
FIGURES 1, 2. *Agetolites* sp., USNM 174704. Longitudinal and transverse thin sections, × 4. USGS colln. 6746–CO.

3–5. *Cyathophylloides* sp. A, × 3.

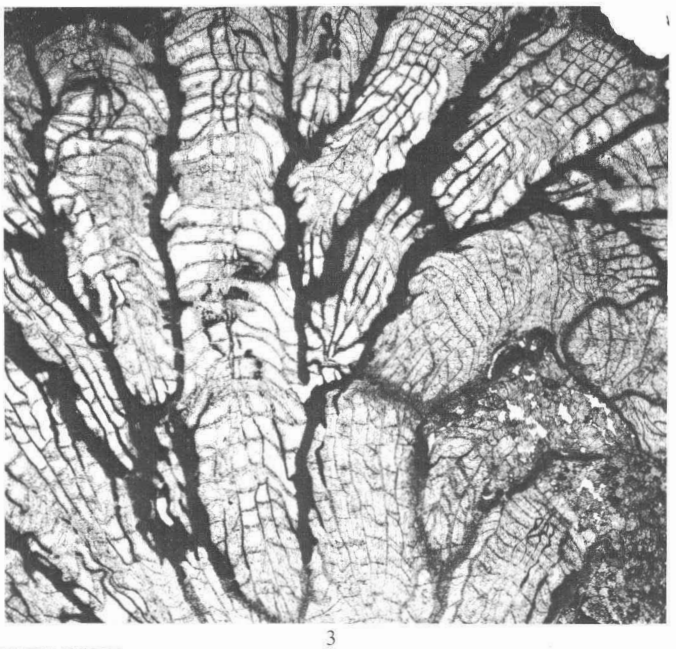
3, 4. USNM 174705. Longitudinal and transverse thin sections. USGS colln. 6749–CO.

5. USNM 172248. Transverse thin section. USGS colln. 4407–CO.

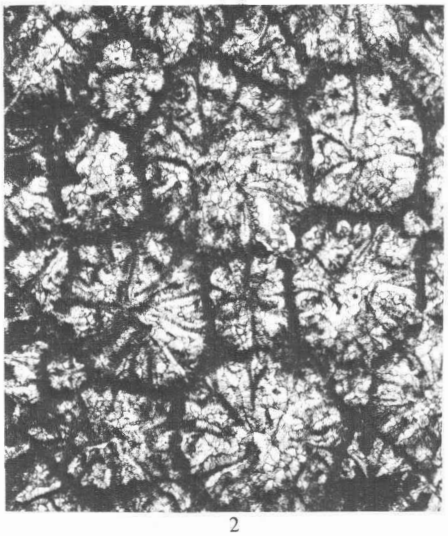
6, 7. *Rhaphidophyllum* sp. A, USNM 174708. Transverse and longitudinal thin sections, × 4. USGS colln. 6749–CO.



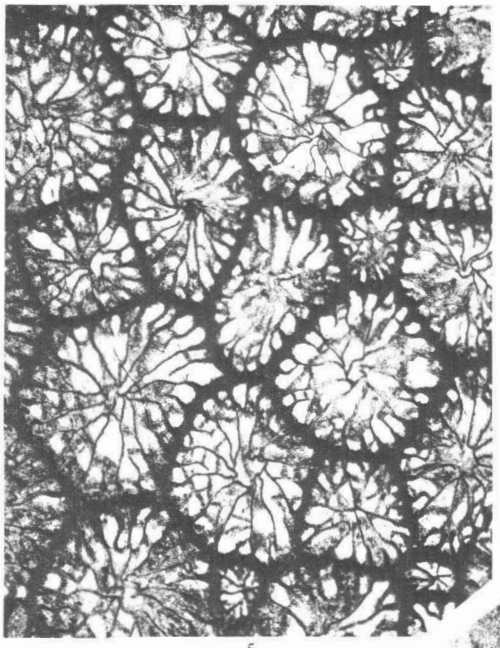
1



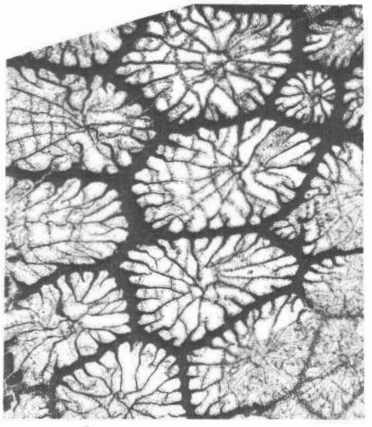
3



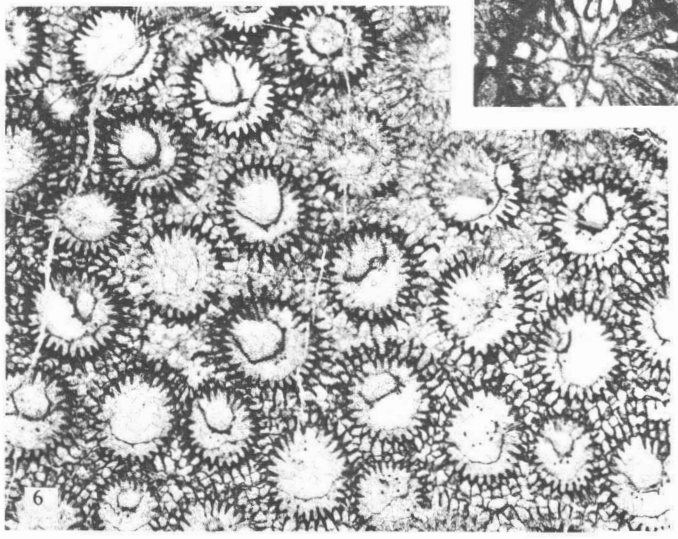
2



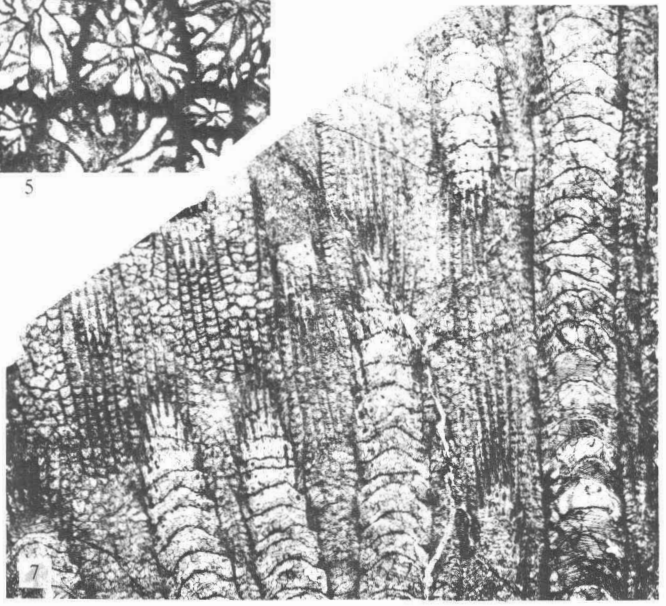
5



4



6



7

UPPER ORDOVICIAN CORALS, SEWARD PENINSULA

PLATE 3

Upper Ordovician corals from the Seward Peninsula

FIGURES 1–10. *Catenipora* spp., × 3.

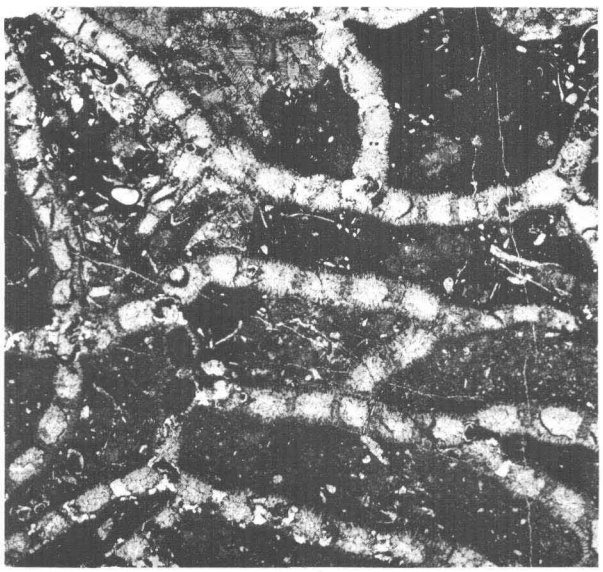
1, 2. *C.* sp. cf. *C. robustus* (Wilson), USNM 172249. Transverse and longitudinal thin sections. USGS colln. 5515–CO.

3, 4. *C.* sp. D, USNM 172250. Transverse and longitudinal thin sections. USGN colln. 5515–CO.

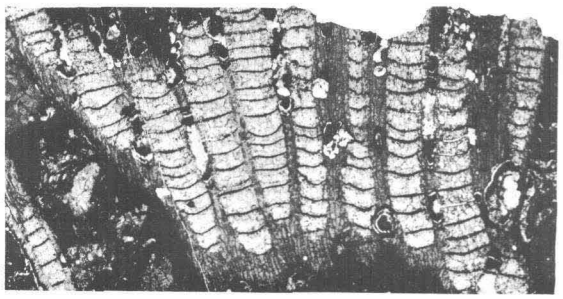
5, 6. *C.* sp. E, USNM 172251. Transverse and longitudinal thin sections. USGS colln. 5515–CO.

7, 8. *C.* sp. cf. *C. rubra* Sinclair and Bolton, USNM 172252. Transverse and longitudinal thin section. USGS 6749–CO.

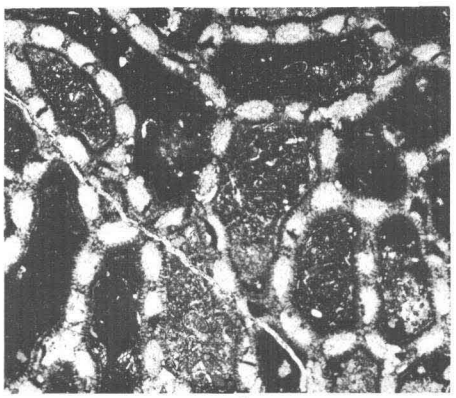
9, 10. *C.* sp. C, USNM 172253. Transverse and longitudinal thin sections. USGS colln. 4407–CO.



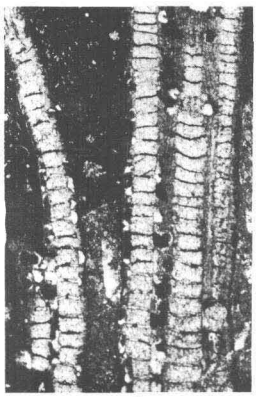
1



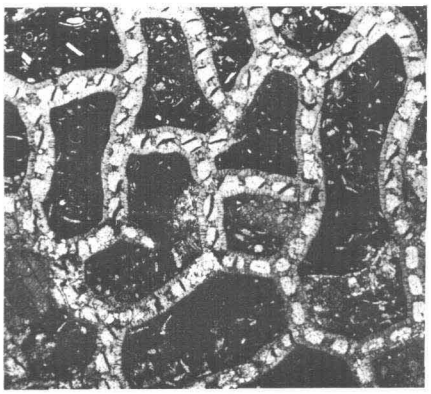
2



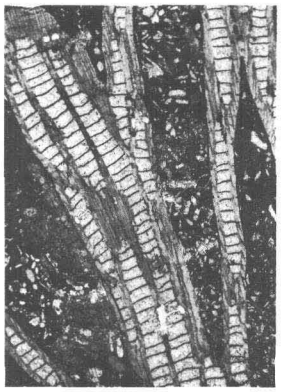
3



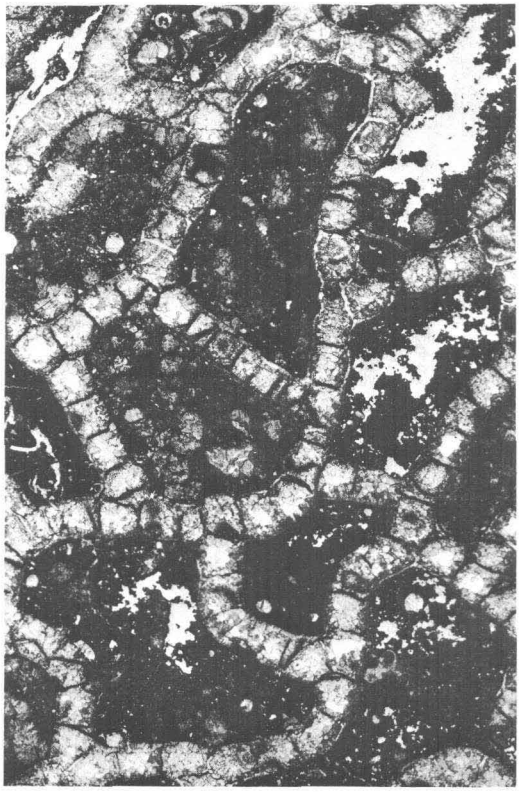
4



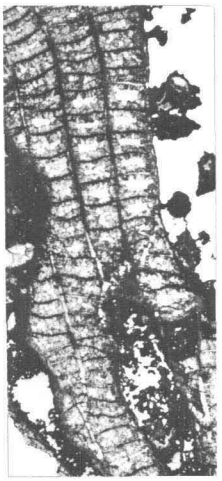
5



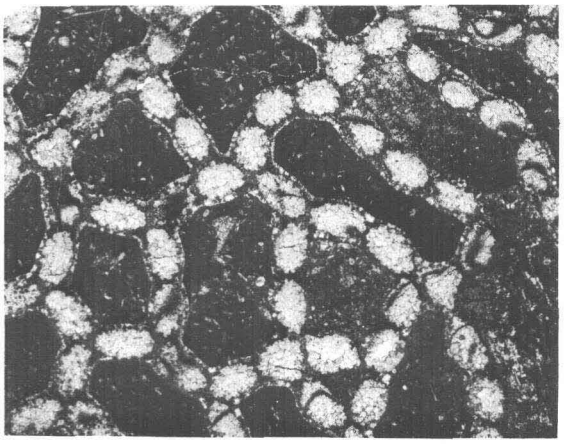
6



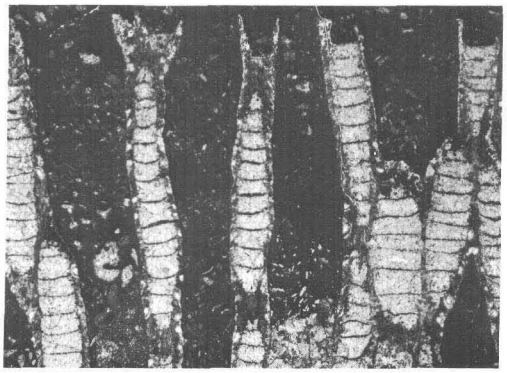
7



8



9



10

UPPER ORDOVICIAN *CATENIPORA*, SEWARD PENINSULA

PLATE 4

Upper Ordovician corals from the Fairbanks-Rampart area

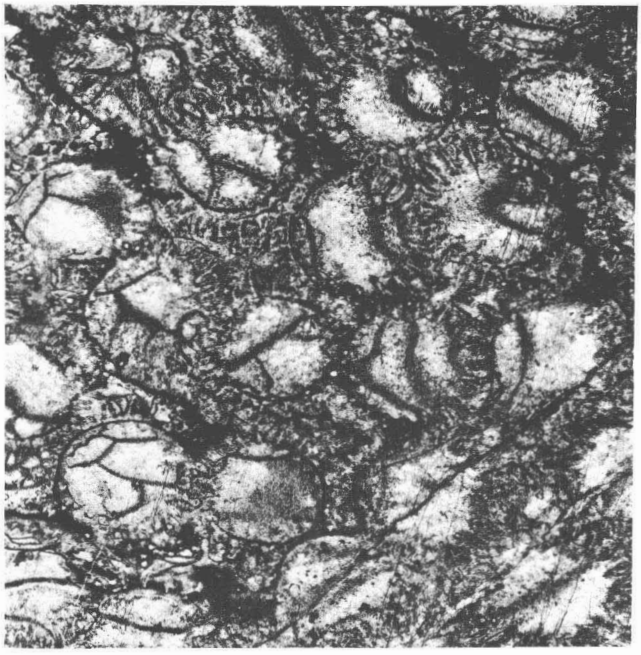
FIGURES 1, 2. *Calapoecia* sp., USNM 182857. Transverse and longitudinal thin sections, × 5. USGS colln. 7092–CO.

3–6. *Chaetetipora* sp. cf. *C. ellesmerensis* Norford.

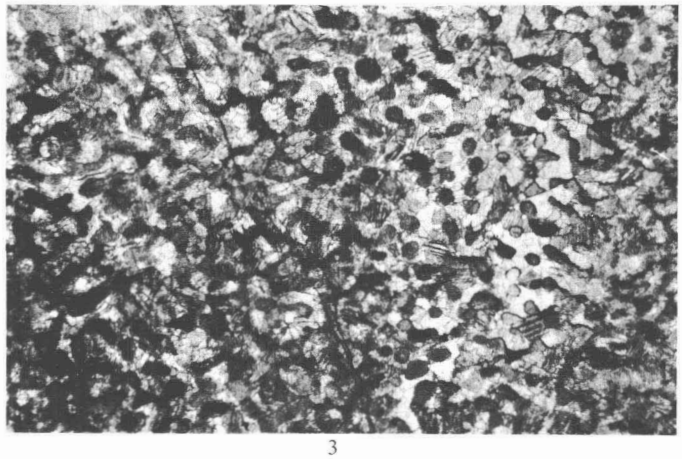
3, 4. USNM 182858. Transverse and longitudinal thin sections, × 10. USGS colln. 7092–CO.

5, 6. USMN 182859. Transverse and longitudinal thin sections, × 5. USGS colln. 7093–CO.

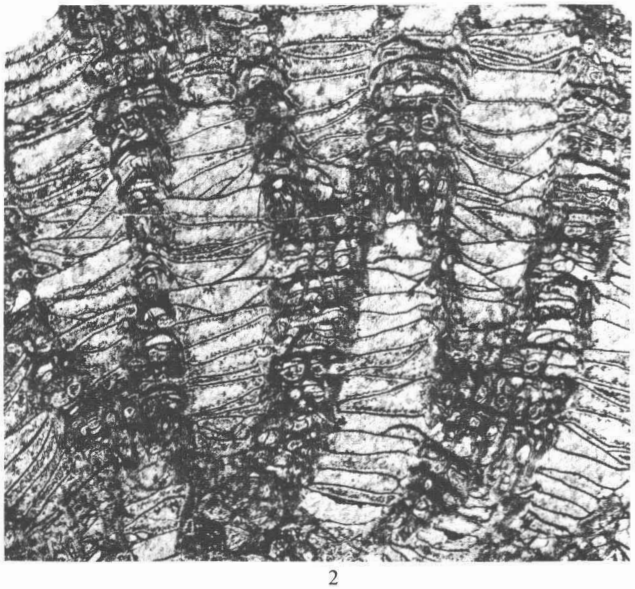
Contrast the meandroid cross-section of 182859 with the more discontinuous walls of 182858. Both conditions are found in the same specimen.



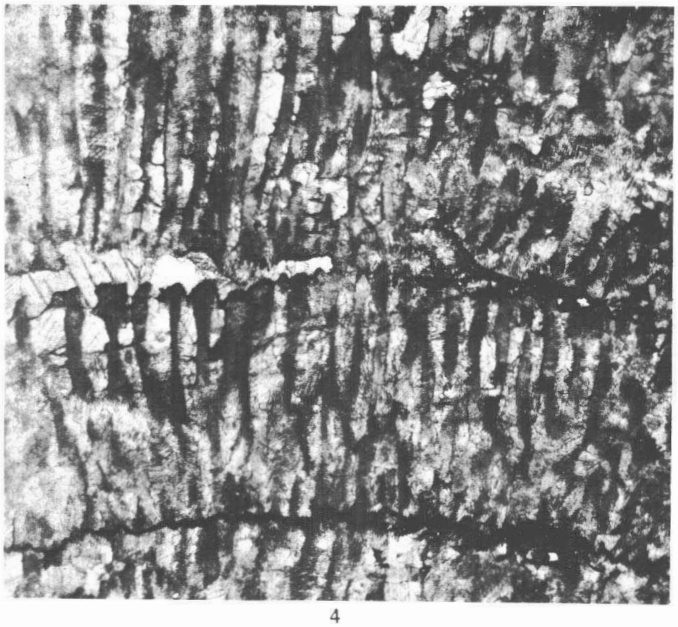
1



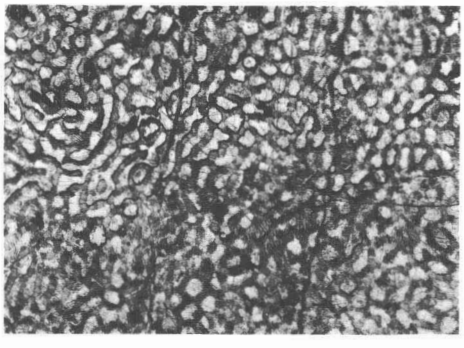
3



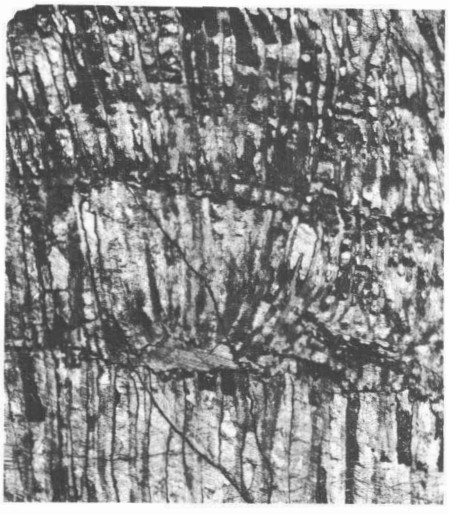
2



4



5



6

UPPER ORDOVICIAN CORALS, FAIRBANKS–RAMPART AREA

PLATE 5

Upper Ordovician corals from east-central Alaska

FIGURES 1, 2. *Palaeofavosites* sp., USNM 182854. Transverse and longitudinal thin sections, ×5. USGS colln. 7089–CO.

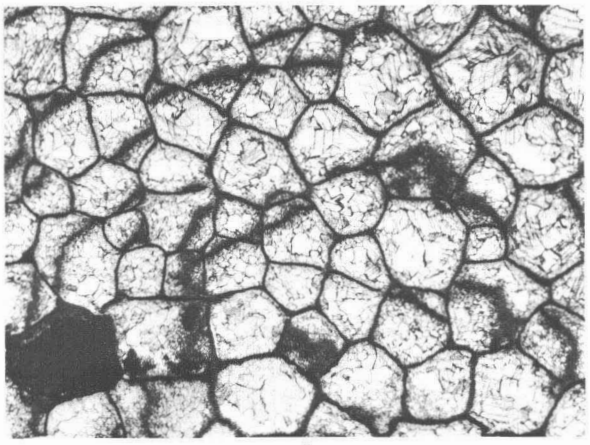
3. *Deiracorallium* sp., USNM 174702. Transverse thin section, × 3. USGS colln. 7031–CO.

4, 5. *Grewingkia* sp., × 3. USGS colln. D1071–CO.
   4. USNM 174707. Longitudinal thin section.
   5. USNM 174706. Transverse thin section.

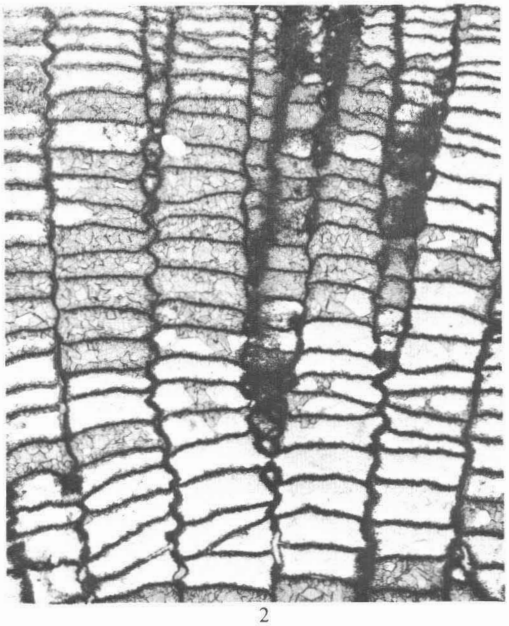
6. *Bighornia* sp., USNM 174703. Transverse thin section, × 3. USGS 7031–CO.

7. *Tetradium* sp., USNM 182855. Transverse thin section, × 10. USGS colln. 6275–CO.

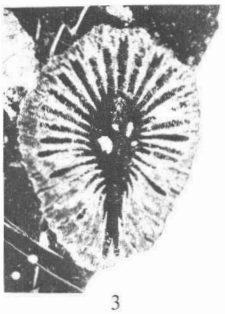
8, 9. *Sarcinula* sp., USNM 182856. Longitudinal and transverse thin sections of silicified specimen, × 5. USGS colln. 7094–CO.



1

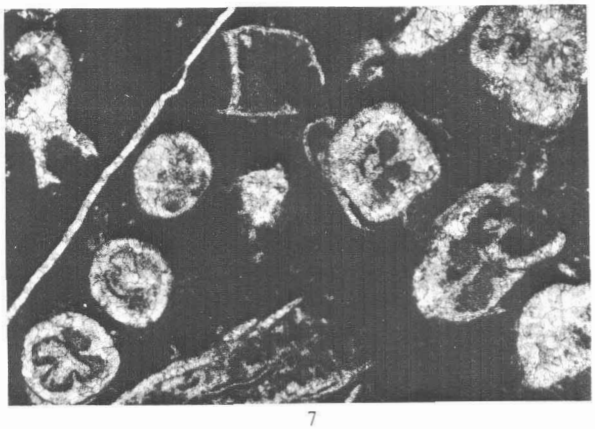


2

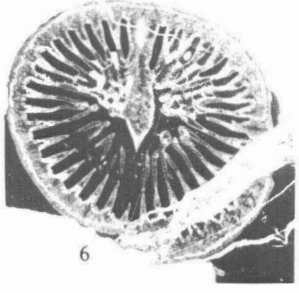


3

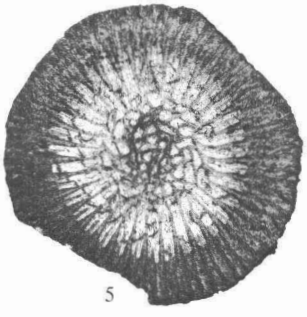
4



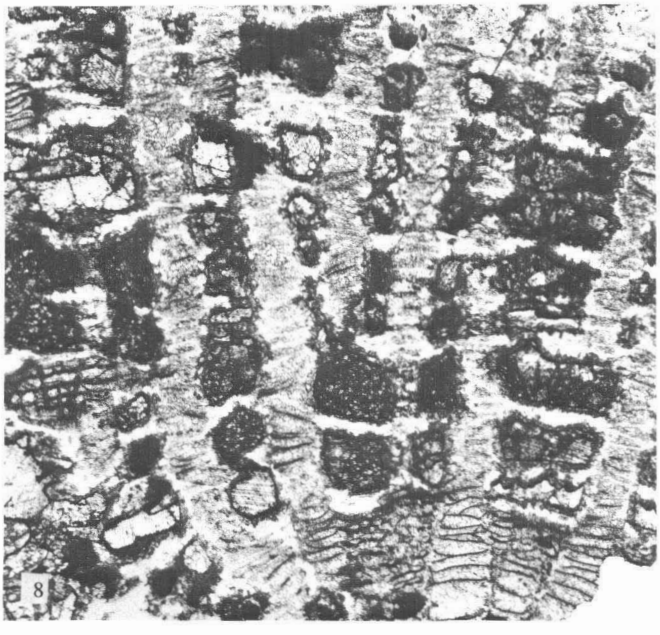
7



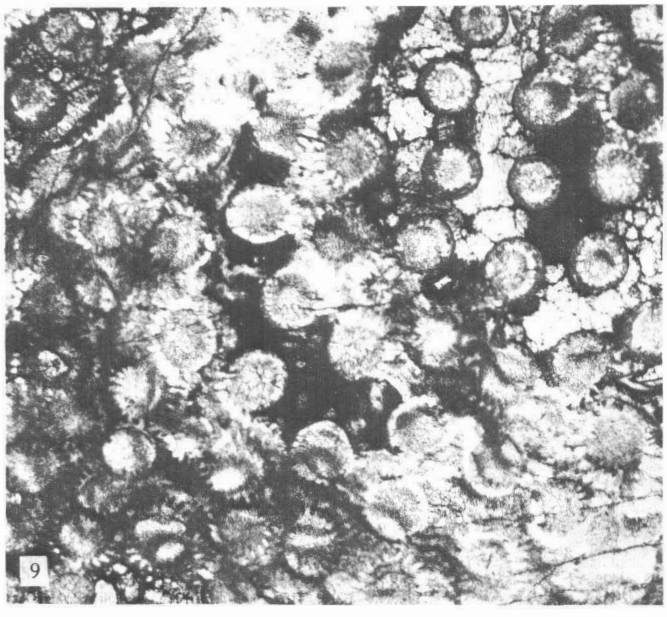
6



5



8



9

UPPER ORDOVICIAN CORALS, EAST-CENTRAL ALASKA

PLATE 6

Middle(?) and Upper Silurian tabulates from the Seward Peninsula

FIGURES 1, 2. *Palaeofavosites* sp., A. USNM 182860. Transverse and longitudinal thin sections, × 5. USGS colln. 8337–SD.

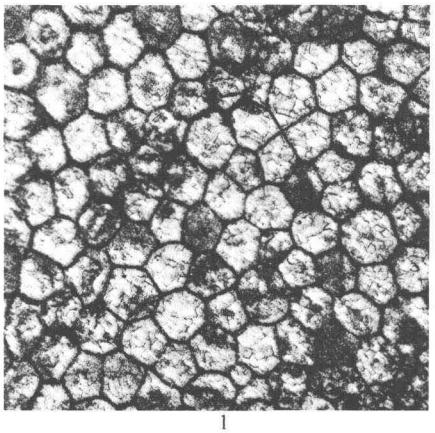
3, 4. *P.* sp. B, USNM 182861. Transverse and longitudinal thin sections, × 5. USGS colln. 8337–SD.

5, 6. *Pachyfavosites* sp. A, USNM 182862. Transverse and longitudinal thin sections, × 10. USGS colln. 7593–SD.

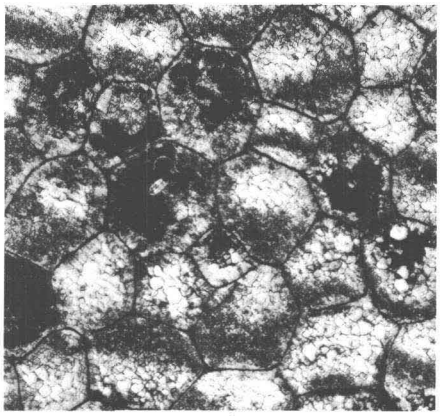
7, 8. *Mesofavosites* sp. B, USNM 182863. Transverse and longitudinal thin sections, × 5. USGS colln. 8338–SD.

9, 10. *M.* sp. A, USNM 182864. Transverse and longitudinal thin sections, × 5. USGS colln. 8339–SD.

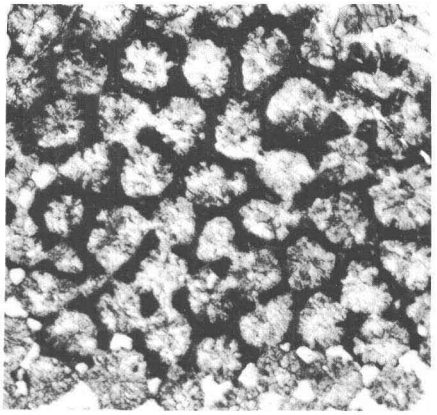
11, 12. *Parastriatopora* sp. A, USNM 182865. Longitudinal (× 3) transverse (× 5) thin sections. USGS colln. 7593–SD.



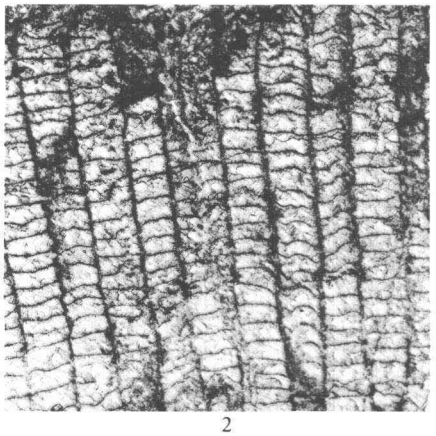
1



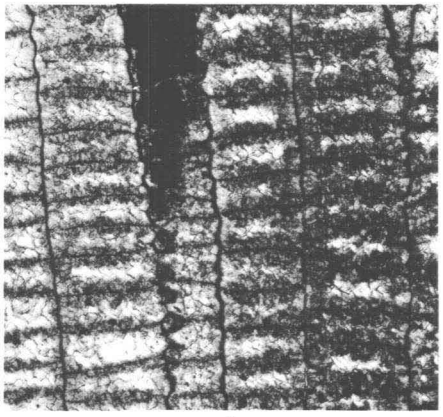
3



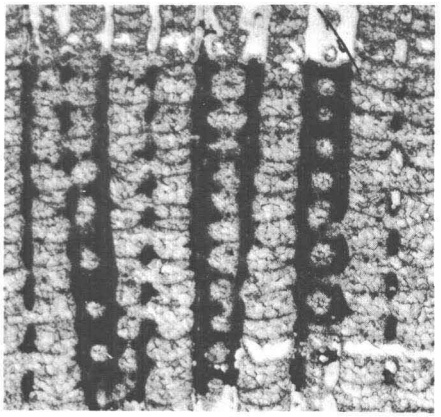
5



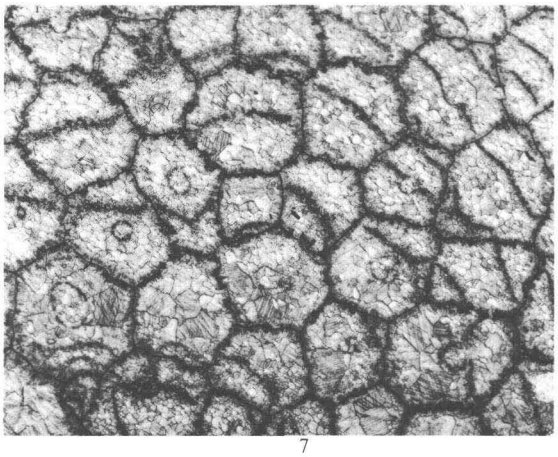
2



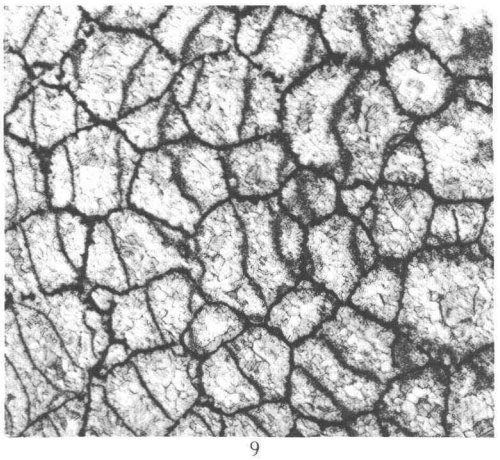
4



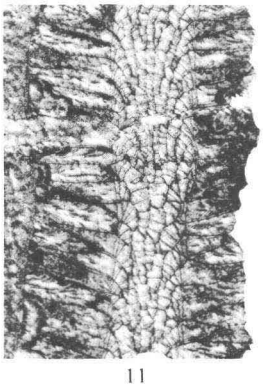
6



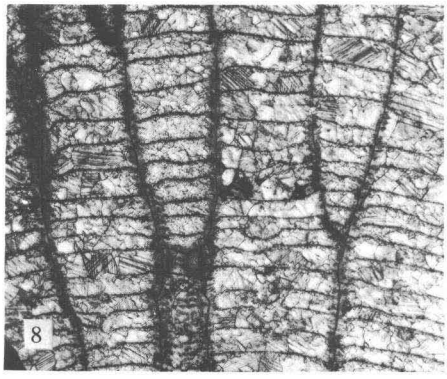
7



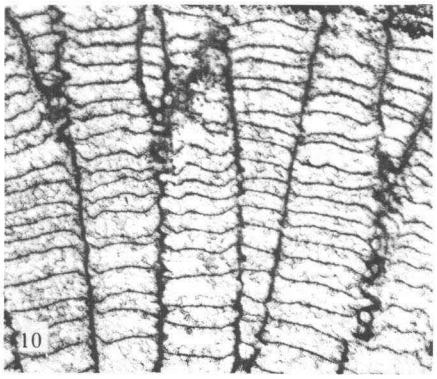
9



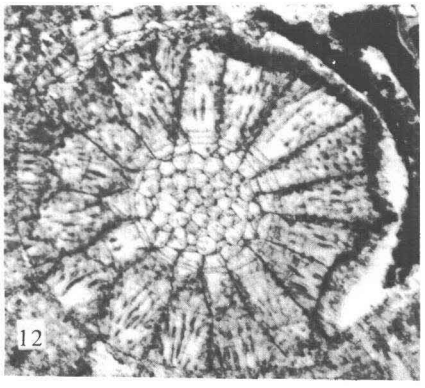
11



8



10



12

MIDDLE(?) AND UPPER SILURIAN TABULATES, SEWARD PENINSULA

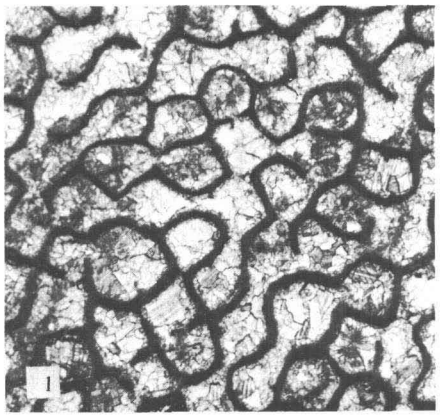
PLATE 7

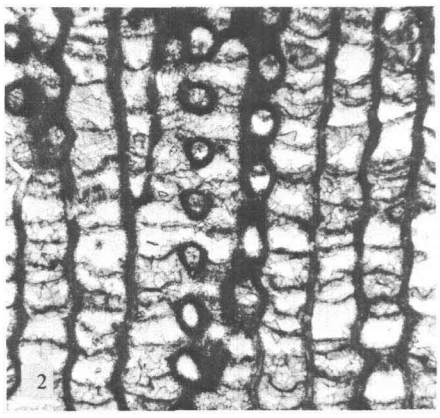
Middle(?) and Upper Silurian tabulates and heliolitoidids from the Seward Peninsula

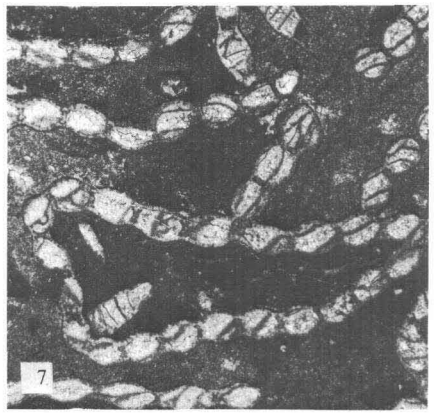
FIGURES 1–6. *Multisolenia* sp. A, transverse and longitudinal thin sections.
1, 2. USNM 182866, × 10. USGS colln. 8343–SD.
3, 4. USNM 182867, × 10. USGS colln. 8344–SD.
5, 6. USNM 182868, × 5. USGS colln. 7731–SD.
Note that 182867 differs from the others in having common short "septa" but this is a variable character and all illustrated specimens probably belong to one species.

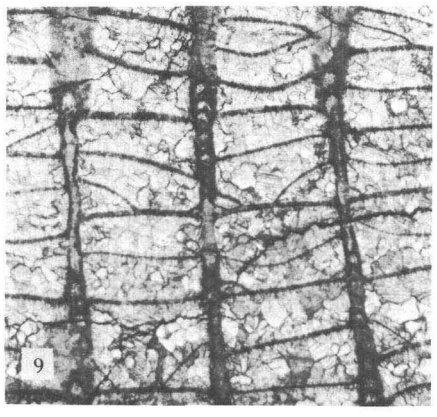
7–9. *Cystihalysites* sp., USNM 182869. Transverse thin section, × 3, and two parts of longitudinal thin section, × 10. USGS colln. 8340–SD.

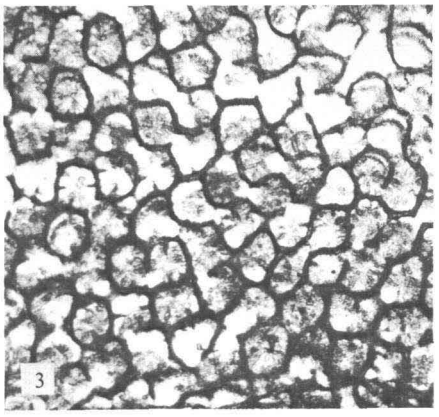
10, 11. *Stelliporella* sp., USNM 182870. Longitudinal and transverse thin sections × 10. USGS colln. 8343–SD.

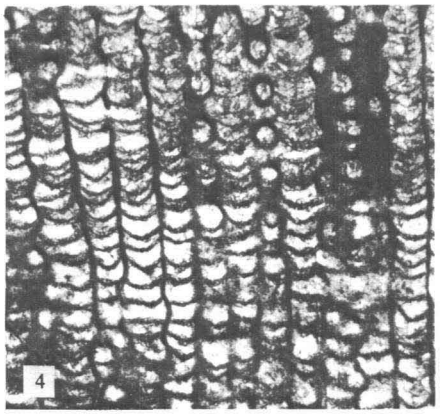


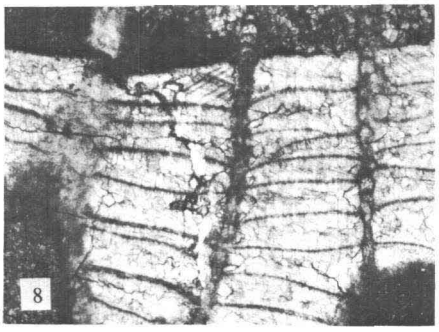


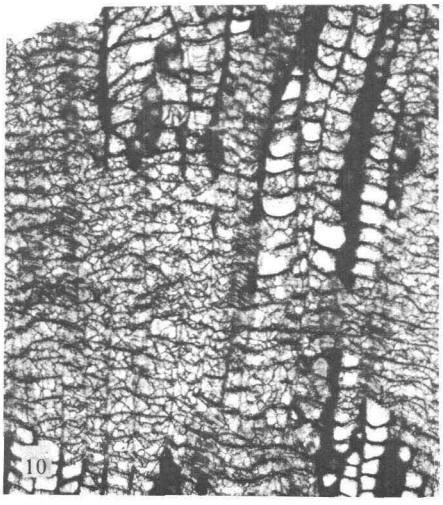


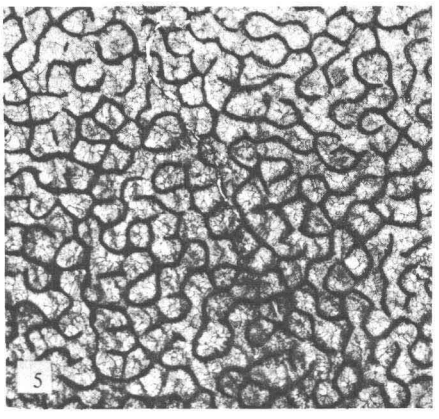


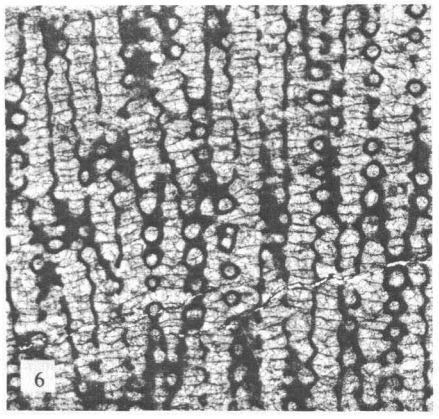


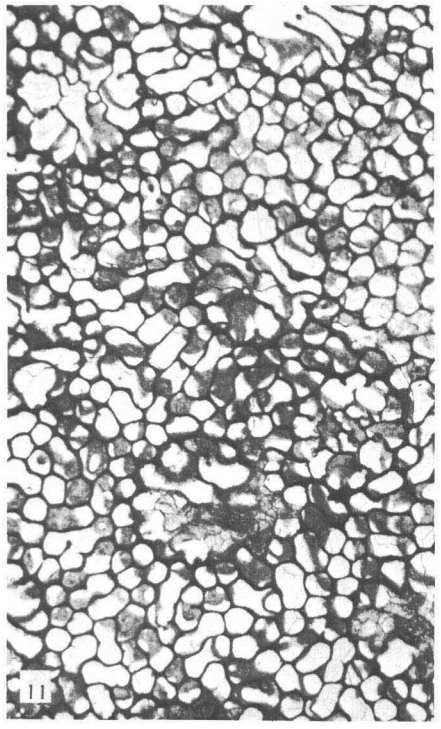












MIDDLE(?) AND UPPER SILURIAN TABULATES AND HELIOLITOIDIDS, SEWARD PENINSULA

PLATE 8

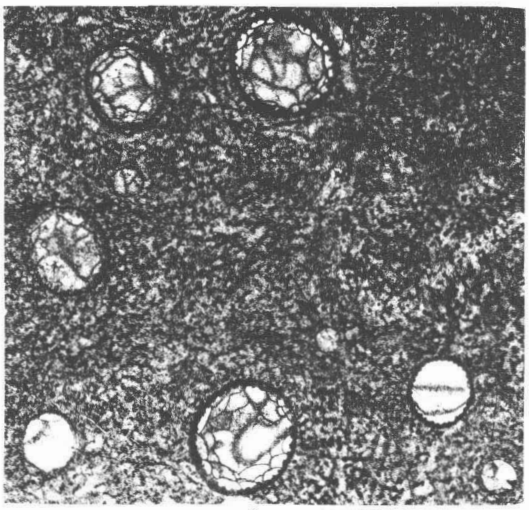
Middle(?) and Upper Silurian rugose and tabulate corals from the Seward Peninsula

FIGURES 1–3. *"Nipponophyllum"* sp. cf. *N. aseptatum* Ivanovsky. Transverse and longitudinal thin sections, × 3. USGS colln. 8343–SD.
1, 3. USNM 182871. Parts of one section.
2. USNM 182872. Individuals from same "cluster" as those of 182871.

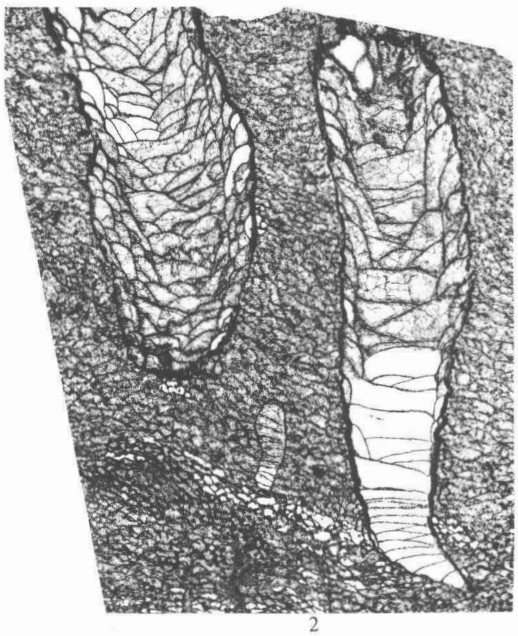
4, 5. *Entelophyllum*? sp., USNM 182873. Longitudinal and transverse thin sections, × 3. USGS colln. 8341–SD.

6, 7. Undetermined rugose coral, USNM 182874, partly embedded in massive stromatoporoid(?) with cf. *Syringoporinus* sp. (see figs. 8–10), × 3. USGS colln. 7731–SD.

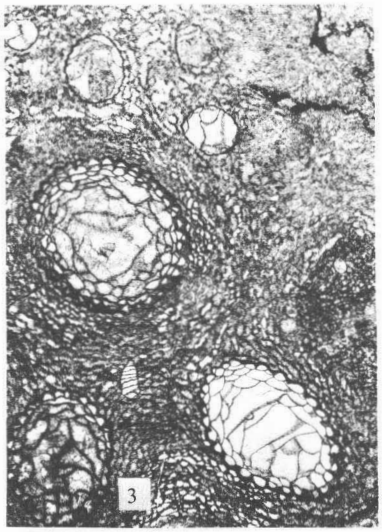
8–10. cf. *Syringoporinus* sp., USNM 182875, in massive stromatoporoid (?). Longitudinal and transverse thin sections, × 10. The transverse section was cut parallel to section illustrated in figure 6 but outside the rugose coral; the longitudinal views are from sections illustrated in figures 6 and 7.



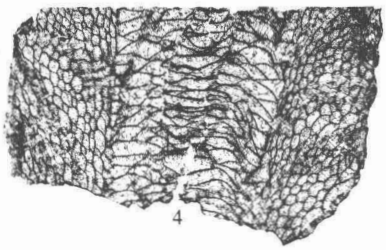
1



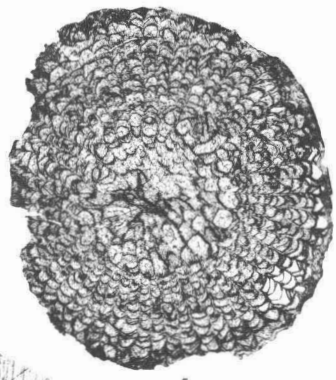
2



3

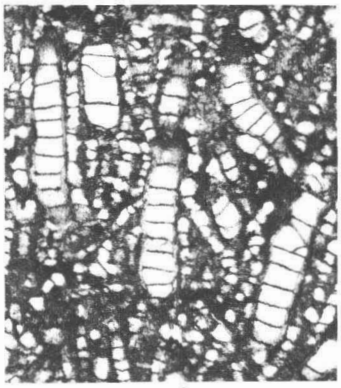


4

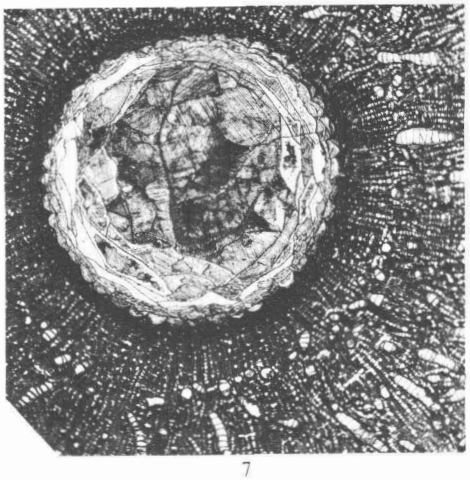


5

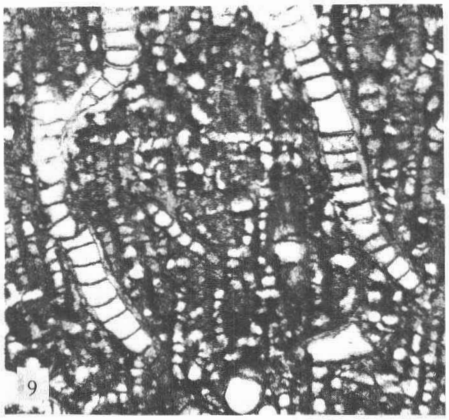
6



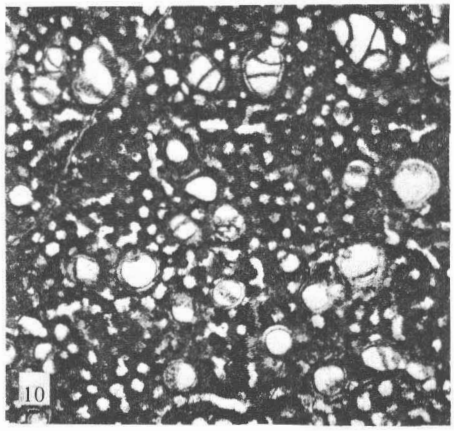
8



7



9



10

MIDDLE(?) AND UPPER SILURIAN RUGOSE AND TABULATE CORALS, SEWARD PENINSULA

PLATE 9

Middle(?) and Upper Silurian rugose corals from the Seward Peninsula

[All figures × 3]

FIGURES 1, 2. *Cyathactis* sp. B, USNM 182876. Transverse and longitudinal thin sections. USGS colln. 8344–SD.

3, 4. *Lamprophyllum* sp., USNM 182877. Transverse and longitudinal thin sections. USGS colln. 7731–SD.

5, 6. *Tryplasma* sp., USNM 182878. Longitudinal and transverse thin sections, USGS colln. 7593–SD.

7, 8. *Cystiphyllum* sp., USNM 182879. Longitudinal and transverse thin sections. USGS colln. 7593–SD.

9–13. *Contortophyllum* sp.

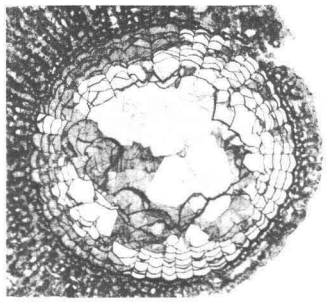
9, 10. USNM 182880. Transverse and longitudinal thin sections. USGS colln. 8344–SD.

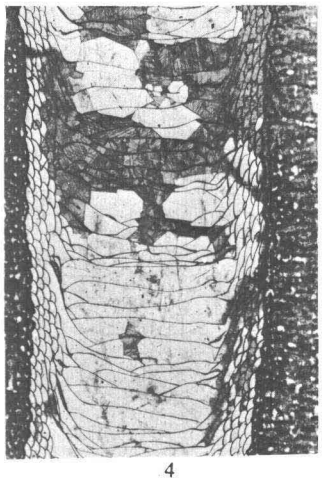
11. USNM 182881. Longitudinal thin section. USGS colln. 8341–SD.

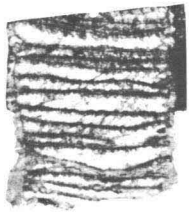
12, 13. USNM 182882. Transverse and longitudinal thin sections. USGS colln. 7731–SD.

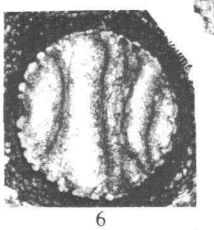
14, 15. cf. *Miculiella* sp., USNM 182883. Longitudinal and transverse thin sections. USGS colln. 7593–SD.

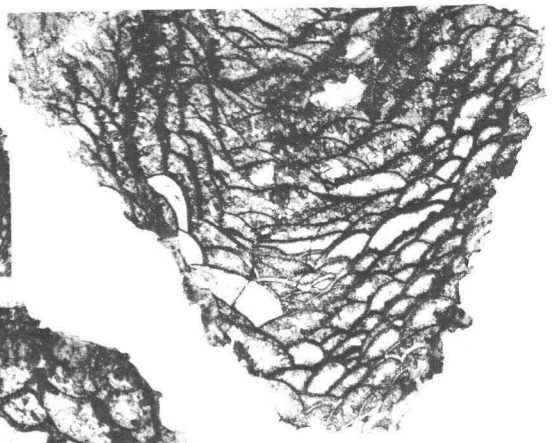

1

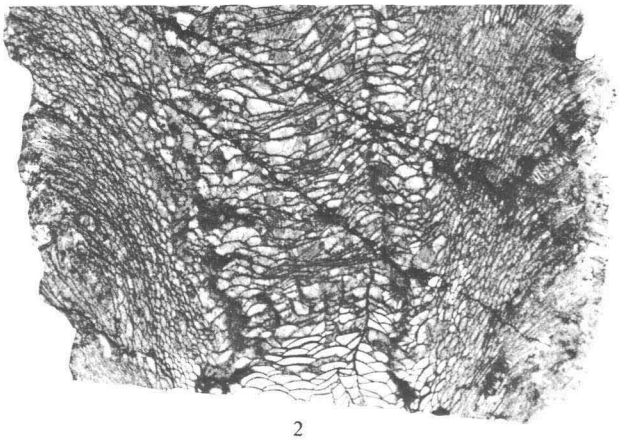

3

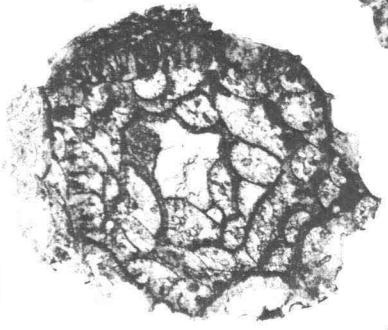

4

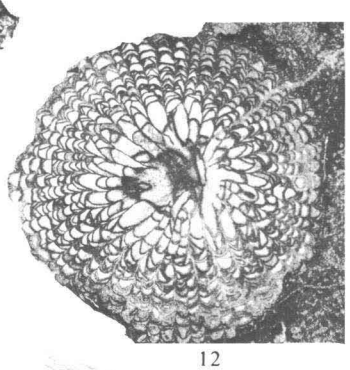

5

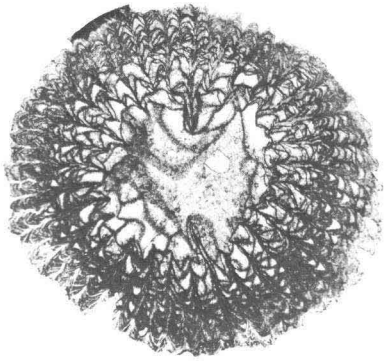

6

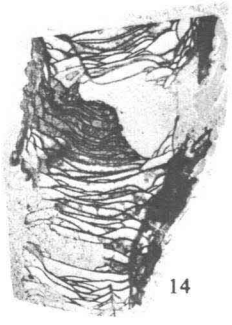

7

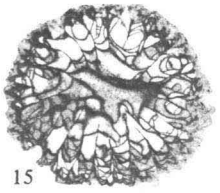

2

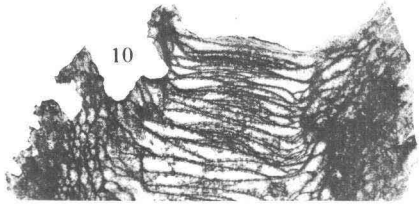

8

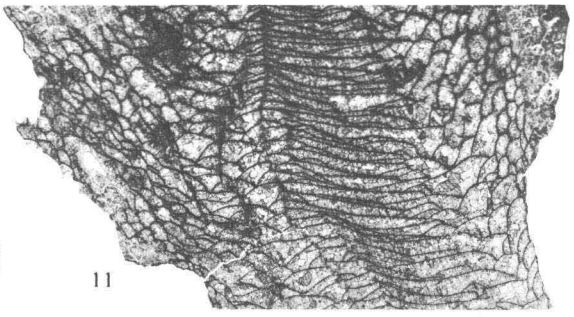

12

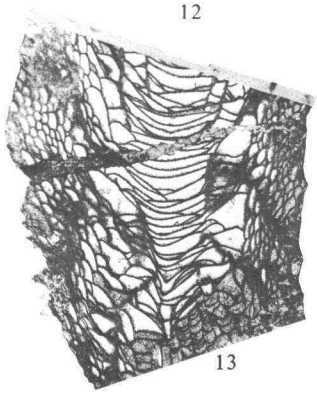

9


14


15


10


11


13

MIDDLE(?) AND UPPER SILURIAN RUGOSE CORALS, SEWARD PENINSULA

PLATE 10

Upper(?) Silurian rugose corals from the eastern Brooks Range

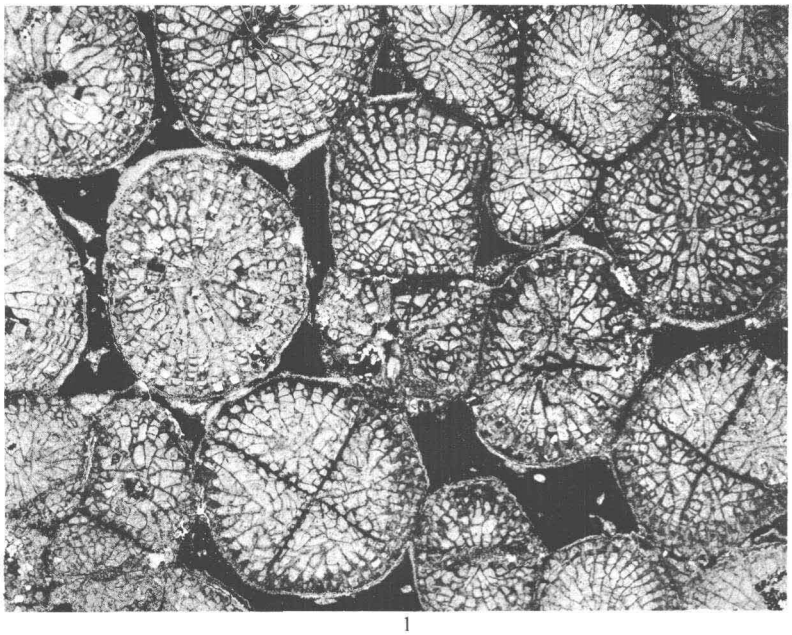
FIGURES 1, 2. *Stauria* sp., USNM 182884. Transverse and longitudinal thin sections, × 3. USGS colln. 8913–SD.

7. *Striatopora* sp., USNM 182907. Random thin section, × 5. USGS colln. 8913–SD.

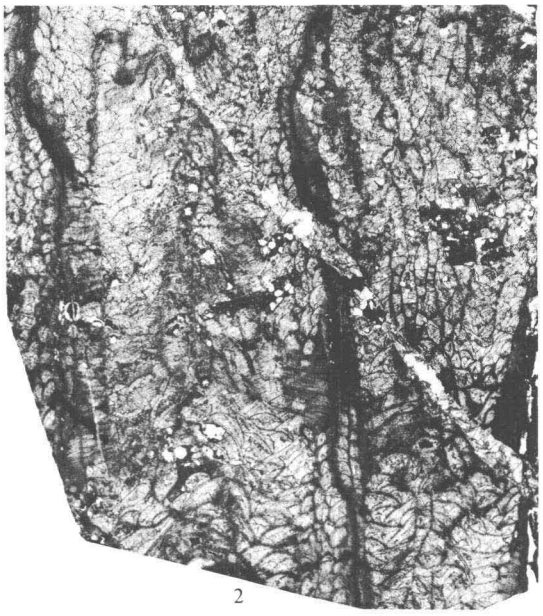
Middle (?) Silurian tabulate corals from the Fairbanks-Rampart area

3, 4. *Palaeofavosites* sp., USNM 182885. Transverse and longitudinal thin sections. × 5. USGS colln. 8920–SD.

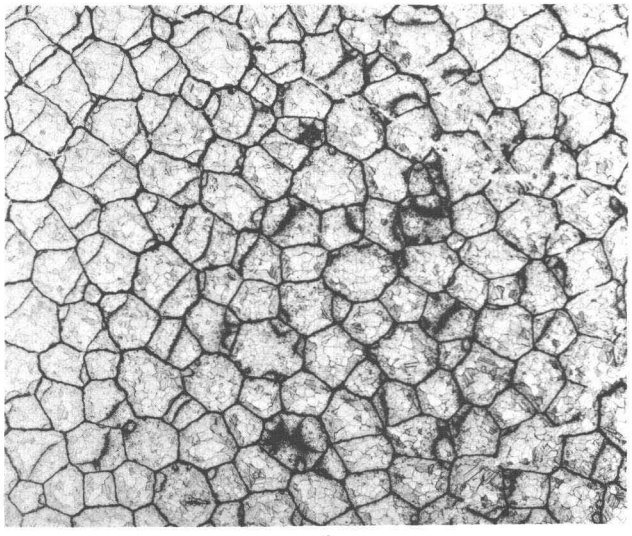
5, 6. *Mesofavosites* sp., USNM 182886. Transverse and longitudinal thin sections, × 5. USGS colln. 8920–SD.



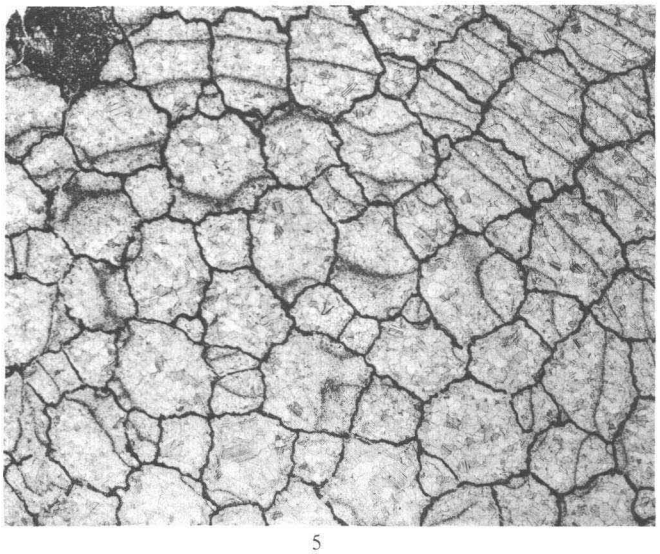
1



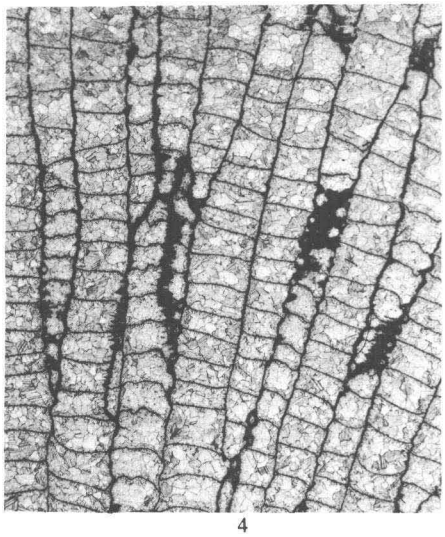
2



3

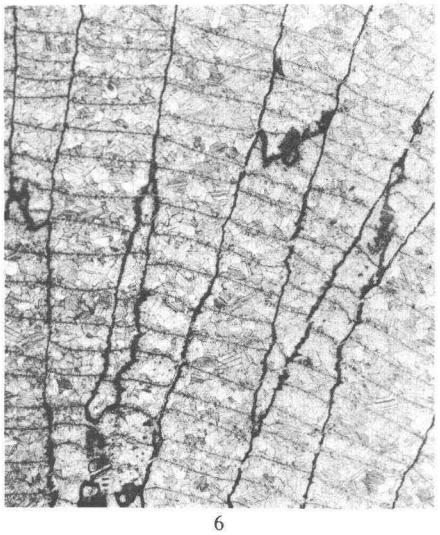


5



4

7



6

UPPER(?) SILURIAN CORALS, FAIRBANKS–RAMPART AND EASTERN BROOKS RANGE AREAS

PLATE 11

Middle or Upper Silurian rugose corals from southwestern Alaska

[All figures × 3]

FIGURES 1–3. *Ketophyllum* sp., USNM 182887. Higher transverse, intermediate longitudinal, and lower transverse thin sections. USGS colln. 6452–SD.

4–9. Undetermined rugose corals; transverse and longitudinal thin sections of each of three specimens. USGS colln. 6452–SD.

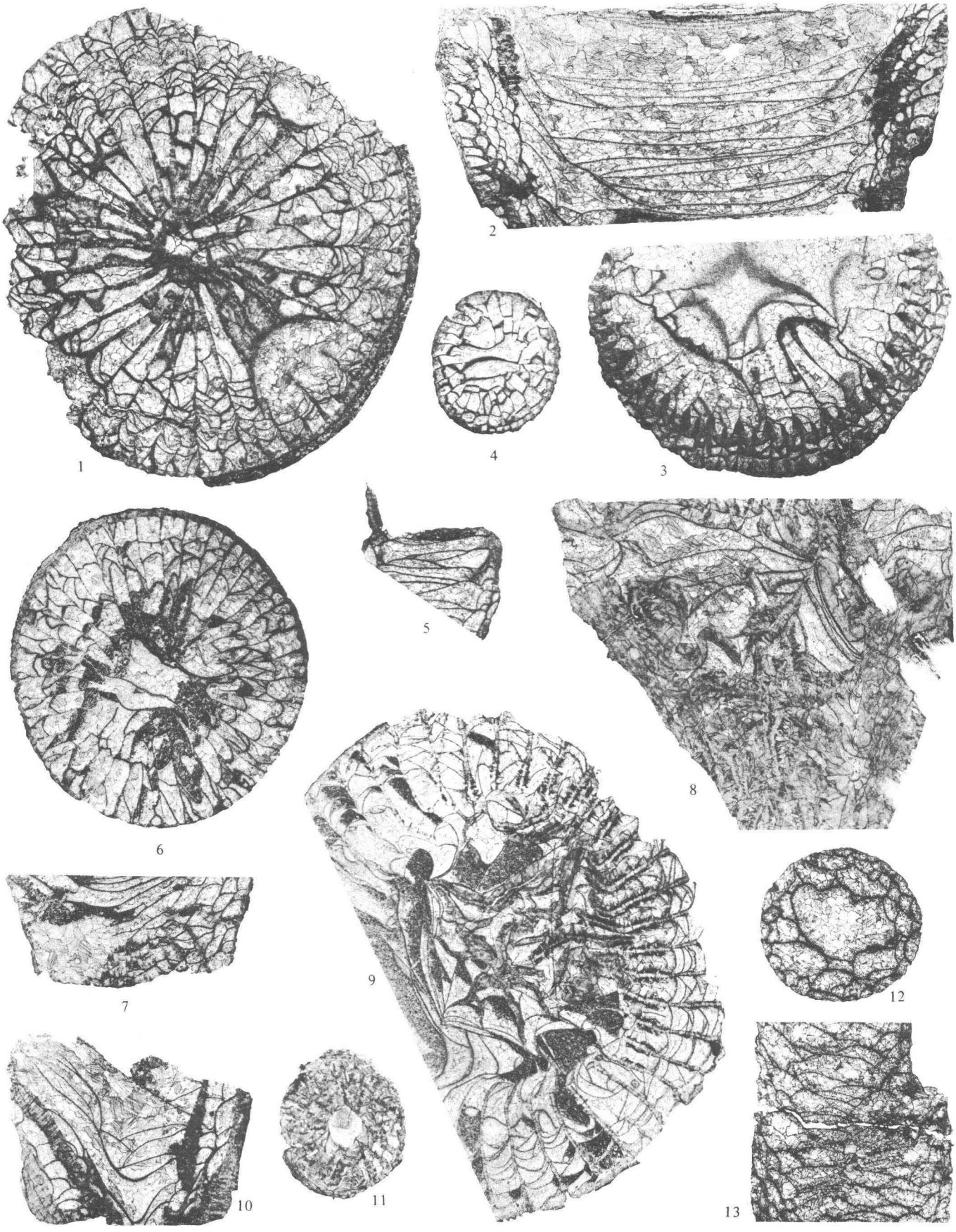
4, 5. USNM 182888.

6, 7. USNM 182889.

8, 9. USNM 182890.

10, 11. *Lykocystiphyllum*? sp., USNM 182891. Longitudinal and transverse thin sections. USGS colln. 6452–SD.

12, 13. *Microplasma*? sp., USNM 182892. Transverse and longitudinal thin sections. USGS colln. 8927–SD.



MIDDLE OR UPPER SILURIAN RUGOSE CORALS, SOUTHWESTERN ALASKA

PLATE 12

Middle Silurian rugose corals from the Porcupine River area

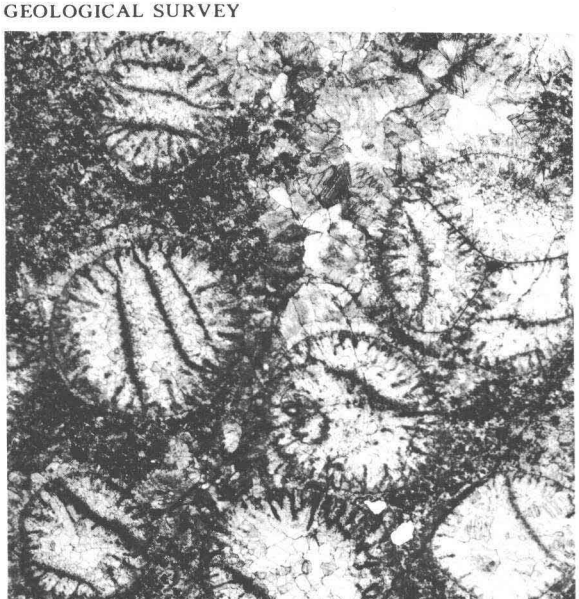
FIGURES 1, 2. *Holacanthia* sp., USNM 182893. Transverse and longitudinal thin sections, × 3. USGS colln. 8083–SD.

3, 4. *Cyathactis* sp. A, USNM 182894. Longitudinal and transverse thin sections, × 1½. USGS colln. 8083–SD.

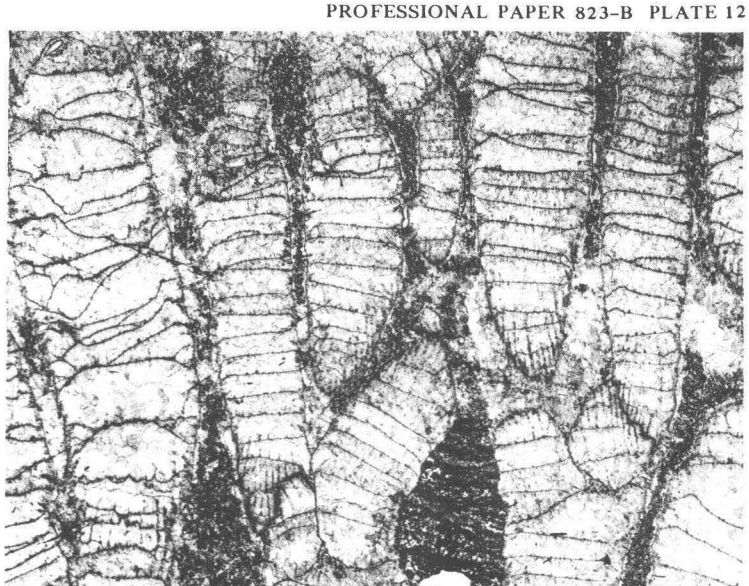
5. *Pycnactis*? sp., USNM 182895. Traverse thin section of only known fragment, × 1½. USGS colln. 8086–SD.

6, 7. *Zelophyllum* sp., USNM 182896. Longitudinal and transverse thin sections, × 2. USGS colln. 8086–SD.

8, 9. *Aphyllum* sp., USNM 182897. Longitudinal and transverse thin sections, × 5. USGS colln. 8086–SD.



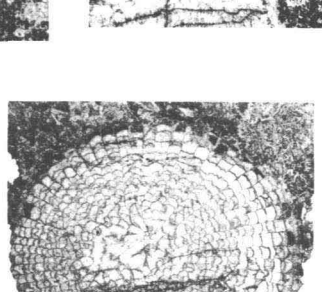
1



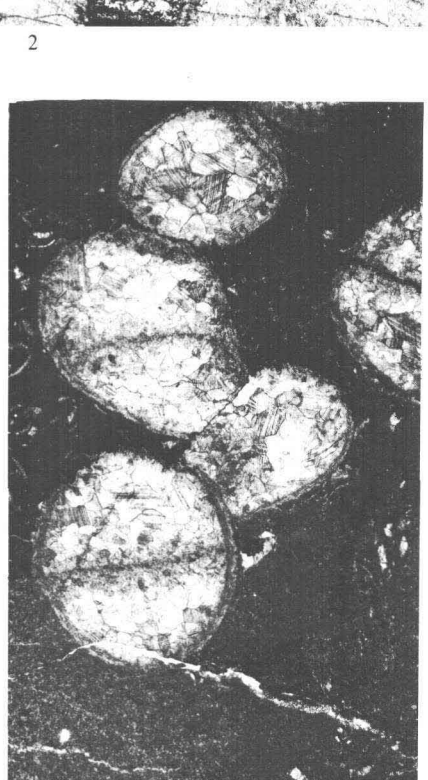
2

3

5

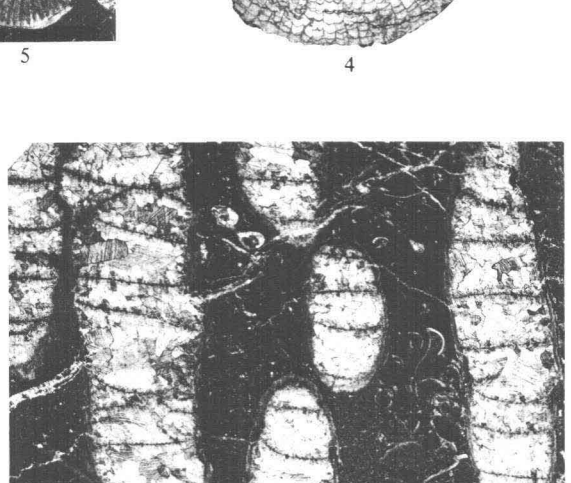


4



9

6



8

7

MIDDLE SILURIAN RUGOSE CORALS, PORCUPINE RIVER AREA

PLATE 13

Middle Silurian rugose corals from the Porcupine River area

FIGURES 1, 2. cf. *Palaeophyllum* sp., USNM 182898. Two thin sections showing variously oriented corallites, × 5. USGS colln. 8083–SD.

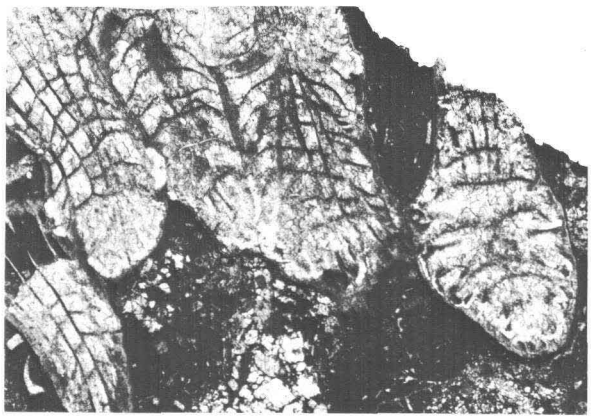
3–5. *Rhabdacanthia* sp., USNM 182889. Longitudinal and transverse thin sections, × 10. USGS colln. 8083–SD.

6, 7. *Tabularia* sp., USNM 182900. Longitudinal and transverse thin sections, × 1½. USGS colln. 8083–SD.

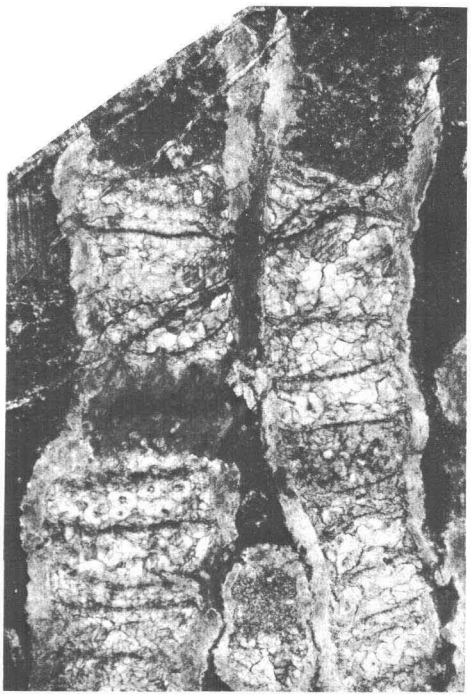
Middle (?) Devonian heliolitoidid coral, Porcupine River area

8, 9. *Heliolites* sp., USNM 182901. Longitudinal (× 5) and transverse (× 5, × 10) thin sections. USGS colln. 8087–SD.

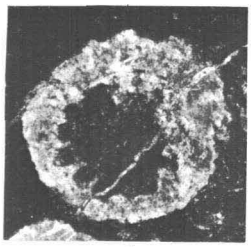
1



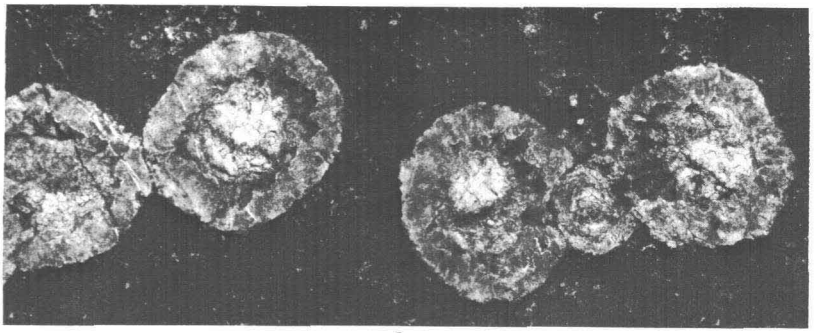
2



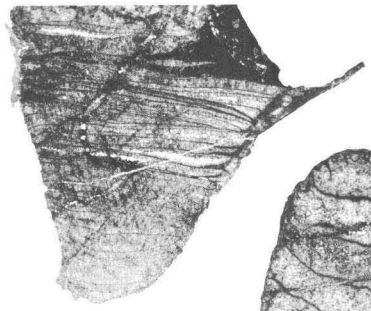
3



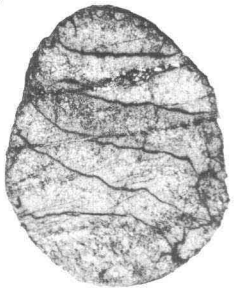
4



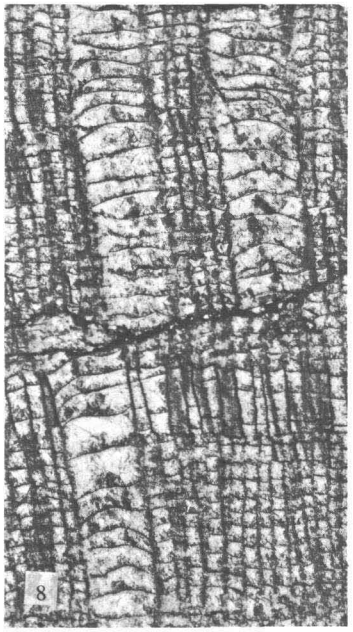
5



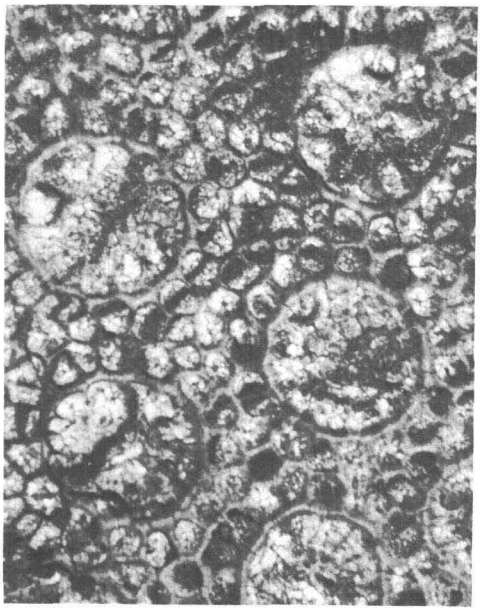
6



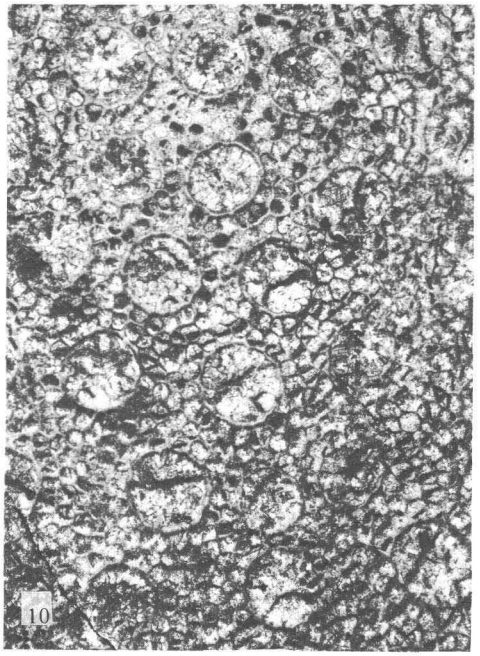
7



8



9



10

MIDDLE SILURIAN AND DEVONIAN CORALS, PORCUPINE RIVER AREA

PLATE 14

Devonian corals from the Brooks Range

FIGURES 1, 2. *Diplochone* sp., USNM 172259. Transverse and longitudinal thin sections, × 2. USGS colln. 7985–SD. Lower or Middle Devonian, Jade Mountains.

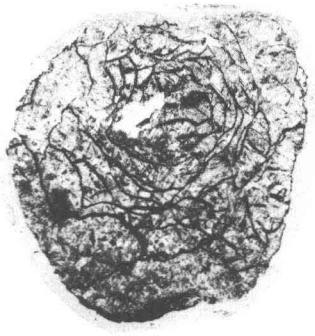
3, 4. *Thamnopora* sp., USNM 172260. Transverse and longitudinal thin sections, × 1½. USGS colln. 8789–SD. Middle(?) Devonian, western Brooks Range.

5, 6. *Hexagonaria* sp. A, USNM 182814. Transverse and longitudinal thin sections, × 2. USGS colln. 8792–SD. Upper Devonian limestone of Arctic Village, eastern Brooks Range.

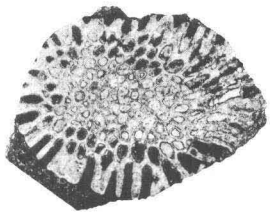
7. *Disphyllum* sp., USNM 182815. Longitudinal thin section, × 3. USGS colln. 6413–SD. Frasnian slate-conglomerate-limestone unit, eastern Brooks Range.

8, 9. *Tabulophyllum* sp., USNM 182816. Longitudinal and transverse thin sections, × 2. USGS colln. 7988–SD. Upper(?) Devonian, western Brooks Range.

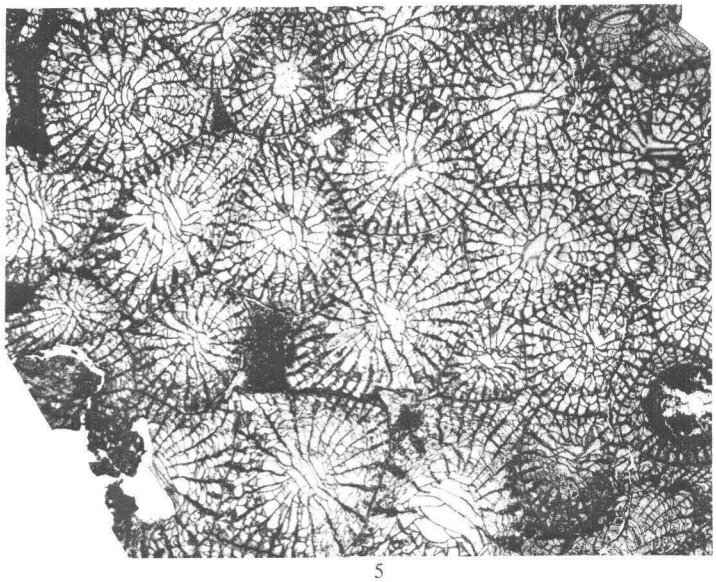
10. *Pachyfavosites*? sp., USNM 182817. Transverse and longitudinal thin section, × 10. USGS colln. 8792–SD. Upper Devonian limestone of Arctic Village, eastern Brooks Range.



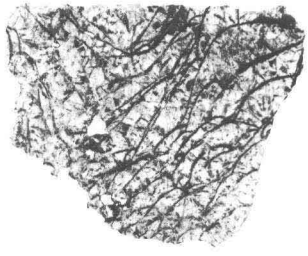
1



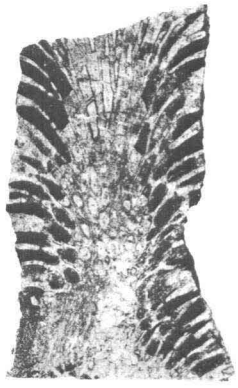
3



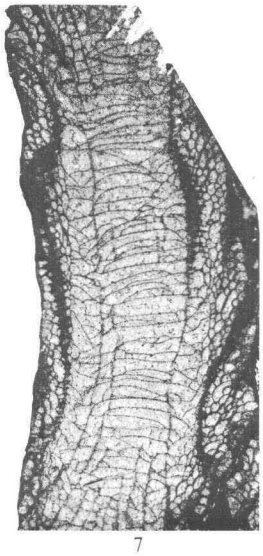
5



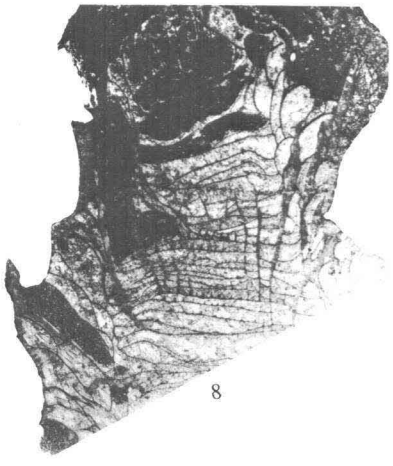
2



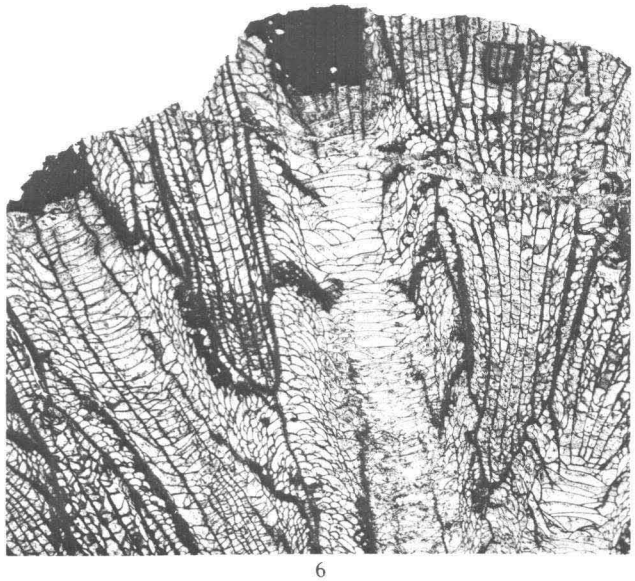
4



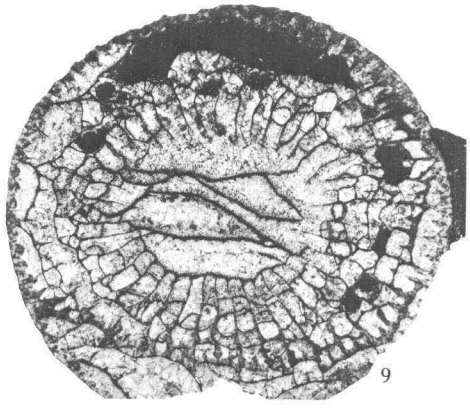
7



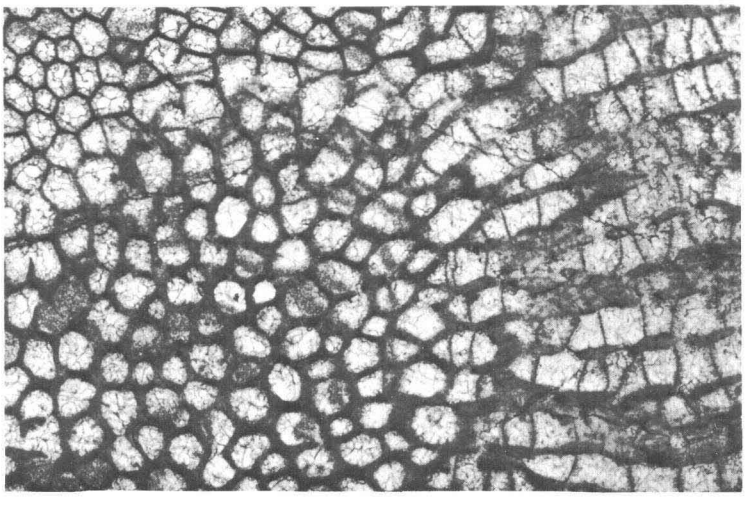
8



6



9



10

DEVONIAN CORALS, BROOKS RANGE

PLATE 15

Devonian corals from the Brooks Range

FIGURES 1, 2. *Disphyllum* sp., USNM 172254. Transverse and longitudinal thin sections, × 3. USGS colln. 8789–SD. Middle(?) Devonian, western Brooks Range.

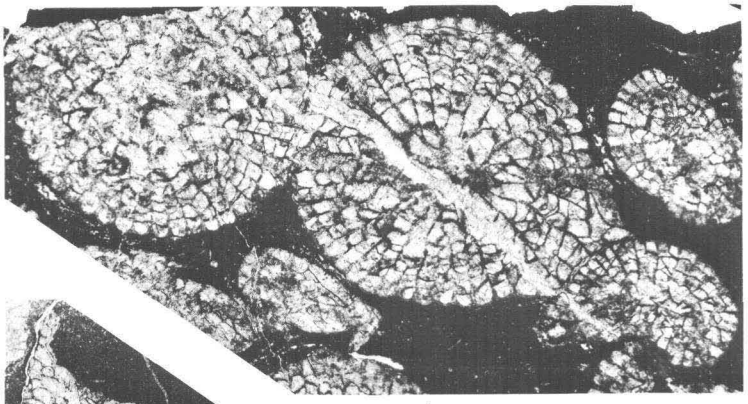
3, 4. Taimyrophyllum sp. A, × 2. Lower or Middle Devonian, Cosmos Hills.

3. USNM 172255. Longitudinal thin section. USGS colln. 7659–SD.

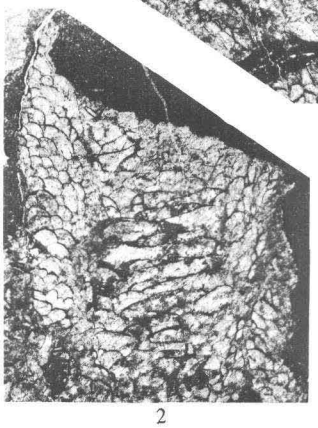
4. USNM 172256. Transverse thin section. USGS colln. 7980–SD.

5, 6. *Disphyllum* sp., USNM 172257. Longitudinal and transverse thin sections, × 3. USGS colln. 8788–SD. Upper(?) Devonian, western Brooks Range.

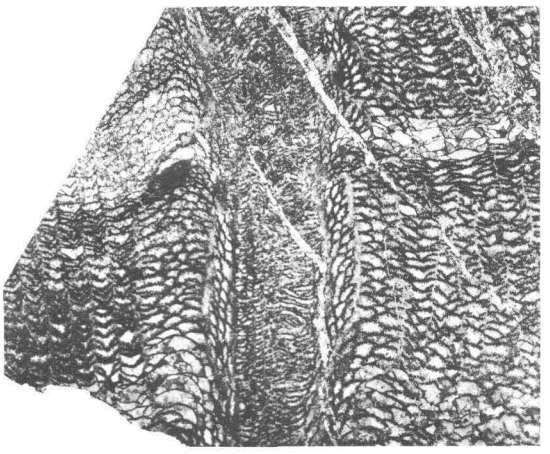
7, 8. *Disphyllum* sp., USNM 172258. Longitudinal and transverse thin sections, × 3. USGS colln. 8910–SD. Frasnian, eastern Brooks Range.



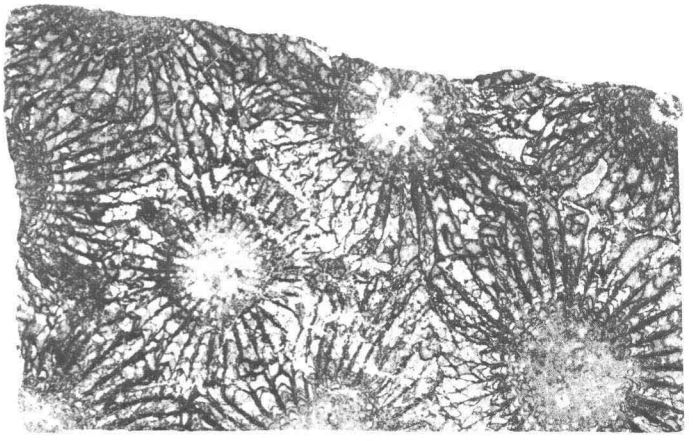
1



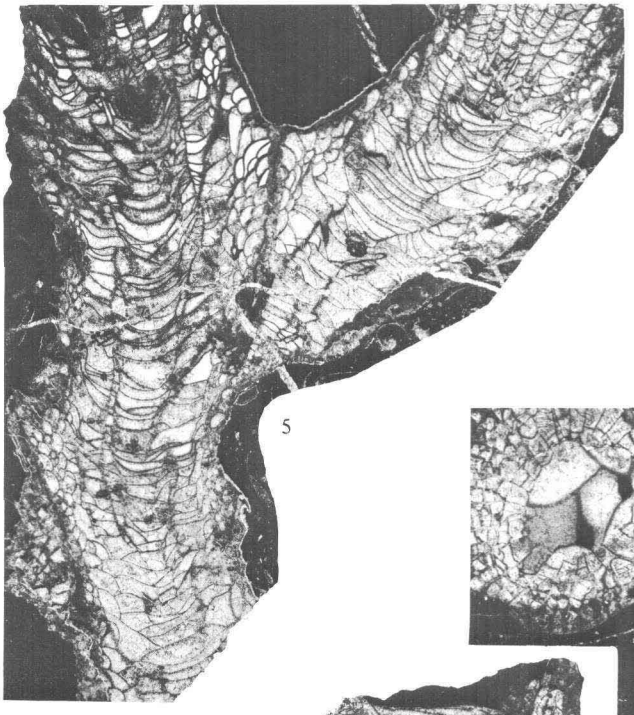
2



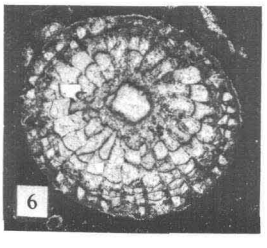
3



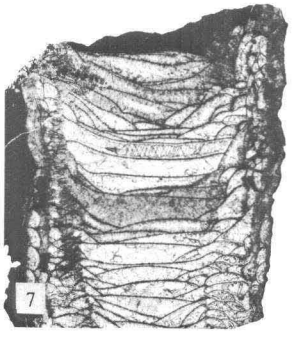
4



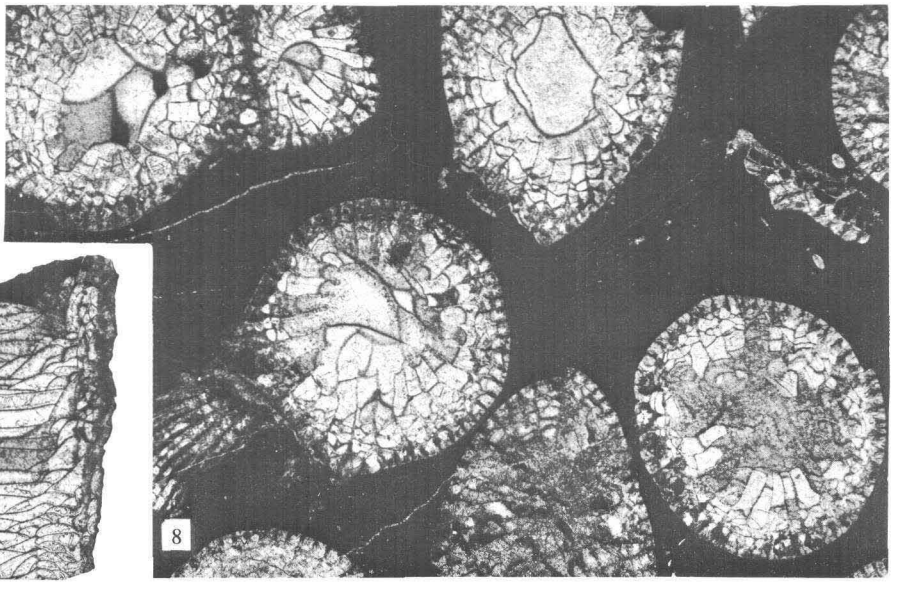
5



6



7



8

DEVONIAN CORALS, BROOKS RANGE

PLATE 16

Lower or Middle Devonian tabulate corals from the McCann Hill Chert in the Yukon-Nation Rivers area

FIGURES

1, 2. *Favosites* sp. C, USNM 182818. Transverse and longitudinal thin sections, × 5. USGS colln. 6826–SD.

3, 4. *Favosites* sp., USNM 182819. Transverse and longitudinal thin sections, × 5. USGS colln. 6445–SD.

5, 6. *Favosites* sp., USNM 182820. Transverse and longitudinal thin sections, × 5. USGS colln. 6445–SD.

7, 8. *Favosites* sp. A, USNM 182821. Transverse and longitudinal thin sections, × 5. USGS colln. 6830–SD.

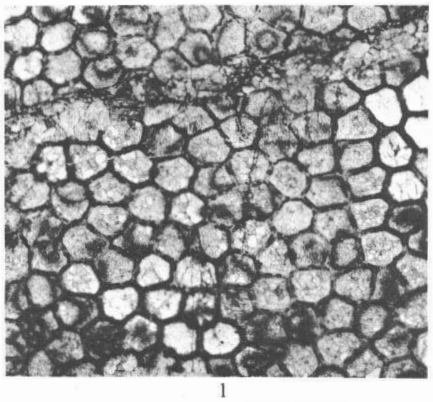
9–11. *Echyropora*? sp.

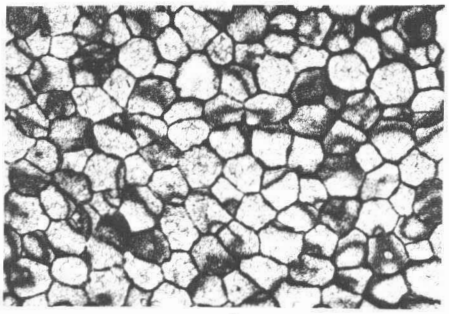
9. USNM 182822. Transverse thin section, × 10. USGS colln. 6830–SD.

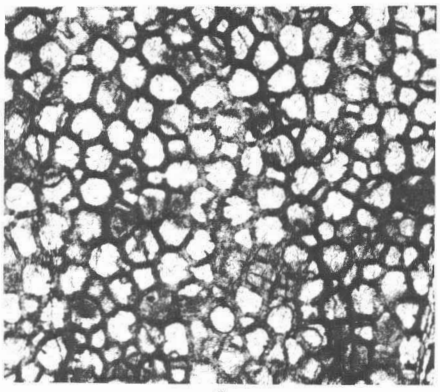
10, 11. USNM 182823. USGS colln. 6823–SD. Figure 10 is a section showing corallites cut both longitudinally and transversely whose walls grade from relatively thin to thick, as in figures 9 and 11, × 5. Figure 11 is a longitudinal thin section, × 10.

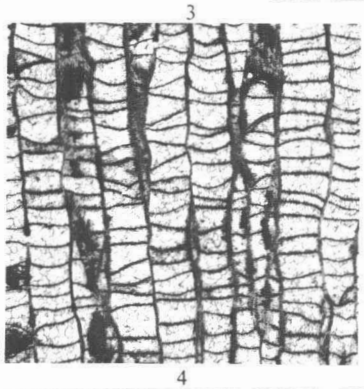
Limestone associated with the Woodchopper Volcanics

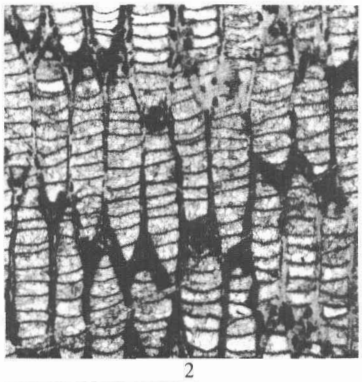
12, 13. *Favosites* sp. b, USNM 182824. Longitudinal and transverse thin sections, × 5. USGS colln. 7186–SD.

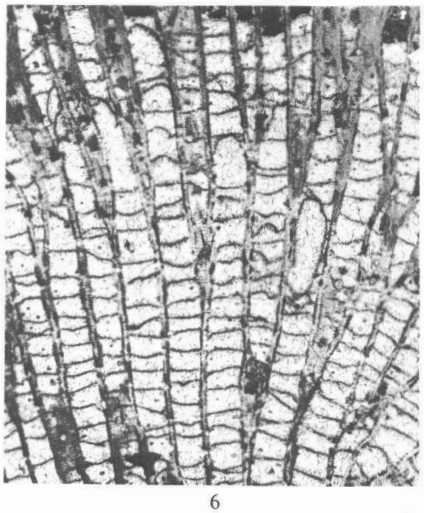

1

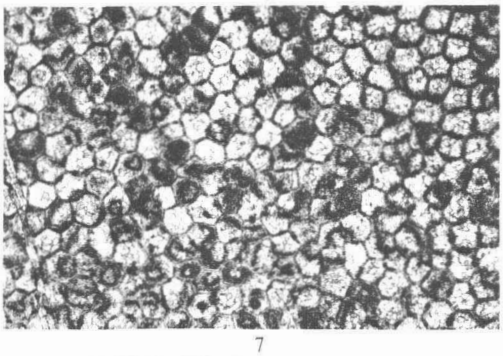

3

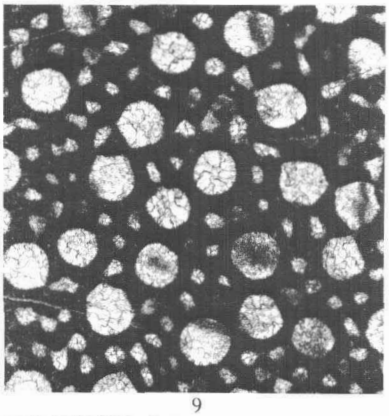

5

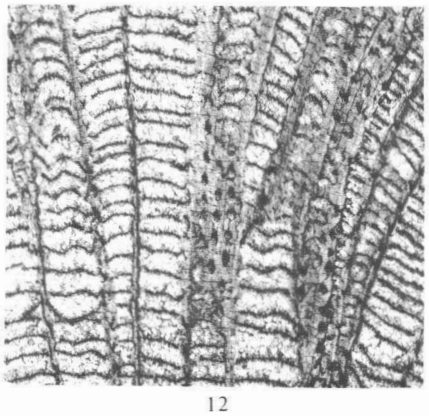

4

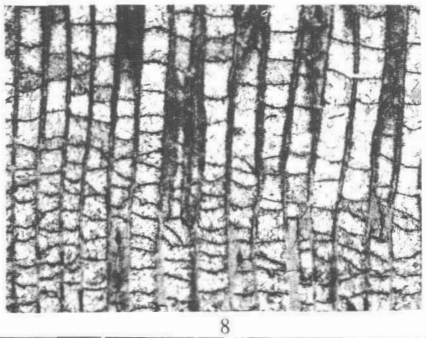

2

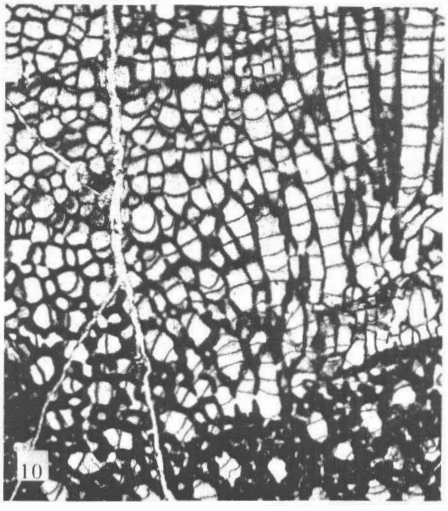

6

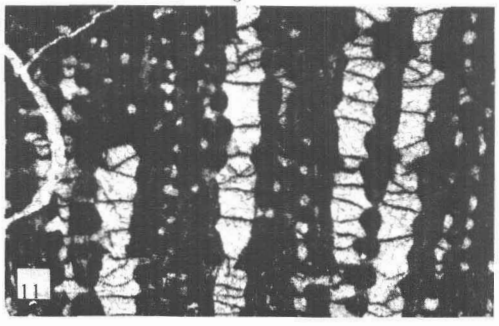

7

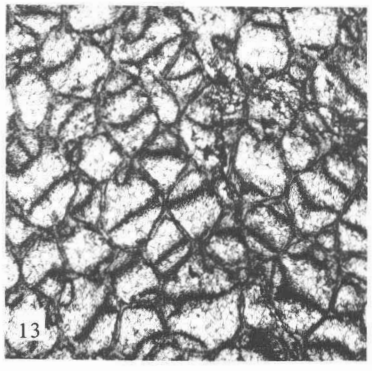

9


12


8


10


11


13

LOWER OR MIDDLE DEVONIAN TABULATE CORALS, YUKON-NATION RIVERS AREA

PLATE 17

Lower or Middle Devonian corals from the McCann Hill Chert in the Yukon-Nation Rivers Area

FIGURES 1–3. *Xystriphyllum*? sp. cf. *Fasciphyllum schluteri* Soshkina, USNM 182852. USGS colln. 6825–D.

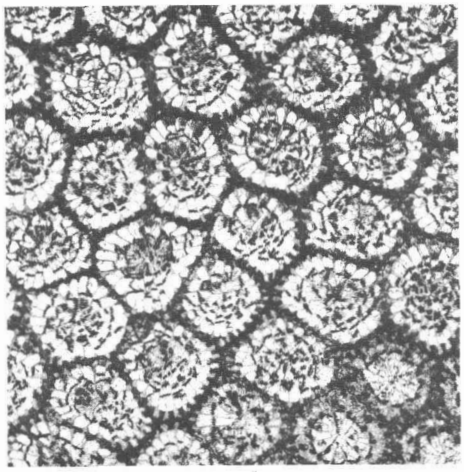
1, 2. Transverse and longitudinal thin sections, × 5.

3. Detail of figure 1, × 10.

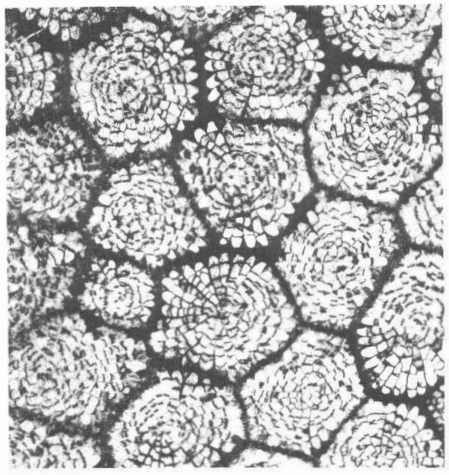
4, 5. *Xystriphyllum* sp. B, USNM 182826. Transverse and longitudinal thin sections, × 5. USGS colln. 6829–SD.

6, 7. *Xystriphyllum* sp. cf. *Stenophyllum gorskii* Bulvanker, USNM 182827. Transverse and longitudinal thin sections, × 5. USGS colln. 6822–SD.

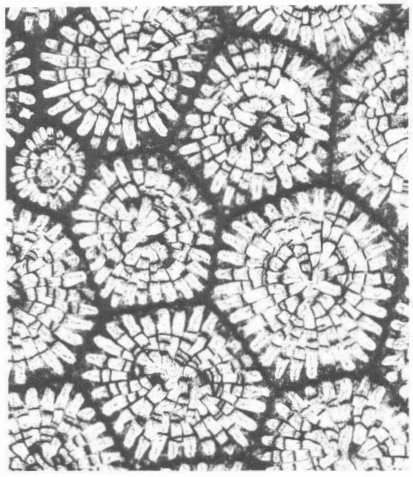
8, 9. *Xystriphyllum* sp. cf. *Stenophyllum devonicum* Bulvanker, USNM 182828. Longitudinal and transverse thin sections, × 5. USGS 6320–SD.



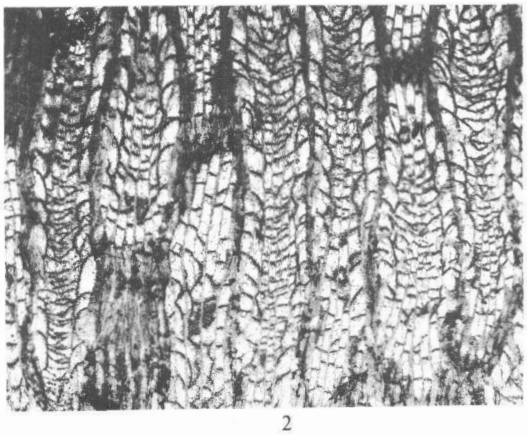
1



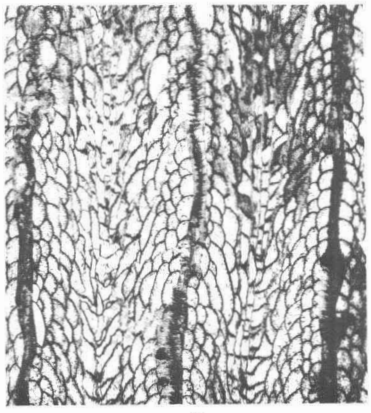
4



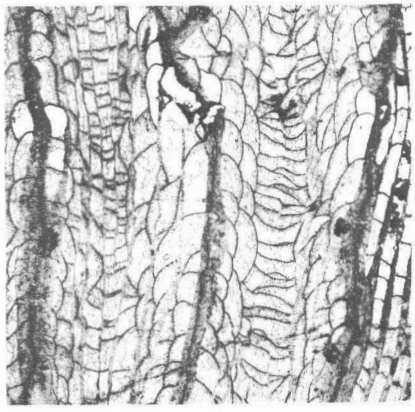
6



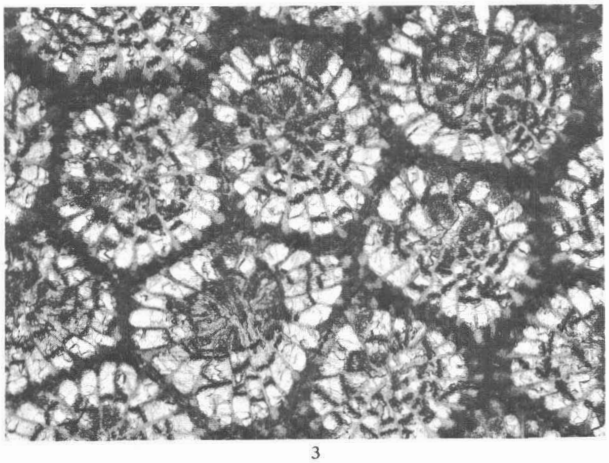
2



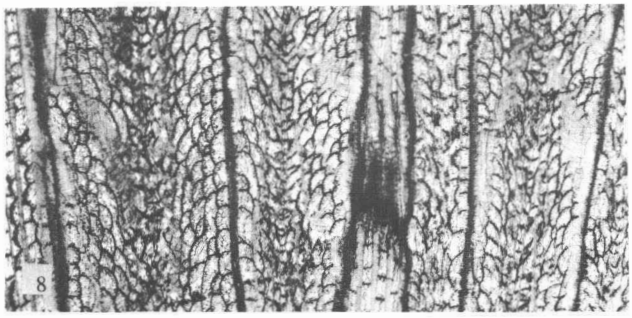
5



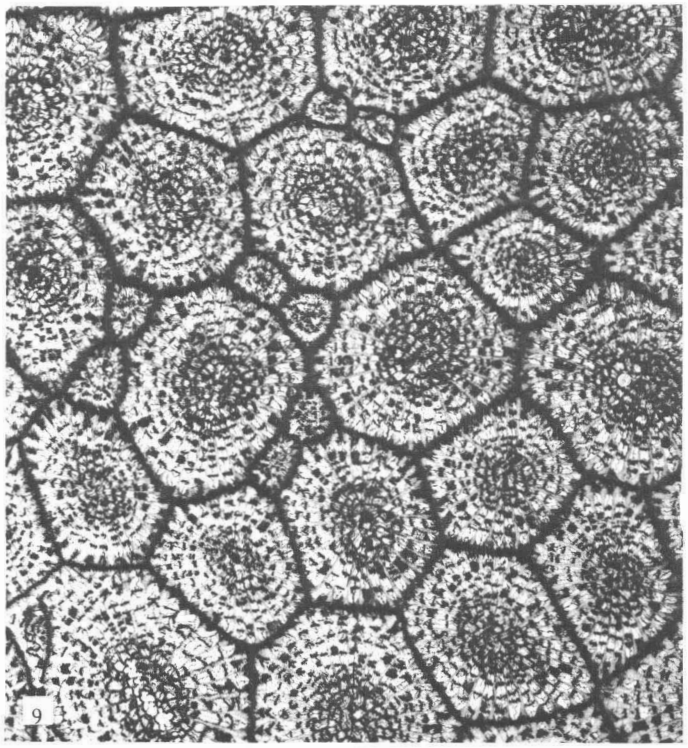
7



3



8



9

LOWER OR MIDDLE DEVONIAN TABULATE CORALS, YUKON-NATION RIVERS AREA

PLATE 18

Lower or Middle Devonian corals from the McCann Hill Chert in east-central Alaska

FIGURES 1, 2. *Spongophyllum* sp. A, USNM 182829. Transverse and longitudinal thin sections, × 5. USGS colln. 6830–SD.

3, 4. *Spongophyllum* sp. B, USNM 182830. Transverse and longitudinal thin sections, × 5. USGS colln. 6829–SD.

5–7. *Peneckiella* sp. A, USNM 182831. USGS colln. 6829–SD.

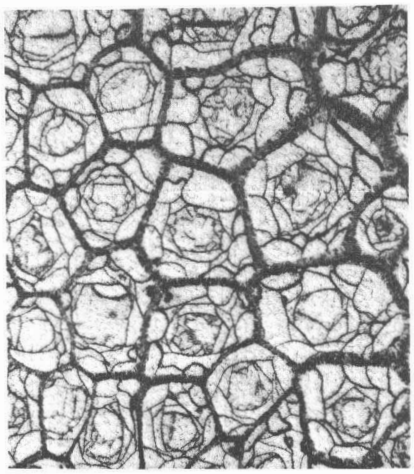
5, 6. Transverse and longitudinal thin sections, × 5.

7. Detail of figure 6, × 10, to show sigmoidal dissepiments and phillipsastraeid trabecular fans.

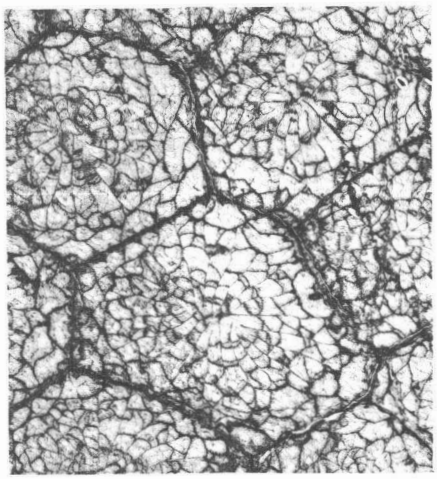
8, 9. *Hexagonaria* sp., USNM 182832. Transverse and longitudinal thin sections, × 3. USGS colln. 6829–SD.

Porcupine River area

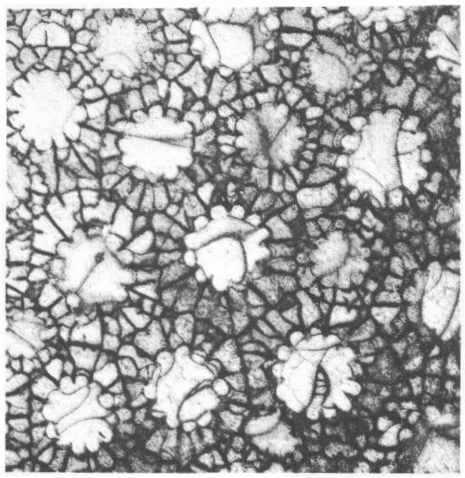
10, 11. *Hexagonaria* sp., USNM 182833. Transverse and longitudinal thin sections, × 2. USGS colln. 6456–SD.



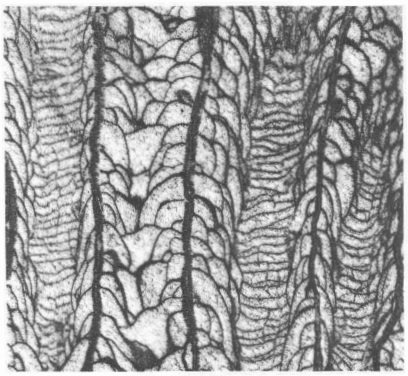
1



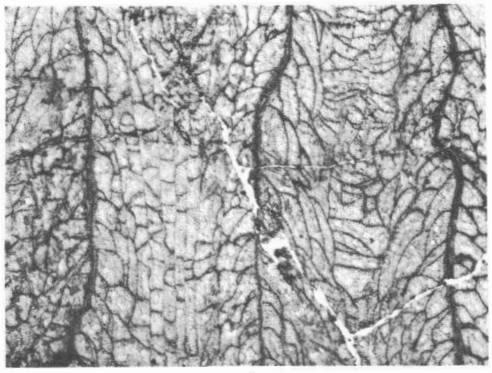
3



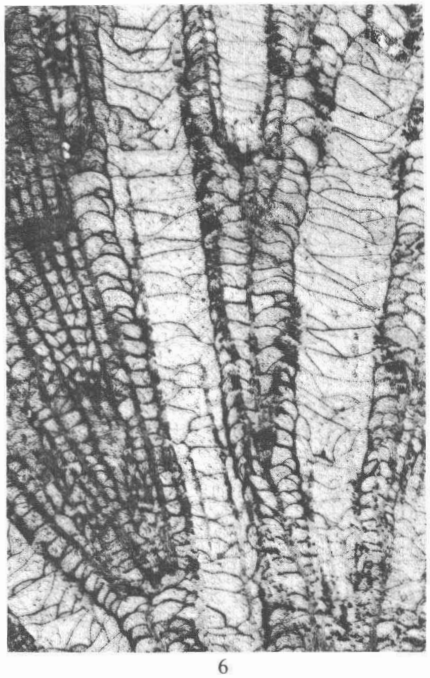
5



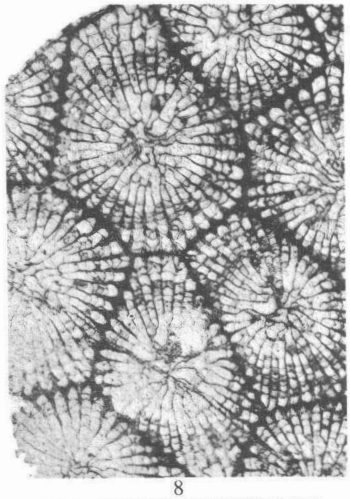
2



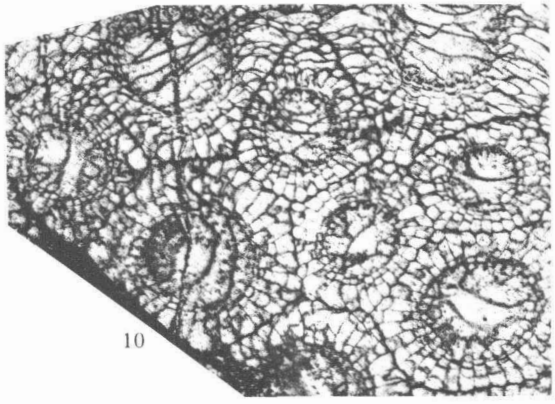
4



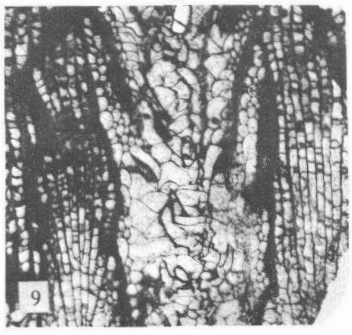
6



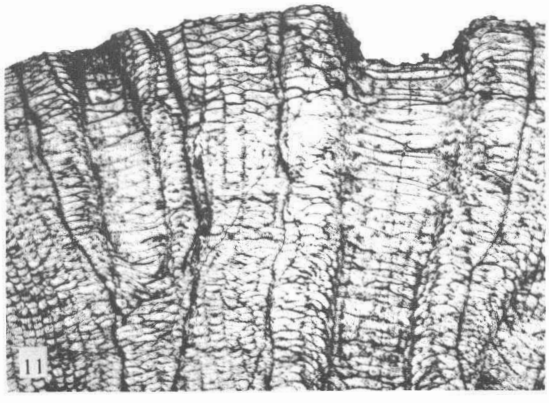
8



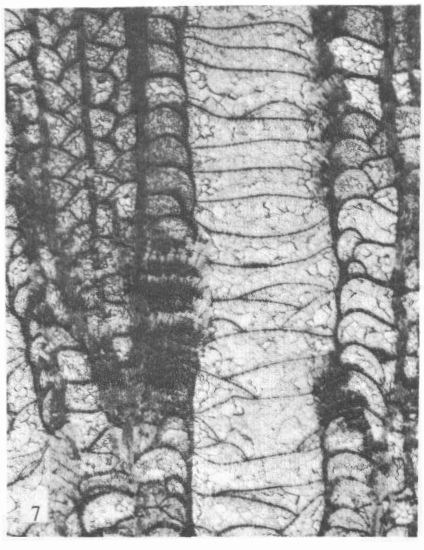
10



9



11



7

LOWER OR MIDDLE DEVONIAN CORALS, EAST-CENTRAL ALASKA

PLATE 19

Lower(?) and Middle Devonian rugose corals from the Yukon-Nation Rivers area

FIGURES 1–8. *Acanthophyllum* (*Acanthophyllum*) sp. or spp. Transverse and longitudinal thin sections of four specimens.

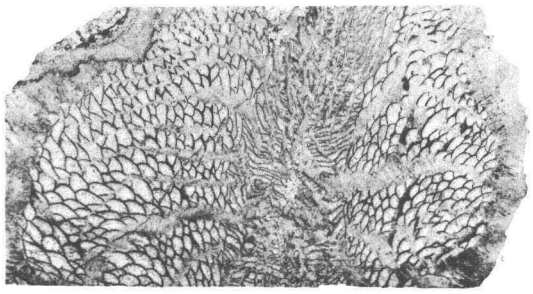
1, 2. USNM 182902. USGS colln. 7178–SD.

3, 4, USNM 182903. USGS colln. 6455–SD.

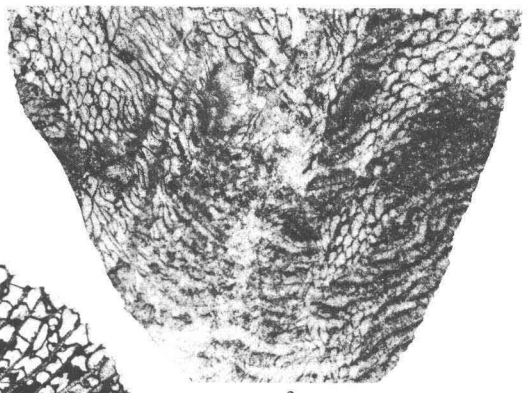
5, 6. USNM 182904. USGS colln. 7178–SD.

7, 8. USNM 182905. USGS colln. 6454–SD.

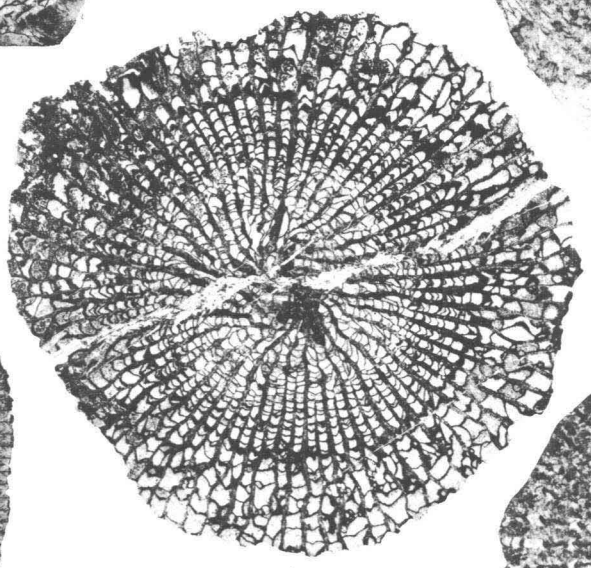
9, 10. *Plasmophyllum* (*Mesophyllum*) sp., USNM 182906. Longitudinal and transverse thin sections of fragment. USGS colln. 6447–SD.



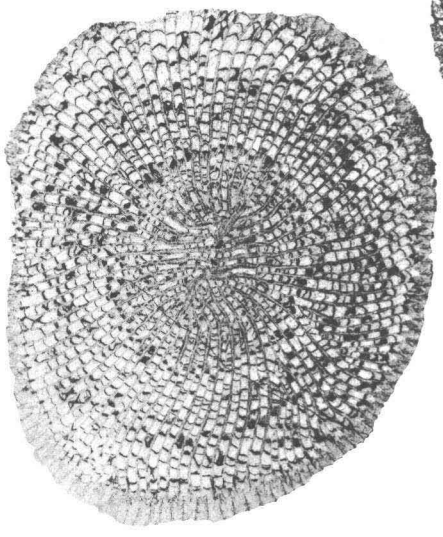
1



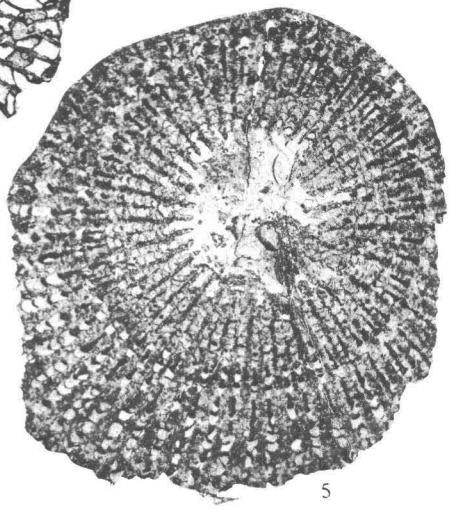
3



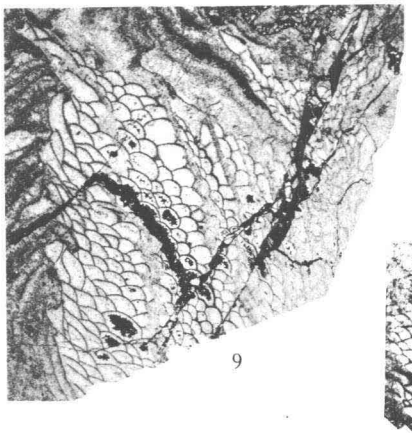
4



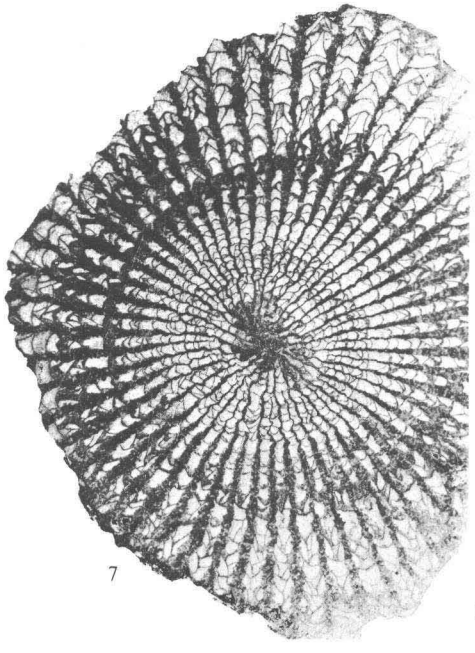
2



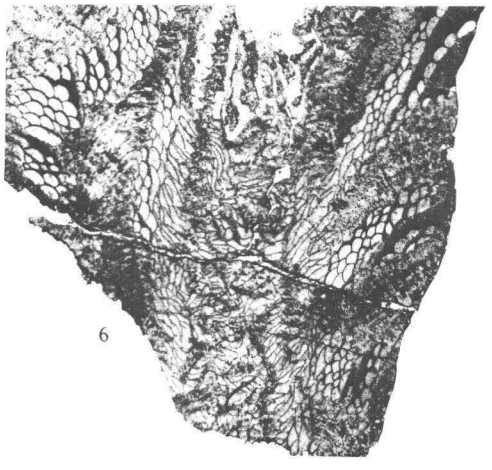
5



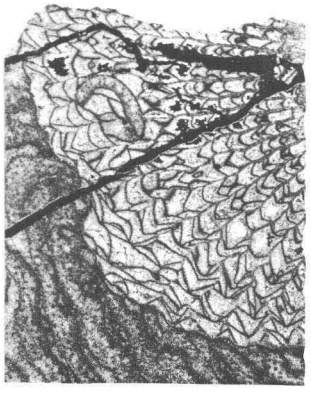
9



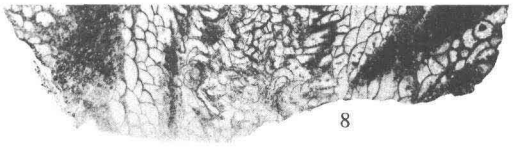
7



6



10



8

LOWER(?) AND MIDDLE DEVONIAN RUGOSE CORALS, YUKON-NATION RIVERS AREA

PLATE 20

DEVONIAN TABULATA AND HELIOLITOIDEA

Middle(?) Devonian from southwestern Alaska

FIGURES 1, 2. *Favosites* sp. with *Antherosalpinx* sp., a commensal "worm" tube, USNM 182834. Transverse and longitudinal thin sections, × 5. In figure 1, the "worm" tube appears as three- to six-rayed openings at "corners" where three or four walls meet; in figure 2, the "worm" tubes appear as light-colored zones in some wall areas. USGS colln. 7698–SD.

3, 4. *Pachyfavosites* sp., USNM 182835. Transverse and longitudinal thin sections, × 10. USGS colln. 7691–SD.

5, 6. *Pachyfavosites* sp., USNM 182836. Transverse and longitudinal thin sections, × 10. USGS colln. 7699–SD.

7, 8. *Heliolites* sp., USNM 182837. Transverse and longitudinal thin sections, × 5. USGS colln. 7698–SD.

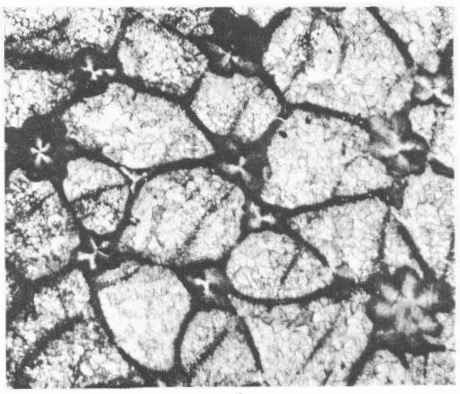
9, 10. *Parastriatopora* sp., USNM 182838. Transverse and longitudinal thin sections, × 1½. USGS colln. 6448–SD.

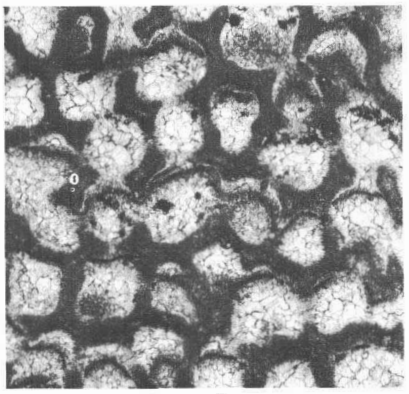
Middle Devonian coral from the Fairbanks-Rampart area

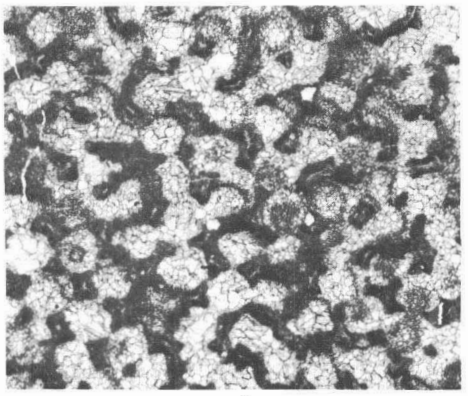
11, 12. *Heliolites* sp., USNM 182839. Transverse and longitudinal thin sections, × 5. USGS colln. 8717–SD.

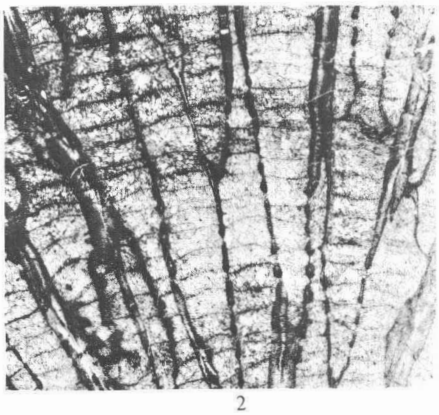
Middle or Upper Devonian coral from the Seward Peninsula

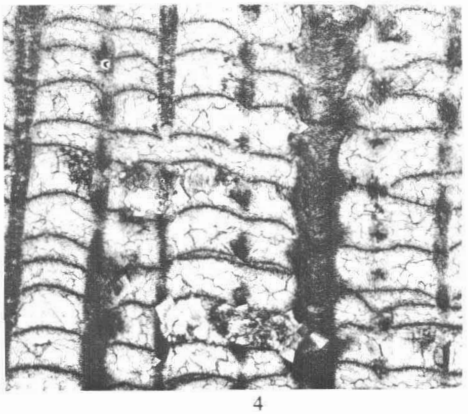
13, 14. *Thecostegites* sp., USNM 182840. Transverse and longitudinal thin sections, × 3. USGS colln. 8297–SD.

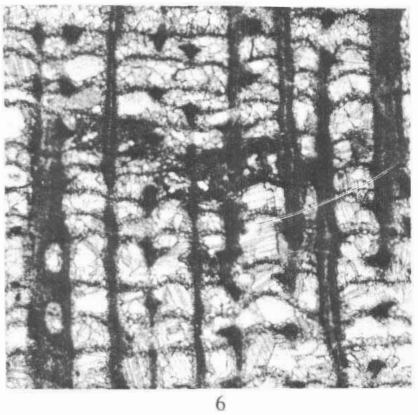

1

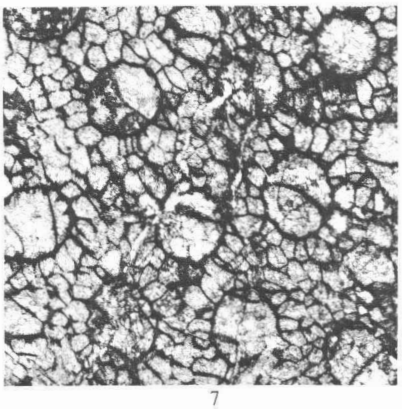

3

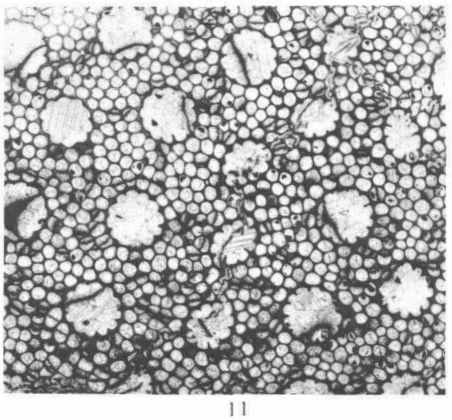

5

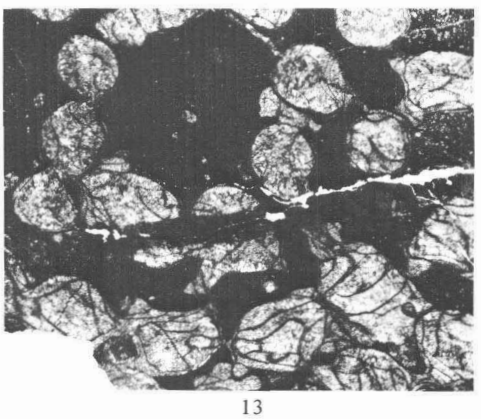

2

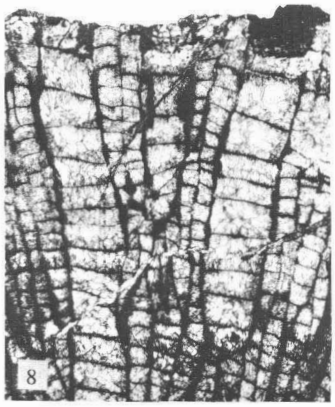

4

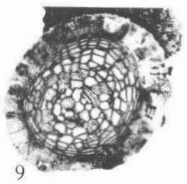

6

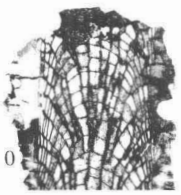

7

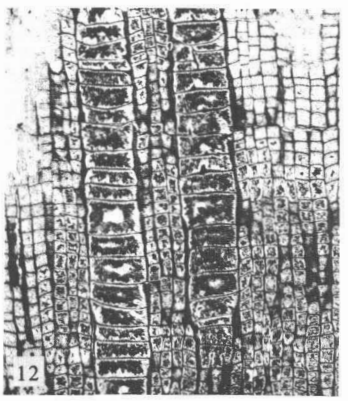

11

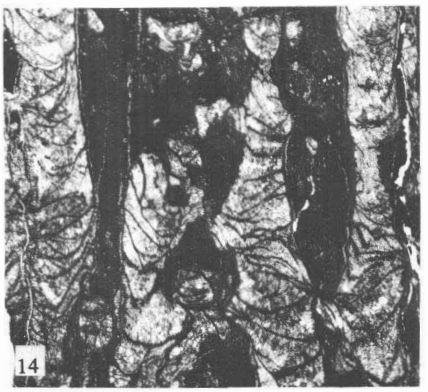

13


8


9


10


12


14

DEVONIAN TABULATE AND HELIOLITOIDID CORALS FROM SOUTHWESTERN ALASKA, FAIRBANKS-RAMPART AREA, AND SEWARD PENINSULA

PLATE 21

Middle(?) Devonian rugose corals from southwestern Alaska

FIGURES 1, 2. *Sociophyllum* sp. cf. *S. glomerulatum* (Crickmay), USNM 182841. Transverse and longitudinal thin sections, × 1½. USGS colln. 7695–SD.

3, 4. cf. *Neostringophyllum* sp., USNM 182842. Longitudinal and transverse thin sections, × 3. USGS colln. 5592–SD.

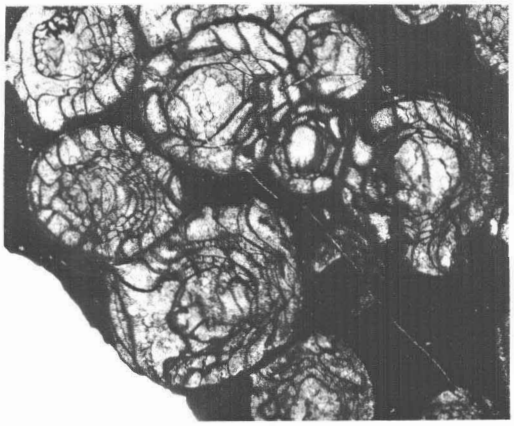
Fairbanks-Rampart area

5–8. *Dendrostella* sp. cf. *D. rhenana* (Frech).

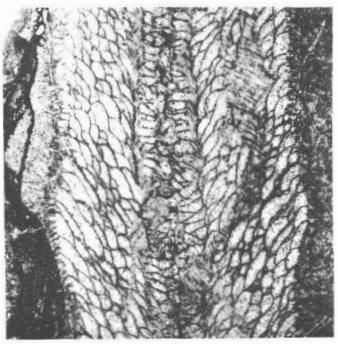
5, 6. USNM 182843. Transverse thin sections, × 5. USGS colln. 6458–SD.

7, 8. USNM 182844. Longitudinal thin sections, × 3. USGS colln. 6457–SD.

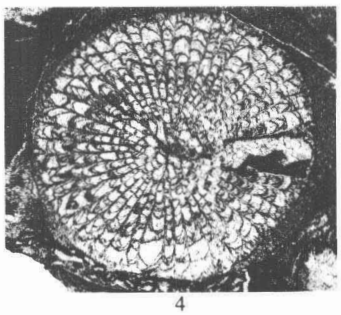
9–11. *"Pseudomicroplasma"* sp., USNM 182845. Transverse and longitudinal thin sections, × 3. USGS colln. 6433–SD.



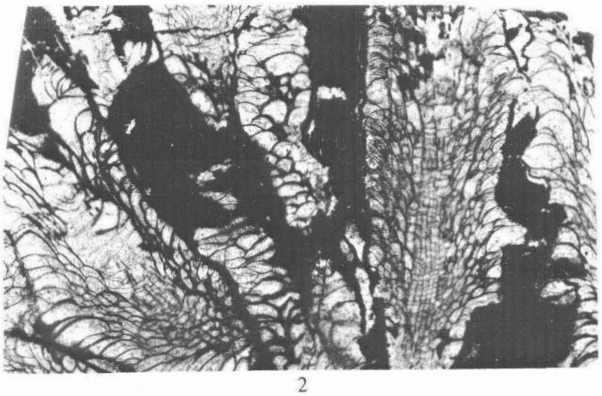
1



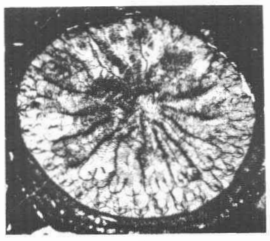
3



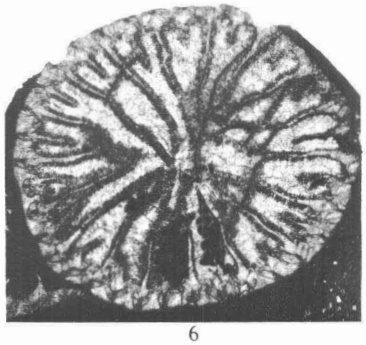
4



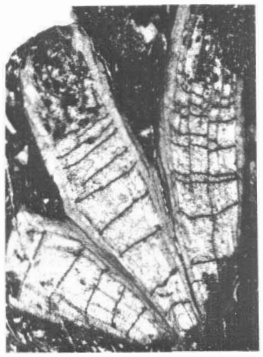
2



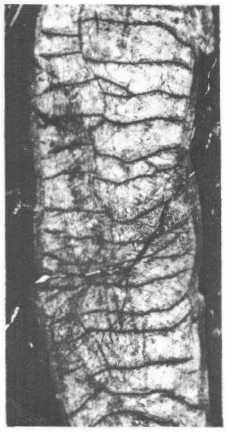
5



6

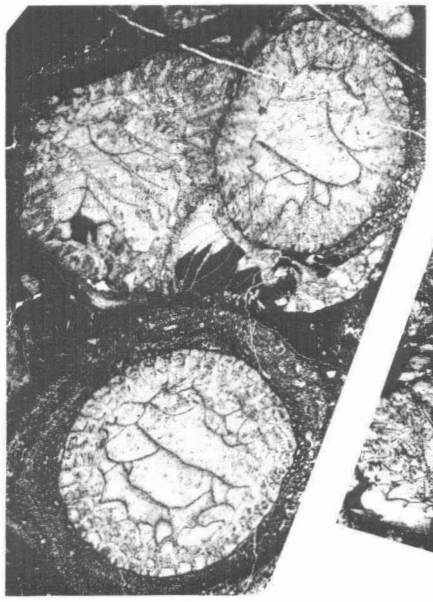


7

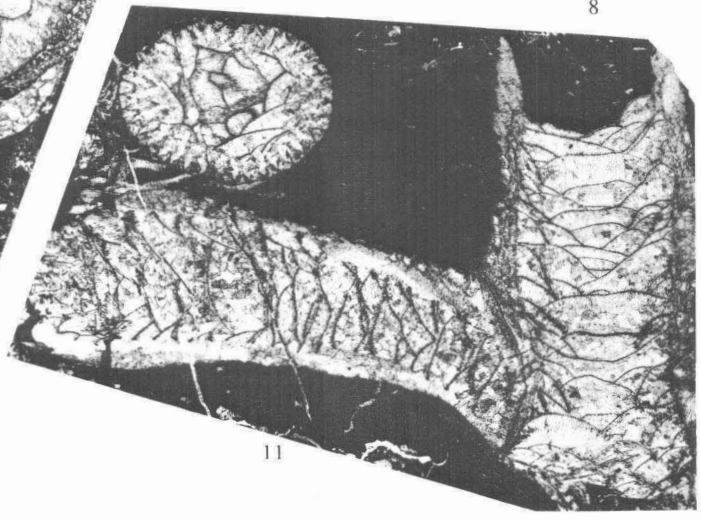


8

9



10



11

MIDDLE(?) DEVONIAN RUGOSE CORALS, SOUTHWESTERN ALASKA AND FAIRBANKS-RAMPART AREA

PLATE 22

Upper Silurian corals from southeastern Alaska

FIGURES 1–3. *Zelophyllum* sp. w. North end of Heceta Island, Alaska; locality M1001, north of Cone Bay.

1. USNM 174709. Lateral exterior view, × 1.

2, 3. USNM 174710. Transverse and longitudinal thin sections, × 4, of another individual.

4–7. *Amphipora* sp. North end of Heceta Island, Alaska; locality M1157, near old marble quarry at Marble Cove south of exposure containing abundant *Conchidium alaskense*.

4. USNM 174711. *Amphipora* and *Zelophyllum* in same rock specimen, × 2.

5–7. USNM 174712. Longitudinal and transverse thin sections of *Amphipora* sp., × 2, showing median canal.

8, 9. *Tryplasma* sp. p. USNM 174713. Transverse and longitudinal thin sections, × 3. Locality M1231, Nossuk Bay, Alaska.

10. *Phaulactis* sp. cf. *P. angusta* (Lonsdale), USNM 174714. Transverse thin section, × 1½. Locality M1153, Ham Island group (of islands), Karheen Passage, Alaska.

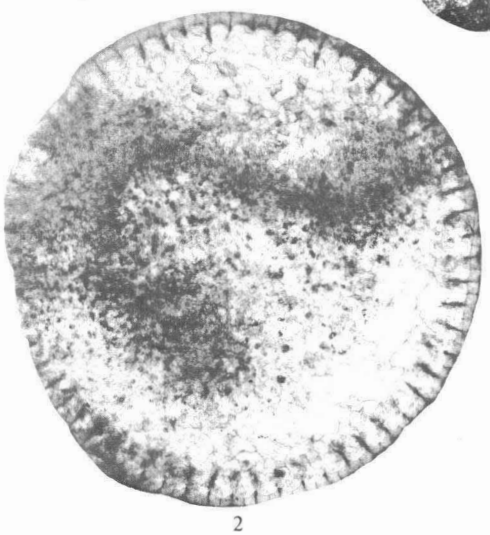
11, 12. *Phaulactis* sp. cf. *P. cyathophylloides* Ryder, USNM 174715. Transverse and longitudinal thin sections, × 1½, of same individual. Locality M1294, north end of Heceta Island, Alaska.

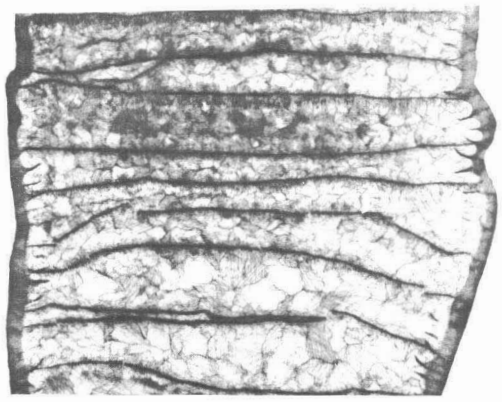
13–16. *Salairophyllum* sp. e. Locality M1186, Kuiu Island, Alaska, where these corals are associated with *Conchidium alaskense*.

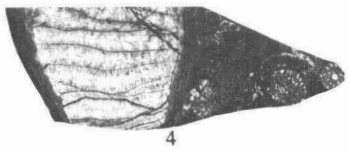
13, 14. USNM 174716. Longitudinal and transverse thin sections, × 3, of same individual.

15, 16. USNM 174717. Transverse and longitudinal thin sections, × 6, of another individual.

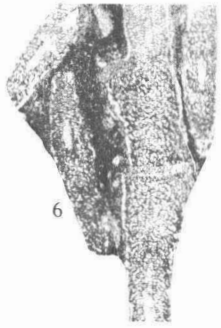

1


2


3


4


5

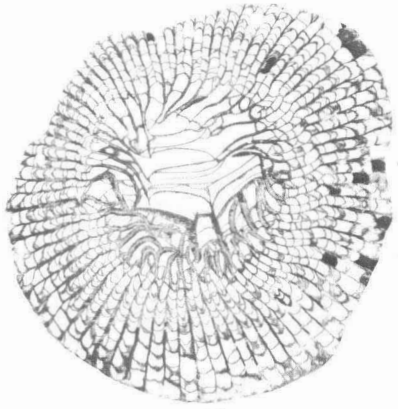

6


7

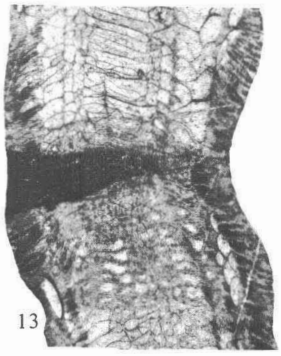

8

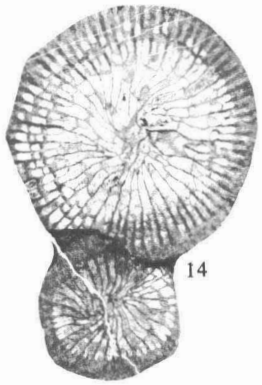

9

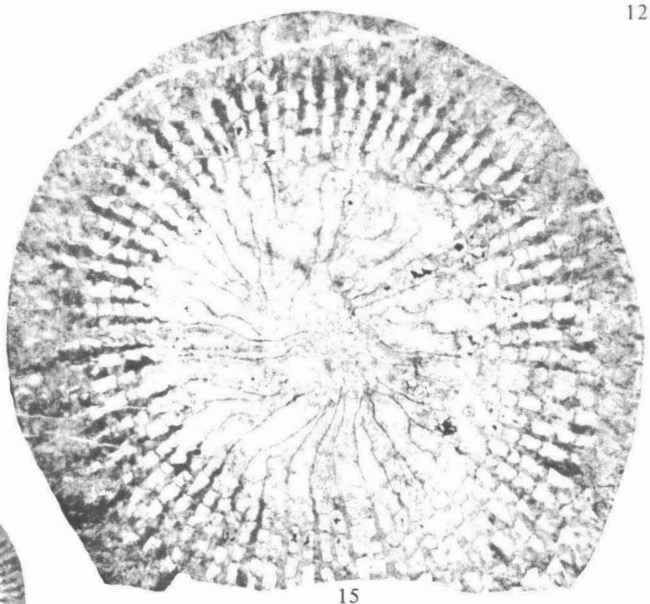

10

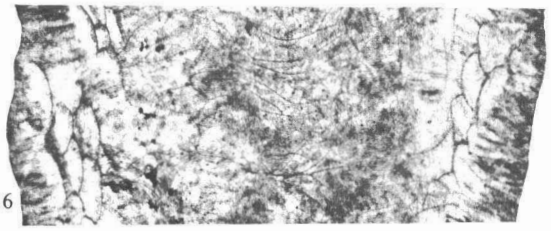

11


12


13


14


15


16

UPPER SILURIAN CORALS, SOUTHEASTERN ALASKA

PLATE 23

Middle Devonian rugose corals from southeastern Alaska

FIGURES 1–3. *Xystriphyllum* sp. m. Alberto Islands group, Alaska.

1, 2. USNM 174718. Transverse and longitudinal thin sections of same individual, × 4. Locality M1272, third island east of main Alberto Island.

3. USNM 174719. Transverse thin section of another colony, × 2. Locality M1271, first small island northeast of main Alberto Island.

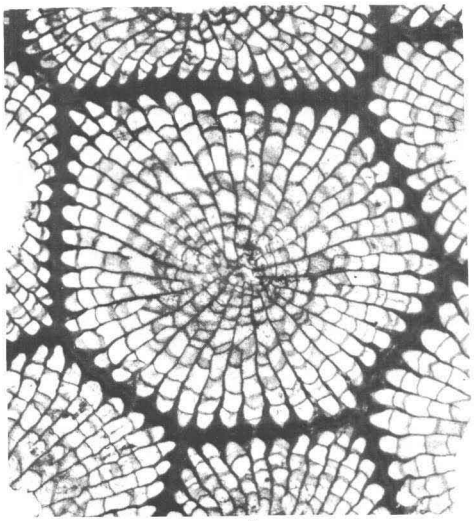
4–6. *Loyolophyllum* sp. a. Alberto Islands group, Alaska.

4, 5. USNM 174720. Transverse and longitudinal thin sections of same colony, × 4. Locality M1219, north end of main Alberto Island.

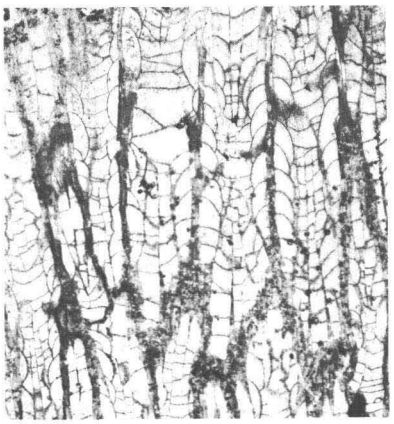
6. USNM 174721. Longitudinal thin section, × 2. Locality M1271, first small island northeast of main Alberto Island.

7, 8. *Hexagonaria* sp. k, USNM 174722. Transverse and longitudinal thin sections of same colony, × 2. Locality M1156, Karheen Passage, Alaska.

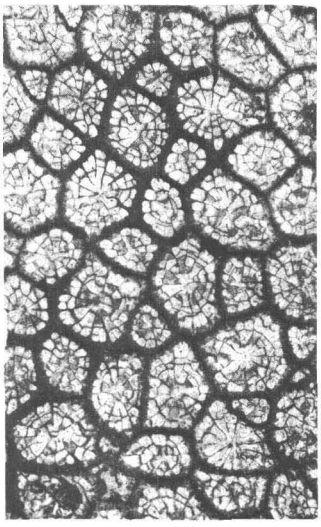
9, 10. *Dendrostella* sp. cf. *D. rhenana* (Frech), USNM 174723. Transverse and longitudinal thin sections of same colony, × 4. Locality M1155, Karheen Passage, Alaska.



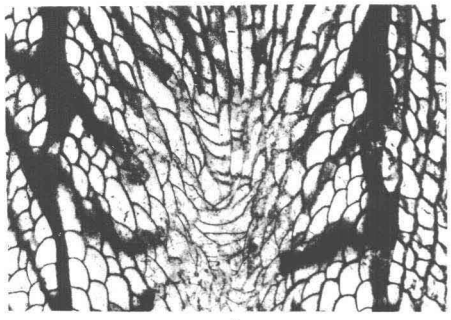
1



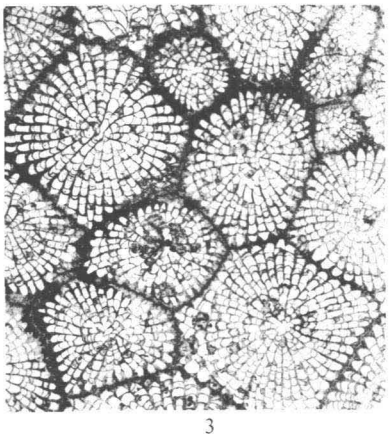
5



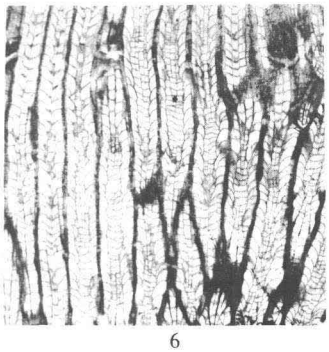
4



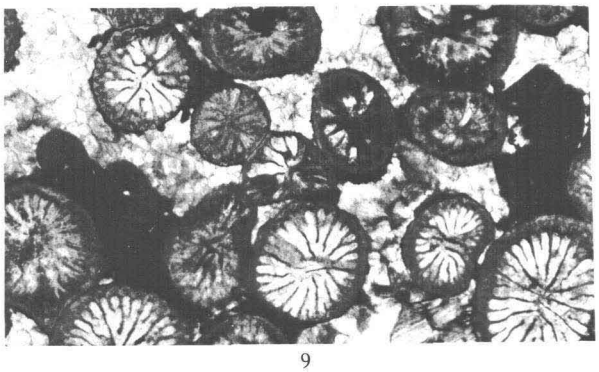
2



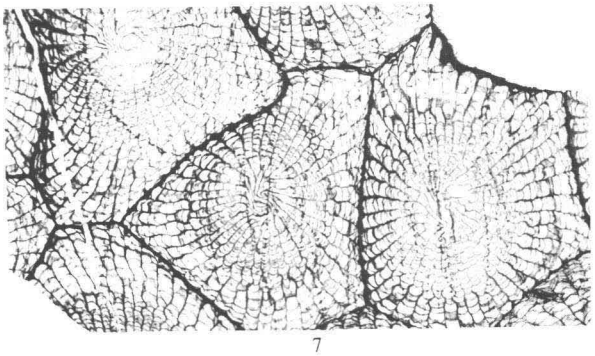
3



6



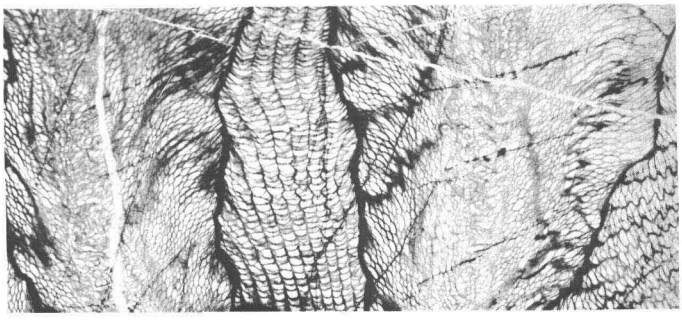
9



7

10

8



MIDDLE DEVONIAN RUGOSE CORALS, SOUTHEASTERN ALASKA

PLATE 24

Middle Devonian rugose corals from southeastern Alaska

FIGURES

1, 2. *Acanthophyllum* sp. a, USNM 174724. Transverse and longitudinal thin sections of same individual, × 2. Locality M1156, Karheen Passage, Alaska.

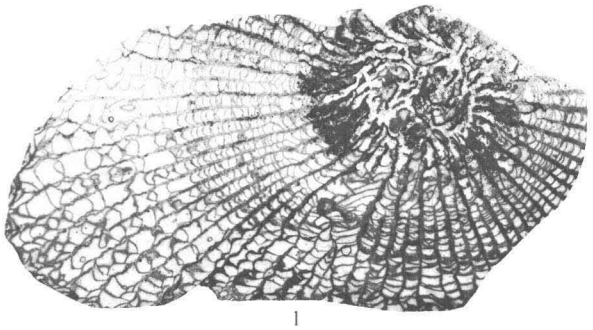
3, 4. *Acanthophyllum* sp. b, USNM 174725. Transverse and longitudinal thin sections of same individual, × 2. Alberto Islands group. Alaska; locality M1271, first small island northeast of Alberto Island.

5, 6. *Mesophyllum* (*Arcophyllum*) sp. a, cf. *A. dachsbergi* (Vollbrecht), USNM 174726. Transverse and longitudinal thin sections (slightly enlarged) of same individual. Alberto Islands group, Alaska; locality M1152, east shore of main Alberto Island.

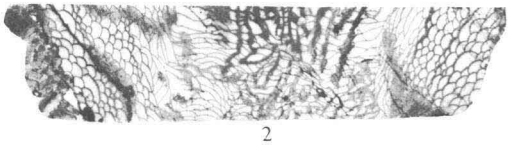
7, 8. *Digonophyllum* sp. c, USNM 174727. Transverse and longitudinal thin sections, × 2, of same individual. Karheen Passage; locality M1154, at junction Karheen Passage and Tuxekan Passage.

9, 10. *Digonophyllum* sp. k, USNM 174728. Transverse and longitudinal thin sections, × 2, of same individual. Locality M1156; Karheen Passage, Alaska.

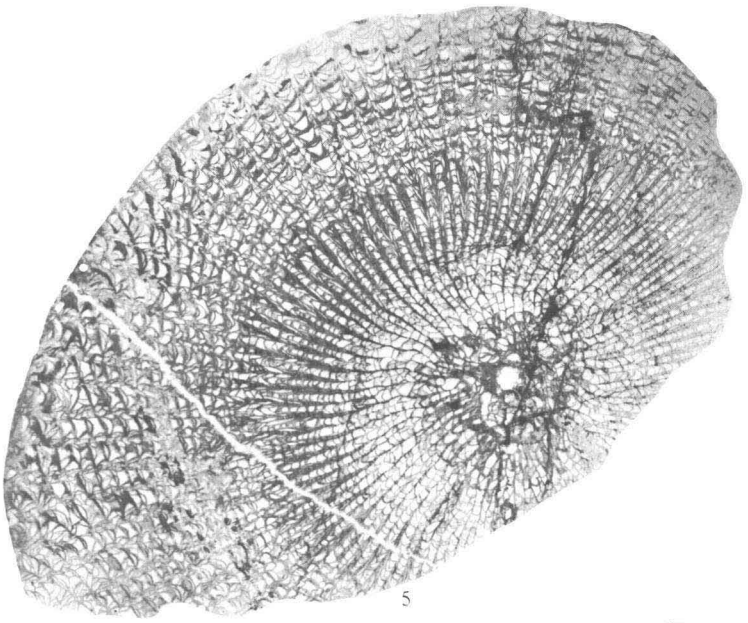
11, 12. Acanthophyllid sp. f, USNM 174729. Transverse and longitudinal thin sections, × 2, of same individual. San Fernando Island, Alaska; locality M1217, Fern Point.



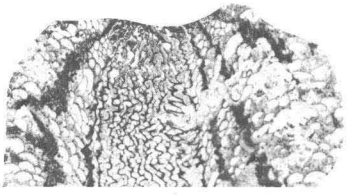
1



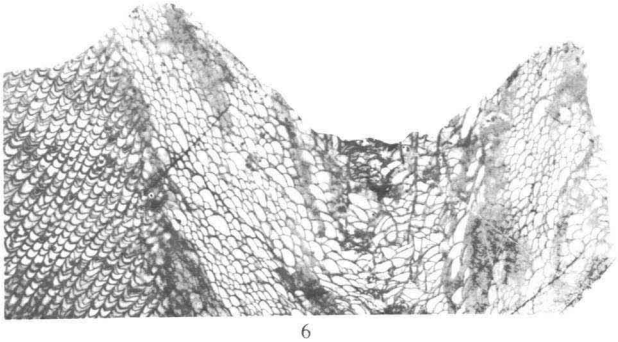
2



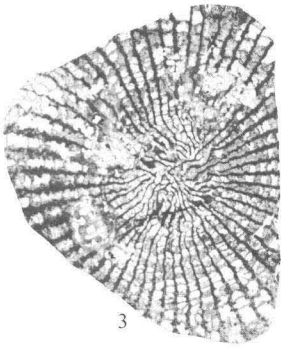
5



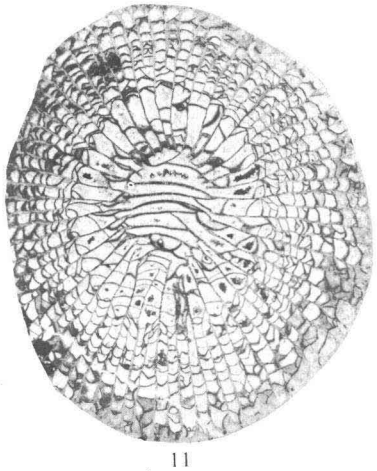
4



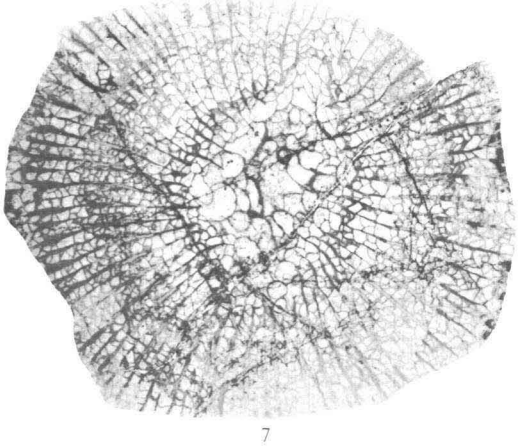
6



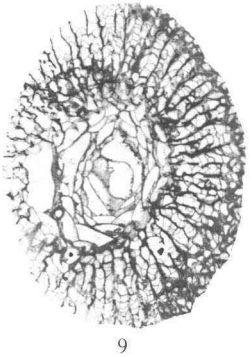
3



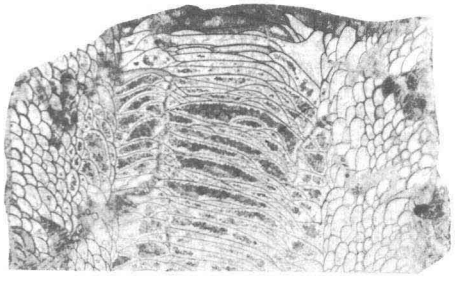
11



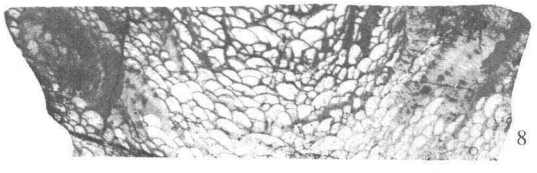
7



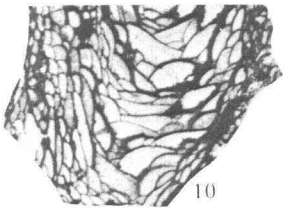
9



12



8



10

MIDDLE DEVONIAN RUGOSE CORALS, SOUTHEASTERN ALASKA

PLATE 25

Upper Devonian rugose corals from southeastern Alaska

FIGURES

1, 2. *Tabulophyllum* sp. c, USNM 174730. Transverse and longitudinal thin sections, × 2, of same individual. Coronados Island group, Alaska; locality M1274, north side of Coronados Island.

3, 4. *Pseudamplexus* sp. w, USNM 174731. Transverse and longitudinal thin sections, × 2, of same individual. Probably Late Devonian. Locality M1170; west shore of Wadleigh Island, Alaska.

5–7. *Macgeea* sp. k. Locality M1158, near south tip of Wadleigh Island, Alaska.

5. USNM 174732. Lateral exterior view, × 1½.

6, 7. USNM 174732a. Transverse and longitudinal thin sections, × 2, of another individual.

8. *Phacellophyllum* sp. t, USNM 174734. Transverse thin section, × 4. Wadleigh Island, Alaska; locality M1167, north end of large island west of southeast tip, Wadleigh Island.

9, 10. *Phacellophyllum* sp. t. Locality M1175, northeast of Nossuk Bay at Tonowek Narrows, Alaska.

9. USNM 174735. Longitudinal thin section, × 8.

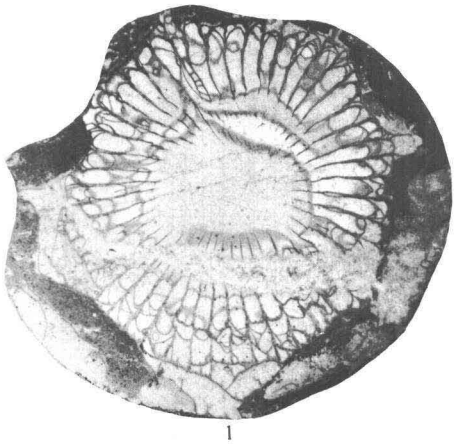
10. USNM 174736. Longitudinal thin section, × 10, of another individual.

11. *Phillipsastraea* (*Phillipsastraea*) sp. c, USNM 174737. Transverse thin section × 2. Locality M1218, Clam Island, off southeast tip of Wadleigh Island, Alaska.

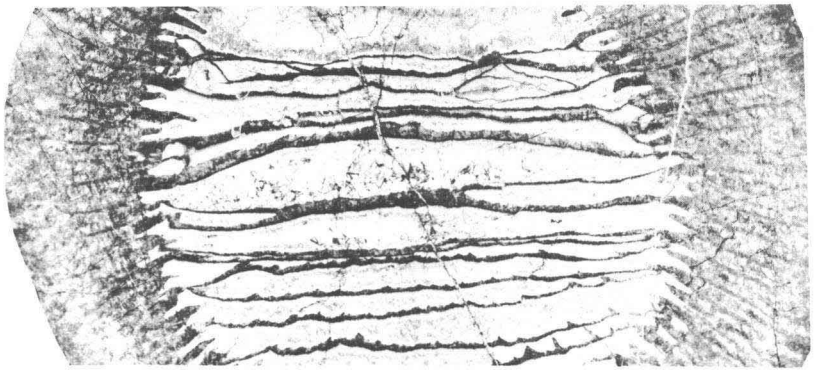
12, 13. *Phillipsastraea* (*Pachypyllum*) sp. w. West shore of Wadleigh Island, Alaska.

12. USNM 174738. Transverse thin section, × 2. Locality M1168.

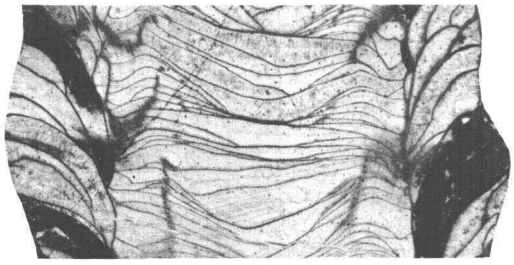
13. USNM 174739. Longitudinal thin section, × 2. Locality M1170.



1

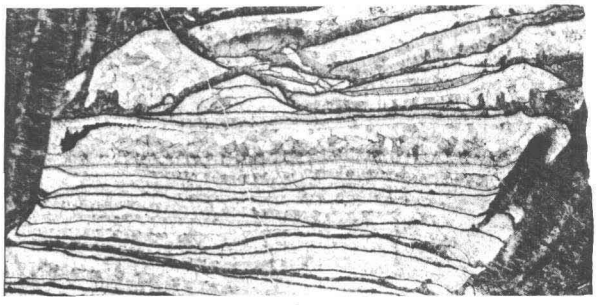


3

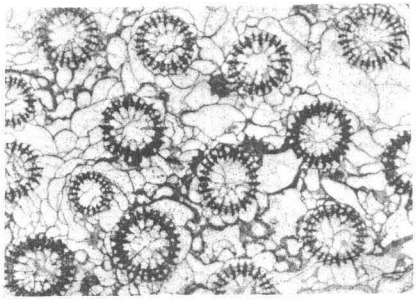


2

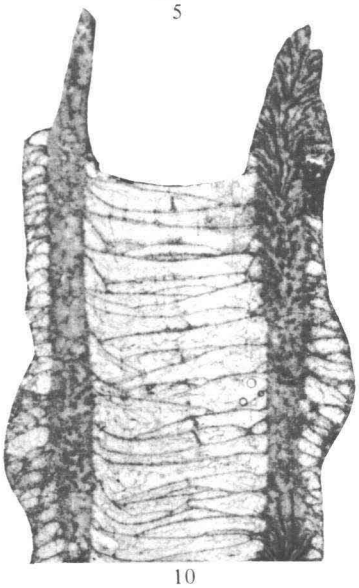
5



4



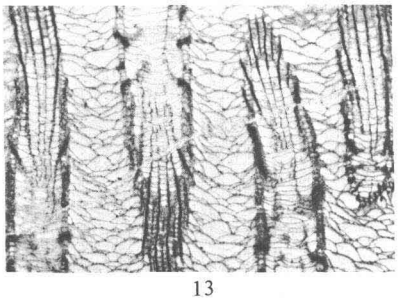
12



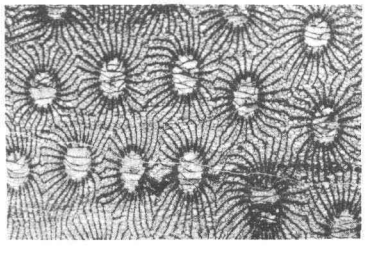
10

6

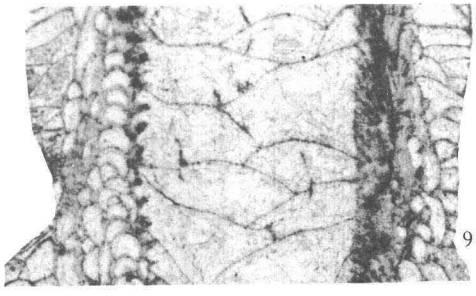
7



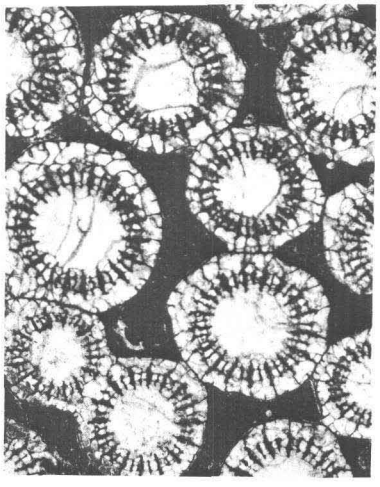
13



11



9



8

UPPER DEVONIAN RUGOSE CORALS, SOUTHEASTERN ALASKA

Carboniferous Corals of Alaska, A Preliminary Report

By AUGUSTUS K. ARMSTRONG

PALEOZOIC CORALS OF ALASKA

GEOLOGICAL SURVEY PROFESSIONAL PAPER 823-C

Stratigraphic and geographic distribution of corals in Carboniferous rocks of Alaska

CONTENTS

ILLUSTRATIONS

PALEOZOIC CORALS OF ALASKA

CARBONIFEROUS CORALS OF ALASKA, A PRELIMINARY REPORT

By AUGUSTUS K. ARMSTRONG

ABSTRACT

The primary studies of Carboniferous coral of Alaska have concentrated on the rich fauna from the Brooks Range in arctic Alaska and the faunas from the northwestern side of Prince of Wales Island in southeastern Alaska. The Lisburne Group of arctic Alaska contains coral faunas from Osagean (Early Mississippian) to Atokan (Middle Pennsylvanian) age. Osagean age beds have a small fauna of solitary and tabulate corals. Meramecian and very earliest Chesterian age beds contain a large fauna of *Ekvasophyllum* spp., *Faberophyllum* spp., *Diphyphyllum venosum* Armstrong, *D. klawockensis* Armstrong, *D. nasorakensis* Armstrong, *Lithostrotion* (*Siphonodendron*) *dutroi* Armstrong, *L.* (*S.*) *sinuosum* (Kelly), *L.* (*S.*) *warreni* Nelson, *L.* (*S.*) *lisburnensis* Armstrong, *Lithostrotion reiseri* Armstrong, *Lithostrotionella niakensis* Armstrong, *L. banffensis* (Warren), *L. mclareni* (Sutherland), *L. birdi* Armstrong, *L. pennsylvanica* (Shimer), *Thysanophyllum astraeiforme* (Warren), *T. orientale* Thomson, *Sciophyllum lambarti* Harker and McLaren, and *S. alaskaensis* Armstrong. Rare corals in younger Chesterian age beds include *Lithostrotionella aff. L mclareni* (Sutherland), *Lithostrotion* (*S.*) *ignekensis* Armstrong, *Syringopora* spp., and occasional solitary corals. Pennsylvanian (Atokan) age beds of the Lisburne Group contain *Lithostrotionella wahooensis* Armstrong, *Corwenia jagoensis* Armstrong, a thick-walled syringoporoid, and *Michelinia* sp.

Lisburne Group limestones were deposited on a slowly subsiding carbonate platform and are cyclic. Colonial corals of Meramecian and Atokan age occur in carbonate deposits associated with shallow-water shoaling facies. The poverty of corals in carbonate rocks of Osagean, Chesterian, and Morrowan age is attributed to regional temperature or salinity changes that inhibited their growth. Carboniferous corals are not known to have formed reeflike masses in arctic Alaska.

The Peratrovich Formation (Mississippian) on the northwest side of Prince of Wales Island in southeastern Alaska contains a fauna of Meramecian and Chesterian age consisting of *Ekvasophyllum* cf. *E. inclinatum* Parks, *Faberophyllum williamsi* Armstrong, *F. girtyi* Armstrong, *Lithostrotion* (*Siphonodendron*) sp., *L.* (*S.*) *warreni* Nelson, *L.* (*S.*) *succinctus* Armstrong, *Diphyphyllum venosum* Armstrong, *D. klawockensis* Armstrong, *Lithostrotionella peratrovichensis* Armstrong, *L. banffensis* (Warren), *L. pennsylvanica* (Shimer), *L. birdi* Armstrong, *Thysanophyllum astraeiforme* (Warren), *Sciophyllum alaskaensis* Armstrong, and *Syringopora* spp.

The overlying Pennsylvanian carbonate rocks of the Ladrones Limestone contain a *Lithostrotionella* sp. of Atokan age.

The type locality of Calico Bluff Formation (Carboniferous) in east-central Alaska contains a meager fauna of Morrowan age corals—*Stereocorypha* aff. *S. spissata* Moore and Jeffords and *Barytichisma* aff. *B. callosum* Moore and Jeffords.

INTRODUCTION

The location of Carboniferous outcrops in Alaska is shown in figure 14. Since 1962 I have been studying the carbonate biostratigraphy and the rugose corals of Alaska. The work is only partially completed, and this paper is an interim report. To date my studies have centered on the faunas collected from the Peratrovich Formation (Mississippian) on Prince of Wales Island in southeastern Alaska (Armstrong, 1970a) and on the rich, arctic lithostrotionoid coral faunas of the Lisburne Group (Carboniferous) in the Brooks Range (Armstrong, 1970b, 1973). Because I have not studied the faunas of solitary rugose and tabulate corals that I have collected, they are, therefore, poorly represented in this report; however, this fact does not reflect the numerical importance in the faunas. My studies of these arctic faunas have been aimed toward systematic description of the taxa and their stratigraphic and geographic distribution. Careful field studies of sedimentary structures and petrographic and microfacies analyses of carbonate rocks helped me to understand the paleoecological controls on coral distribution in a stratigraphic succession. The study of the Lisburne fauna and its distribution is the major part of this paper. I have also collected a small fauna of solitary corals from the type locality of the Calico Bluff Formation (Carboniferous) on the Yukon River at Calico Bluff.

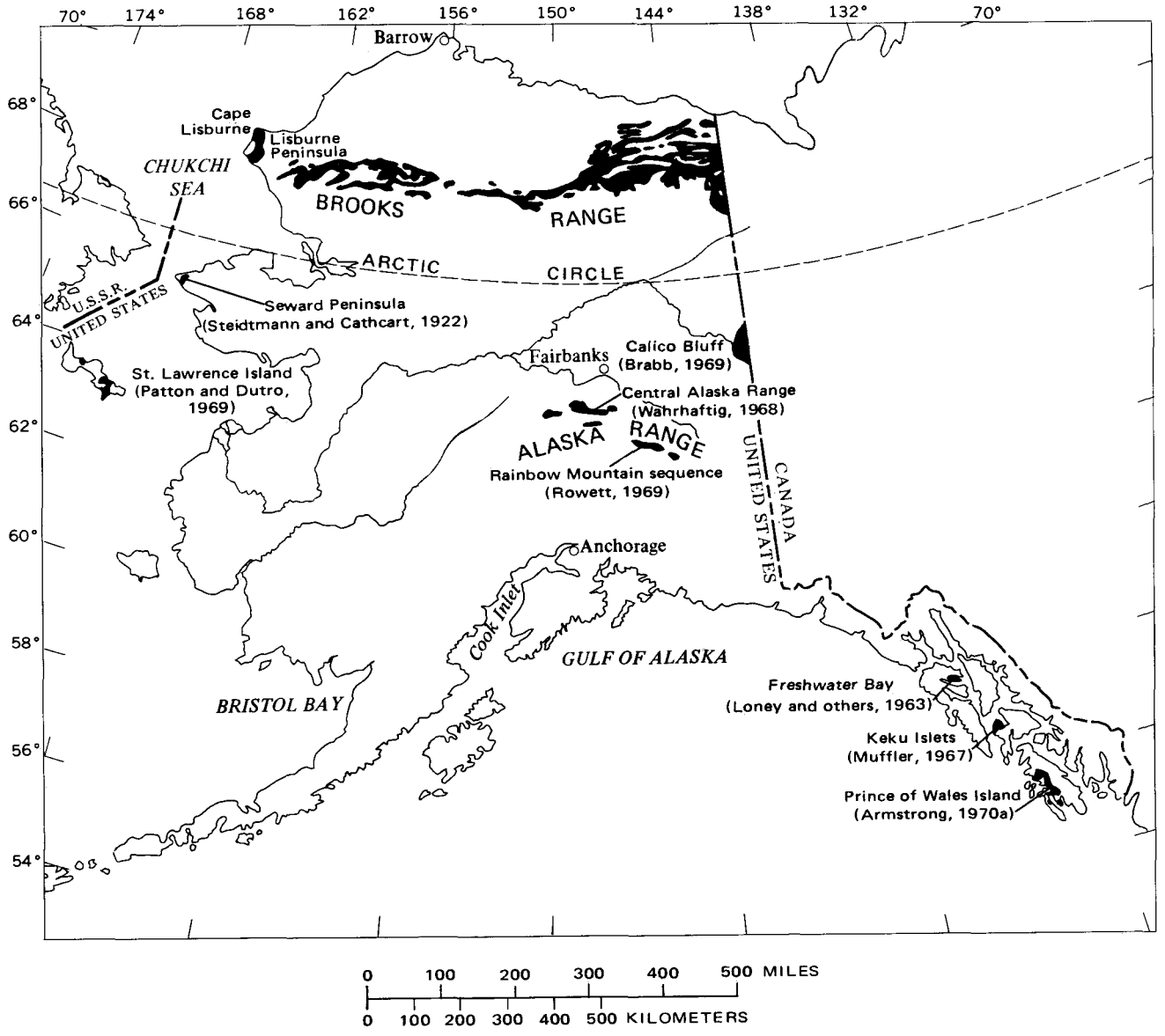


FIGURE 14.—Index map of Alaska showing location of Carboniferous rock outcrops (patterned).

Rowett (1969) described Pennsylvanian corals and stratigraphy of the Rainbow Mountain sequence of the Alaska Range. Carboniferous coral faunas from other outcrop regions of Alaska have not as yet been systematically described or illustrated.

Stratigraphic sections in the Brooks Range in arctic Alaska and on Prince of Wales Island in southeastern Alaska were measured by Jacob's staff and tape. Rock and foraminiferal samples were collected every 5 to 10 feet; coral collections were made throughout the section. Petrographic thin sections were made for carbonate microfacies and microfossil studies. The corals collected were studied by means of 2- by 3-inch oriented thin sections.

Bernard L. Mamet's microfossil zonations (Armstrong and others, 1970, 1971; Mamet and Armstrong, 1972) and his identifications were used in the biostratigraphic analysis of the Lisburne Group of arctic Alaska and in the determination of the vertical range of its large coral faunas. Although stratigraphic, lithologic, and foraminiferal collections were made from the Peratrovich Formation, Prince of Wales Island, southeastern Alaska, detailed studies of the Foraminifera fauna have not been made. The small collection of solitary corals from the Calico Bluff Formation in east-central Alaska are tied to Mamet's microfossil identification. I have not examined the remaining Carbonifer-

ous outcrops of Alaska and their reported coral faunas, and the information about them is taken from the literature.

ACKNOWLEDGMENTS

I spent part of June and July 1966 on the west side of Prince of Wales Island collecting the Carboniferous sequence. G. D. Eberlein and Michael Churkin conducted geologic studies of the area; I am grateful to them for their support and help in my stratigraphic studies. Earl E. Brabb, party chief, September 1967, supported my field collecting of corals from the Calico Bluff Formation of east-central Alaska.

I appreciated the help by Irvin Tailleur, party chief, summer of 1968, and Hillard Reiser, party chief, summers of 1969–71, who generously supported my Lisburne Group coral collecting and stratigraphic studies. I wish to thank the Naval Arctic Research Laboratory (Barrow), Office of Naval Research, for their logistical support of fieldwork in the summers of 1968–71. Large collections of corals, Foraminifera, and thin sections used in this study were collected by Shell Oil Company geologists in 1959–64, and the collections I made in 1962 and 1964, while employed by Shell Oil Company, were given to the U.S. Geological Survey; appreciation is therefore acknowledged to R. E. McAdams and G. E. Burton, vice presidents of Shell Oil Co.

ARCTIC ALASKA

Bowsher and Dutro (1957) established the names Kayak Shale and Lisburne Group for exposures near Shainin Lake in the Endicott Mountains and published the first major study of the Carboniferous stratigraphy and faunas. They gave (p. 3) an excellent account of the earlier history of studies and paleontology of the Carboniferous rocks of arctic Alaska. Helen Duncan (unpub. data, 1950) made the first detailed study of Lisburne Group corals from the Endicott Mountains. She illustrated and listed a number of species of solitary rugose and colonial tabulate corals of Early and Late Mississippian age. She also recognized and illustrated most of the colonial lithostrotionoids that occur in the Lisburne Group.

Corals are abundant in many of the Lisburne Group outcrops in the Brooks Range. These exposures (figs. 15 and 16) extend from the east on the Canadian border to the west on the Chukchi Sea.

My research on the Lisburne coral faunas has been done in conjunction with the detailed analysis of the Lisburne Group biostratigraphy, petrology, diagenesis, and environments of deposition. The regional biostratigraphy has been based on the microfossil studies and research of Dr. Bernard L. Mamet, University of Montreal. Parts of his work, along with detailed stratigraphic description, have been published (Armstrong and others, 1970, 1971; Armstrong and Mamet, 1970; and Mamet and Armstrong, 1972). Detailed analysis of the stratigraphy, petrography, and diagenesis of the Lisburne Group in northeastern Alaska has been done by Wood and Armstrong (1974) and in the west-central Brooks Range by Armstrong (1970c). Armstrong (1970b, 1972a, 1972b, 1973) has published descriptions, illustrations, and stratigraphic and paleoecological analysis of the major groups of Lisburne corals.

Dunham's (1962) classification of carbonate rocks is used in this report.

BIOSTRATIGRAPHIC AND GEOGRAPHIC DISTRIBUTION OF CORALS

The stratigraphic distribution of the lithostrotionoid corals from the Lisburne Group is based on material collected from 36 measured sections (fig. 15). The sections were measured with a Jacob's staff, and lithologic samples were collected every 5 to 10 feet for petrographic and foraminiferal studies. Bernard L. Mamet zoned each of these stratigraphic sections by microfossils.

The known vertical stratigraphic distribution of the lithostrotionoid corals is shown in figure 17, plotted on a geologic time scale based on Mamet's microfossil assemblage zones. Lithostrotionoid corals are not known in pre-Meramecian age rocks of the Lisburne Group. Armstrong, Mamet, and Dutro (1970) reported that based on microfossil evidence the oldest known carbonate deposits in the central and eastern Brooks Range are of earliest Keokuk (Osagean) age (zone 8). Mamet (oral commun., 1970) reported that the oldest known carbonate unit in the Kogruk Formation of the De Long Mountains is again zone 8. The present knowledge indicates carbonate deposition in the Lisburne Group began after the decline and extinction of the widespread Cordilleran late Kinderhookian-earliest Osagean lithostrotionoid coral fauna consisting of *Lithostrotionella microstylum* (White), *L. macra* Kelly, and *L. lochmanae* Armstrong.

Helen Duncan (in Bowsher and Dutro, 1957, p. 5, 6) identified the solitary coral *"Zaphrentis" ko-*

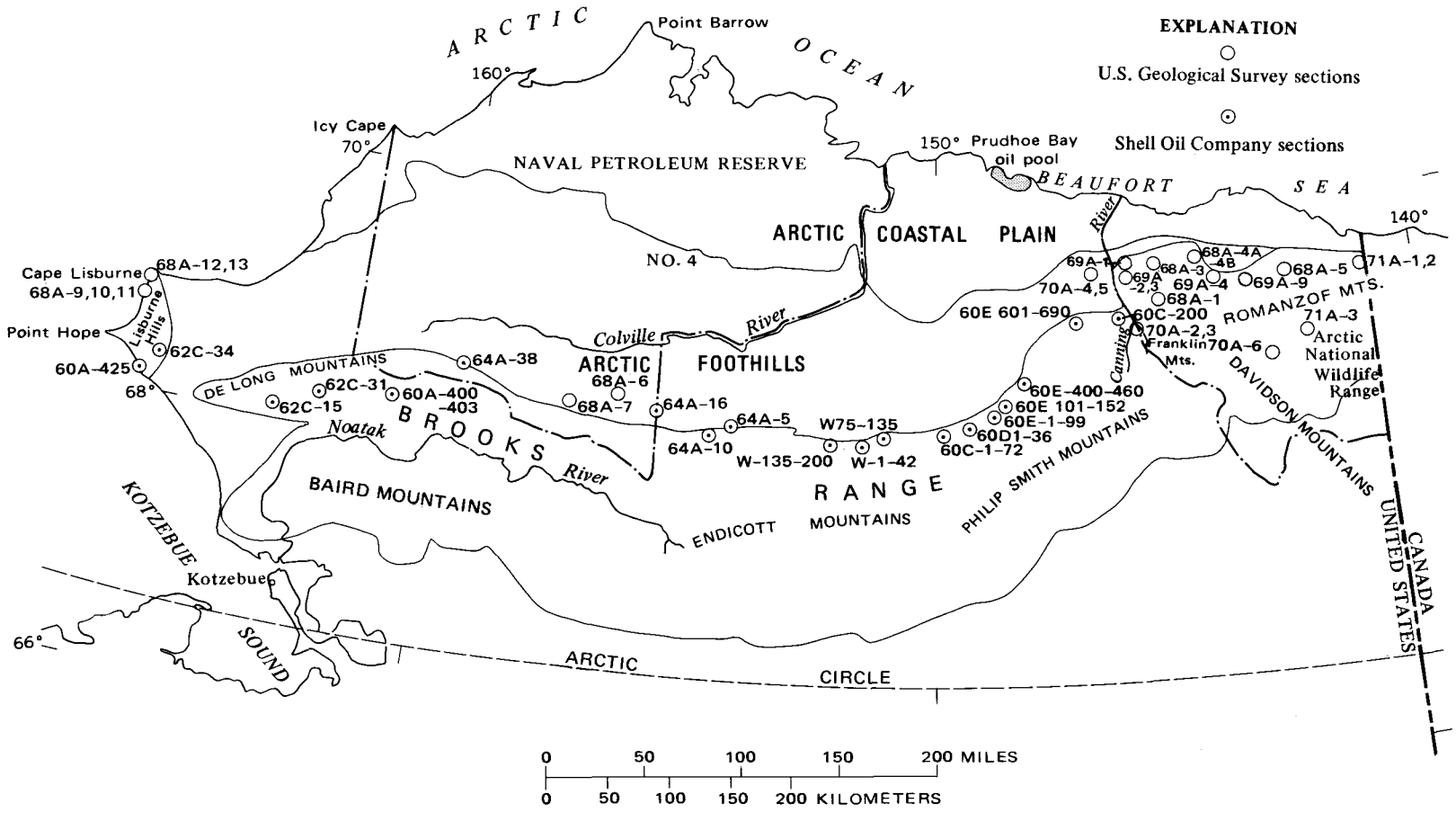


FIGURE 15.—Index map of arctic Alaska showing location of measured stratigraphic sections and coral localities. Physiographic divisions of arctic Alaska from Wahrhaftig (1965).

nincki s. l. (Milne-Edwards and Haime) from the lower part of the type section of the Wachsmuth Limestone at Shainin Lake (fig. 15, W75–135) in zone 8 (Osagean).

In the east-central and eastern Brooks Range—the Endicott, Philip Smith, Franklin, and Romanzof Mountains—there are sequences of Upper Mississippian packstones and wackestones ranging in thickness from a few hundred feet to more than 1,500 feet; the environment of deposition was that of an open marine, shallow-water platform. Bryozoans and echinoderms are common in the packstone and wackestone. Rugose colonial corals are abundant in this facies but also are abundant in the basal transgressive phase of this facies. In the Romanzof, Franklin, and Shublik Mountains, the Meramecian age shale and argillaceous limestone facies near the Kayak(?) Shale–Alapah Limestone contact commonly has an abundant lithostrotionoid coral fauna. The most common lithostrotionoid corals in the Meramecian rocks of the region are *Lithostrotionella banffensis* (Warren), *L. mclareni* (Sutherland), *L. birdi* Armstrong, *L. pennsylvanica* (Shimer), *Lithostrotion reiseri* Armstrong, *L.* (*Siphonodendron*) *warreni* Nelson, *L.* (*S.*) *sinuosum* (Kelly), *L.* (*S.*) *dutroi* Armstrong, *Thysanophyllum astraeiforme* (Warren), *Sciophyllum alaskaensis* Armstrong, *S. lambarti* Harker and McLaren, and *Diphyphyllum klawockensis* Armstrong. Associated with the lithostrotionoids are numerous colonies of the tabulate coral *Syringopora* spp. and individuals of *Faberophyllum* spp. and *Amplexizaphrentis* spp.

To the west, the Lisburne Group in the Killik River (fig. 15, 64A–5) to Mount Bupto area (fig. 15, 68A–7) is thinner (less than 2,000 feet thick) and composed of dolomites, some of which were deposited in an intertidal-supratidal environment, and dolomitized shallow marine wackestones and packstones (Armstrong, 1970c). Corals are relatively rare, and those found are poorly preserved and are in the dolomitic bryozoan-echinoderm facies. Meramecian age carbonate rocks at the Killik River section have yielded a small fauna of corals including *Lithostrotionella mclareni* (Sutherland), *Lithostrotion* (*Siphonodendron*) *warreni* Nelson, and a few poorly preserved *Vesiculophyllum*? sp. The Mount Bupto section (fig. 15, 68A–7) is extensively dolomitized, but preserved in the chert are colonies of *Lithostrotion* (*S.*) *sinosum* (Kelly) (Armstrong, 1970c).

Farther west in the Arctic Foothills province, on Nuka Ridge, the type section of the Nuka Formation of Tailleur and Sable (1963) consists of three thrust plates, each of which includes rocks primarily of Upper Mississippian age; the Meramecian to Chesterian age is based on microfossils from zones 14 to 19. The Upper Mississippian part of the Nuka Formation is siltstone and arkosic sandstone, shale, and limestone. The depositional environment of the terrigenous clastic-rich Upper Mississippian part of the formation was unfavorable for coral growth, and it contains a very sparse fauna of solitary corals and no colonial corals.

Armstrong (1970b) reported a large fauna of Meramecian age lithostrotionoid corals from the Kogruk Formation of the De Long Mountains. The sections 62C–15, 62C–31, and 60A–400–403 in the De Long Mountains indicate that the Kogruk Formation was deposited in an open marine environment on a subsiding shelf on which carbonate deposition and subsidence were in near equilibrium. These sections clearly show that the Meramecian corals of the Kogruk Formation are most abundant in specific rock types. The lithostrotionoid corals are common in bryozoan-echinoderm and ooidal packstones adjacent to ooidal and well-sorted crinoid grainstones.

The Kogruk coral fauna is *Lithostrotion* (*Siphonodendron*) *sinuosum* (Kelly), *L.* (*S.*) *warreni* Nelson, *Lithostrotionella niakensis* Armstrong, *L. mclareni* (Sutherland), *L. birdi* Armstrong, *L.* aff. *L. banffensis* (Warren), *Thysanophyllum astraeiforme* (Warren), *T. orientale* Thomson, *Sciophyllum lambarti* Harker and McLaren, and *S. alaskaensis* Armstrong. Also associated with the lithostrotionoids are the solitary coral *Faberophyllum* spp. and abundant tabulate corals of the genus *Syringopora.*

Armstrong, Mamet, and Dutro (1971) listed a Meramecian (zone 13) coral fauna from the base of section 68A–12. This incomplete section is in a structurally complex terrane and is exposed on a sea cliff in the northwestern Lisburne Hills. This location yielded the oldest known lithostrotionoid fauna in the Lisburne Hills area. The corals collected from the base of section 68A–12 are: *Lithostrotion* (*Siphonodendron*) *warreni* Nelson, *Lithostrotionella banffensis* (Warren), *L.* aff. *L. banffensis* (Warren), *L. niakensis* Armstrong, and *Syringopora* sp.

South of this location, a large fauna of corals (similar to the fauna from 68A–9 listed below) was found in the highest beds (68A–13) of the Nasorak Formation; the fact that the corals were found with a Foraminifera fauna indicates that they are in a transition zone between beds of Meramecian and Chesterian (zones 15–16_1) age.

nincki s. l. (Milne-Edwards and Haime) from the lower part of the type section of the Wachsmuth Limestone at Shainin Lake (fig. 15, W75–135) in zone 8 (Osagean).

In the east-central and eastern Brooks Range—the Endicott, Philip Smith, Franklin, and Romanzof Mountains—there are sequences of Upper Mississippian packstones and wackestones ranging in thickness from a few hundred feet to more than 1,500 feet; the environment of deposition was that of an open marine, shallow-water platform. Bryozoans and echinoderms are common in the packstone and wackestone. Rugose colonial corals are abundant in this facies but also are abundant in the basal transgressive phase of this facies. In the Romanzof, Franklin, and Shublik Mountains, the Meramecian age shale and argillaceous limestone facies near the Kayak(?) Shale–Alapah Limestone contact commonly has an abundant lithostrotionoid coral fauna. The most common lithostrotionoid corals in the Meramecian rocks of the region are *Lithostrotionella banffensis* (Warren), *L. mclareni* (Sutherland), *L. birdi* Armstrong, *L. pennsylvanica* (Shimer), *Lithostrotion reiseri* Armstrong, *L.* (*Siphonodendron*) *warreni* Nelson, *L.* (*S.*) *sinuosum* (Kelly), *L.* (*S.*) *dutroi* Armstrong, *Thysanophyllum astraeiforme* (Warren), *Sciophyllum alaskaensis* Armstrong, *S. lambarti* Harker and McLaren, and *Diphyphyllum klawockensis* Armstrong. Associated with the lithostrotionoids are numerous colonies of the tabulate coral *Syringopora* spp. and individuals of *Faberophyllum* spp. and *Amplexizaphrentis* spp.

To the west, the Lisburne Group in the Killik River (fig. 15, 64A–5) to Mount Bupto area (fig. 15, 68A–7) is thinner (less than 2,000 feet thick) and composed of dolomites, some of which were deposited in an intertidal-supratidal environment, and dolomitized shallow marine wackestones and packstones (Armstrong, 1970c). Corals are relatively rare, and those found are poorly preserved and are in the dolomitic bryozoan-echinoderm facies. Meramecian age carbonate rocks at the Killik River section have yielded a small fauna of corals including *Lithostrotionella mclareni* (Sutherland), *Lithostrotion* (*Siphonodendron*) *warreni* Nelson, and a few poorly preserved *Vesiculophyllum*? sp. The Mount Bupto section (fig. 15, 68A–7) is extensively dolomitized, but preserved in the chert are colonies of *Lithostrotion* (*S.*) *sinosum* (Kelly) (Armstrong, 1970c).

Farther west in the Arctic Foothills province, on Nuka Ridge, the type section of the Nuka Formation of Tailleur and Sable (1963) consists of three thrust plates, each of which includes rocks primarily of Upper Mississippian age; the Meramecian to Chesterian age is based on microfossils from zones 14 to 19. The Upper Mississippian part of the Nuka Formation is siltstone and arkosic sandstone, shale, and limestone. The depositional environment of the terrigenous clastic-rich Upper Mississippian part of the formation was unfavorable for coral growth, and it contains a very sparse fauna of solitary corals and no colonial corals.

Armstrong (1970b) reported a large fauna of Meramecian age lithostrotionoid corals from the Kogruk Formation of the De Long Mountains. The sections 62C–15, 62C–31, and 60A–400–403 in the De Long Mountains indicate that the Kogruk Formation was deposited in an open marine environment on a subsiding shelf on which carbonate deposition and subsidence were in near equilibrium. These sections clearly show that the Meramecian corals of the Kogruk Formation are most abundant in specific rock types. The lithostrotionoid corals are common in bryozoan-echinoderm and ooidal packstones adjacent to ooidal and well-sorted crinoid grainstones.

The Kogruk coral fauna is *Lithostrotion* (*Siphonodendron*) *sinuosum* (Kelly), *L.* (*S.*) *warreni* Nelson, *Lithostrotionella niakensis* Armstrong, *L. mclareni* (Sutherland), *L. birdi* Armstrong, *L.* aff. *L. banffensis* (Warren), *Thysanophyllum astraeiforme* (Warren), *T. orientale* Thomson, *Sciophyllum lambarti* Harker and McLaren, and *S. alaskaensis* Armstrong. Also associated with the lithostrotionoids are the solitary coral *Faberophyllum* spp. and abundant tabulate corals of the genus *Syringopora.*

Armstrong, Mamet, and Dutro (1971) listed a Meramecian (zone 13) coral fauna from the base of section 68A–12. This incomplete section is in a structurally complex terrane and is exposed on a sea cliff in the northwestern Lisburne Hills. This location yielded the oldest known lithostrotionoid fauna in the Lisburne Hills area. The corals collected from the base of section 68A–12 are: *Lithostrotion* (*Siphonodendron*) *warreni* Nelson, *Lithostrotionella banffensis* (Warren), *L.* aff. *L. banffensis* (Warren), *L. niakensis* Armstrong, and *Syringopora* sp.

South of this location, a large fauna of corals (similar to the fauna from 68A–9 listed below) was found in the highest beds (68A–13) of the Nasorak Formation; the fact that the corals were found with a Foraminifera fauna indicates that they are in a transition zone between beds of Meramecian and Chesterian (zones 15–16_1) age.

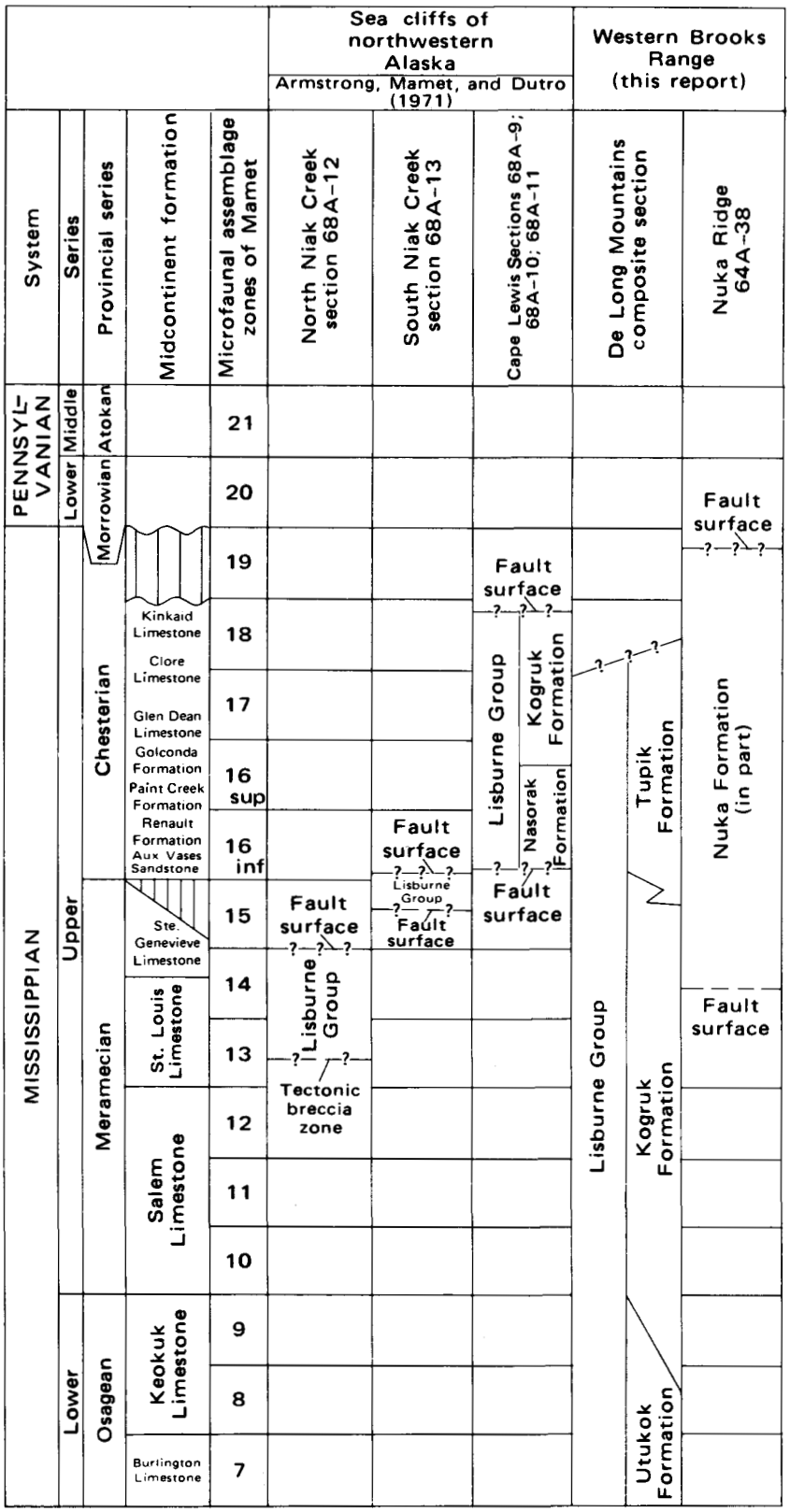


FIGURE 16.—Carboniferous correlation chart, Brooks

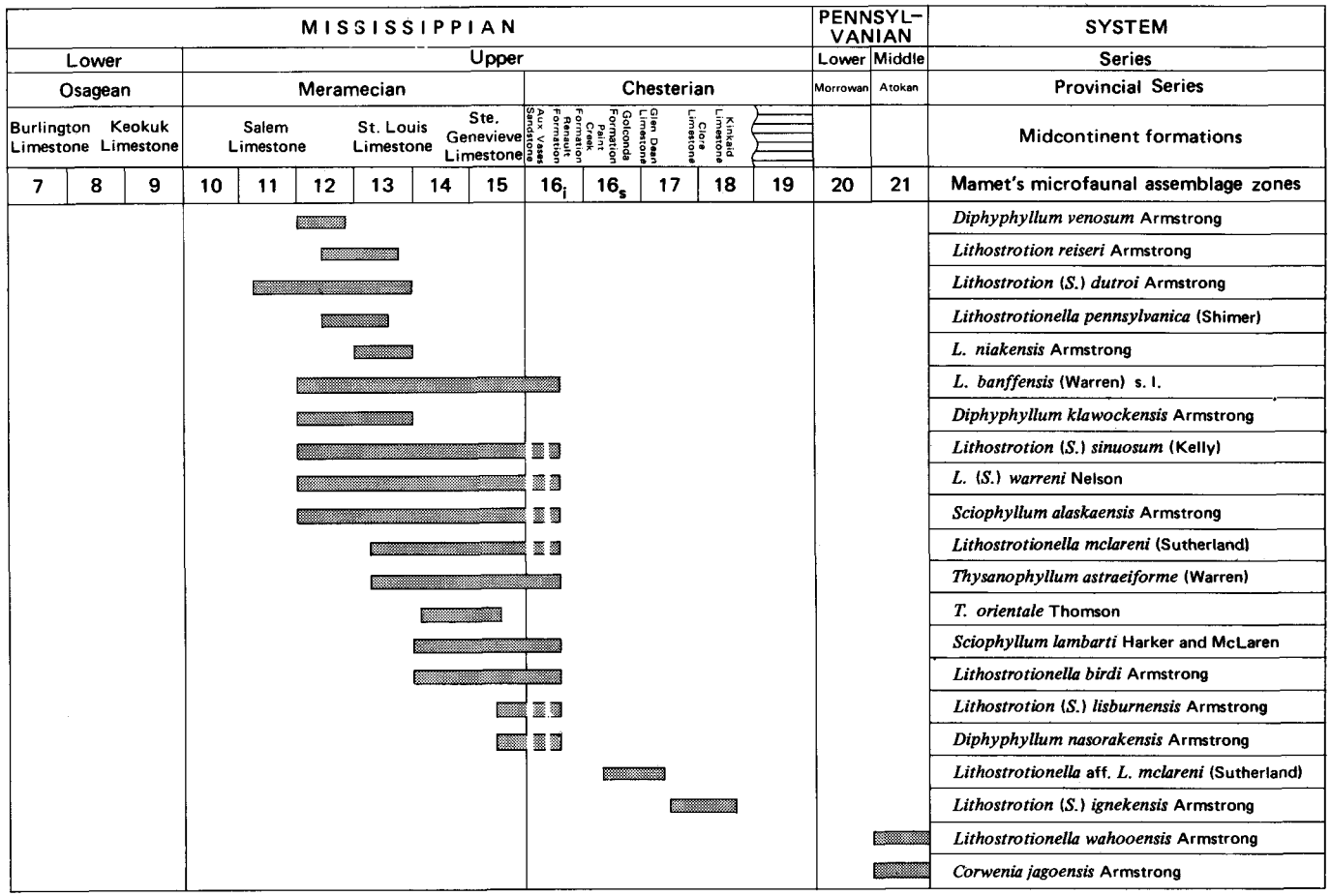


FIGURE 17.—Stratigraphic distribution of various species of colonial rugose corals within the Lisburne Group, arctic Alaska. Solid bars within zone 16_i indicate species occurs in zone 16_i in the eastern and western Brooks Range; dashed bar indicates species is known only in zone 16_i in the Lisburne Hills area of northeastern Alaska. Microfossil zonations from Armstrong, Mamet, and Dutro (1970, 1971) and Mamet and Armstrong (1972).

A few miles to the south at Cape Lewis (68A–9–11), a large fauna of lithostrotionoid corals was collected from Nasorak beds of early Chesterian age (zone 16_i).

The coral fauna both both sections (68A–9 and 69A–13) and the Shell Oil Co. collection from the Nasorak Formation at Cape Thompson are similar and contain the following: *Lithostrotion (Siphonodendron) sinuosum* (Kelly), *L. (S.) warreni* Nelson, *L. (S.) lisburnensis* Armstrong, *Lithostrotionella banffensis* (Warren), *L.* sp., *L. mclareni* (Sutherland), *L. birdi* Armstrong, *Thysanophyllum astraeiforme* (Warren), *Sciophyllum lambarti* Harker and McLaren, *S. alaskaensis* Armstrong, and *Diphyphyllum nasorakensis* Armstrong.

In contrast to the central and eastern Brooks Range, where very few lithostrotionoid corals are found above the Meramecian-Chesterian boundary, the Lisburne Hills faunas persisted in abundance into microfossil zone 16, of the Chesterian, then abruptly became extinct. This coral fauna is absent in beds of zone 16_s and younger age.

Armstrong, Mamet, and Dutro (1971) reported the occurrence of two new species of poorly preserved cerioid *Lithostrotionella* from zone 16_s at Cape Lewis; the carbonate sequence there is thick and cyclic and was deposited in a shallow shelf. Higher in the same section, corals are rare in cyclic shelf carbonate units of zones 17 and 18. The only corals collected were a few fragmentary solitary corals. One of the few taxa of corals found in beds of zone 17 or younger Chesterian age is from the northeastern Brooks Range. Here Armstrong (1972a) described *Lithostrotion (Siphonodendron) ignekensis* Armstrong in zones 17–18 of the Alapah Limestone from the Sadlerochit, Shublik, and Franklin Mountains of northeastern Alaska.

Pennsylvanian carbonate rocks in arctic Alaska are known only from the northeast part of the State. The Wahoo Limestone of the Lisburne Group represents Morrowan (zone 20) and Atokan (zone 21) age sediments (fig. 16). Rugose corals are only moderately abundant in beds of Atokan age in the Wahoo Limestone. Only fragments of solitary corals are known in the carbonate beds of Morrowan age. Armstrong (1972b) described two species of colonial rugose corals, *Lithostrotionella wahooensis* Armstrong and *Corwenia jagoensis* Armstrong, from beds containing a Foraminifera fauna of Atokan age. Tabulate corals from the Atokan age carbonate beds are a thick-walled syringoporoid and *Michelinia* sp.

REGIONAL RELATIONSHIPS OF THE LISBURNE GROUP CORAL FAUNAS

The Meramecian age (zones 13–15) coral fauna from the Lisburne Group contains many species in common with the contemporaneous Peratrovich Formation on Prince of Wales Island, southeastern Alaska. These rocks contain the following species of corals in common (Armstrong, 1970a): *Lithostrotion (Siphonodendron) warreni* Nelson, *L. (S.) sinuosum* (Kelly), *Lithostrotionella birdi* Armstrong, *L. banffensis* (Warren), *L. pennsylvanica* (Shimer), *Thysanophyllum astraeiforme* (Warren), *Sciophyllum alaskaensis* Armstrong, and *Diphyphyllum klawockensis* Armstrong.

The Lisburne Group corals shown in figure 17, which occur in the upper half of microfaunal assemblage zones 13 and 14, correspond approximately to Macqueen and Bamber's (1968) macrofaunal zones 2 and 3, those corals in zone 15, to their macrofaunal zone 4 for the Mississippian of Alberta, Canada. Macqueen and Bamber's (1967, 1968) and Petryk, Mamet, and Macqueen's (1970) papers on the lower Carboniferous (zones 13–15) of southwestern Alberta list the following species of corals in common with the Lisburne Group: *Lithostrotion (Siphonodendron) warreni* Nelson, *Lithostrotionella pennsylvanica* (Shimer), *L. mclareni* (Sutherland), and *Thysanophyllum astraeiforme* (Warren). The large solitary corals *Faberophyllum* spp. and *Ekvasophyllum* spp. are common to both areas.

Macqueen and Bamber list a number of Meramecian age taxa from southwestern Alberta which have not been found in the Lisburne Group. They are *Lithostrotionella shimeri* (Crickmay), *Lithostrotion (Siphonodendron) arizelum* (Crickmay); the taxon from zones 16_i and 16_s of the Chesterian is *Lithostrotion (S.) genevievensis* Easton.

Sando, Mamet, and Dutro's (1969, p E7) list of lithostrotionoids from the Mississippian of the northern Cordillera of the United States shows no species in common with the Lisburne Group.

Rugose corals from the Wahoo Limestone (Atokan part) of the Lisburne Group are represented by two new species, *Corwenia jagoensis* Armstrong and *Lithostrotionella wahooensis* Armstrong. The nearest described morphologic and time-stratigraphic equivalents are *L. orboensis* Groot (1963) from the upper Moscovian of Spain and *Petalaxis mohikana* Fomichev (1953) from the upper Moscovian of the Donetz Basin, U.S.S.R. *C. jagoensis* Armstrong shows close similarity to the Late Moscovian coral *C. symmetrica* (Dobrolyubova, 1958)

from Spain and the Moscow and Donetz Basins of U.S.S.R. Taxa similar to *L. wahooensis* have not been described from the Pennsylvanian of the Cordilleran region of North America. The close relationship of the two Wahoo corals with forms described from Eurasia is probably more apparent than real and is due to the lack of detailed systematic studies on Pennsylvanian colonial corals from North America.

ST. LAWRENCE ISLAND

Patton and Dutro (1969) reported a Late Mississippian coral fauna, identified by W. J. Sando, from Mississippian limestones on St. Lawrence Island: *Caninia* sp., *Syringopora* cf. *S. virginica* Butts, and large *Zaphrentites* sp. From float material I identified *Lithostrotionella* aff. *L. mclareni* (Sutherland).

SEWARD PENINSULA

Steidtmann and Cathcart (1922) reported that coral-bearing limestones of probable Late Mississippian age have been recognized in a small exposure near Cape Prince of Wales, the extreme western end of Seward Peninsula.

EAST-CENTRAL ALASKA

Brabb (1969, figs. 2, 3) redescribed the type locality of the Calico Bluff Formation on the large cut bank of the Yukon River; the unit is some 1,500 feet thick and consists primarily of argillaceous brown-black shales and some beds of argillaceous lime mudstone to packstone. Limestones and calcareous shales are more abundant in the lower 200 to 300 feet of the formation. Bernard L. Mamet examined the microfossils in the thin sections made from the argillaceous limestone beds. The base of the type locality is zone 16_i, early Chesterian age, and the top of the unit is zone 20, Morrowan age. The Calico Bluff Formation at its type locality appears to represent continuous sedimentation from zones 16_i to 20 and contains a very sparse and poorly preserved solitary coral fauna. The lowermost beds yielded fragments of *Faberophyllum*? sp. indet. and *Amplexizaphrentis* spp. indet. Corals near the top of the section in zone 20 (Morrowan) beds are the most interesting because of the geographic distribution of genera. A number of individuals of *Stereocorypha* aff. *S. spissata* Moore and Jeffords and *Barytichisma* aff. *B. callosum* Moore and Jeffords were collected.

ALASKA RANGE, CENTRAL ALASKA

Rowett (1969) published a detailed study of the upper Paleozoic stratigraphy and corals of the east-central Alaska Range. Most of the material is Permian in age. He described a thick succession of dacite tuff volcanic breccias and conglomerates that are overlain by sandstones, siltstones, and limestones from the northern Rainbow Mountain area (fig. 14). The higher beds contain a fauna of Pennsylvanian age which includes the corals *Cryptophyllum striatum* Rowett, *Cladochonus* sp., and *Michelinia* sp.

Wahrhaftig (1968) described a thick sequence of schist from the central Alaska Range. He found a fossiliferous lens in the complex schist terrane which yielded crinoid fragments and *Syringopora* sp., identified by Helen Duncan as of probable Mississippian age.

SOUTHEASTERN ALASKA

The Mississippian rugose corals from the Peratrovich Formation of Eberlein and Churkin (1970), west coast of Prince of Wales Island, southeastern Alaska, were described and illustrated by Armstrong (1970a).

The Peratrovich Formation and the overlying carbonate rocks of the Ladrones Limestone (Pennsylvanian) are exposed as shoreline outcrops on a number of small islands. No continuous exposures are available, and a stratigraphic column for the Carboniferous was pieced together from various outcrops.

The Peratrovich Formation contains three members that represent continuous marine sedimentation from Osagean into Chesterian time. The chert member, about 200 feet thick, rests disconformably on strata of Devonian age and is composed of dark-gray radiolarian cherts, lime mudstones, and thin shale beds that were deposited in an euxinic environment. The limestone and chert member, about 400 feet thick, is composed of gray chert and of bryozoan-echinoderm-foraminiferal wackestones and packstones. *Ekvasophyllum* cf. *E. inclinatum* Parks and *Faberophyllum williamsi* Armstrong are found in the middle to the top of the member. The upper 100 to 120 feet of the member contains *F. girtyi* Armstrong, *Lithostrotion* (*Siphonodendron*) sp., *L.* (*S.*) *warreni* Nelson, *Diphyphyllum venosum* Arm-

strong, *D. klawockensis* Armstrong, *Lithostrotionella banffensis* (Warren), *L. pennsylvanica* (Shimer), *L. birdi* Armstrong, *Thysanophyllum astraeiforme* (Warren), and *Sciophyllum alaskaensis* Armstrong. This fauna is of Meramecian age and suggestive of a correlation with the Mount Head Formation of Alberta, Canada.

The limestone member, about 400 feet thick, is gray to light-gray echinoderm-bryozoan-foraminiferal wackestone to echinoderm-foraminiferal ooidal grainstone. The lower part of the member contains *Faberophyllum girtyi* Armstrong, *Lithostrotionella banffensis* (Warren), and *L. peratrovichensis* Armstrong and is of late Meramecian age. The upper part of the member contains *Lithostrotion (Siphonodendron) succinctus* Armstrong. The limestone member represents late Meramecian through late Chesterian carbonate sedimentation.

The Mississippian strata are overlain by marine carbonate deposits of the Ladrones Limestone of Early and Middle Pennsylvanian age.

The Ladrones Limestone on the Ladrones Islands is incompletely exposed in a series of shoreline outcrops. A measured section totals in excess of 1,000 feet. The Ladrones Limestone is a thick-bedded gray, pelletoid-lime mudstone and ostracode-foraminiferal wackestone to ooid packstone. Douglass (1971) described and illustrated a fusulinid fauna of Middle Pennsylvanian age from the upper half of the formation. A few coralla of a cerioid coral were collected in association with the Middle Pennsylvanian fusulinids. These corals are assigned to the genus *Lithostrotionella* sp. s. l.

North of Prince of Wales Island (fig. 14), on Kuiu Island and Keku Islets, Muffler (1967) described the Saginaw Bay Formation; it is composed of four informal members: a volcanic member, a black chert member, a chert and limestone member, and a silty limestone member. The silty limestone member is of Middle Pennsylvanian age (Muffler, 1967; Dutro and Douglass, 1961). The chert and limestone member contains a rugose coral fauna of Mississippian age, which has not been studied in detail.

To the north at Freshwater Bay (fig. 14) Loney, Condon, and Dutro (1963) described the Iyoukeen Formation, a sequence ±4,500 feet thick of cherty limestones and shale of both Early and Late Mississippian age. They reported a rich coral fauna of *Syringopora* spp. and solitary rugose corals. They stated that the Upper Mississippian beds contain abundant lithostrotionoid corals and a variety of large horn corals. This fauna has not been studied in detail.

REFERENCES CITED

Armstrong, A. K., 1970a, Mississippian rugose corals, Peratrovich Formation, west coast, Prince of Wales Island, southeastern Alaska: U.S. Geol. Survey Prof. Paper 534, 44 p., 13 pls. 30 figs.

——— 1970b, Carbonate facies and the lithostrotionid corals of the Mississippian Kogruk Formation, De Long Mountains, northwestern Alaska: U.S. Geol. Survey Prof. Paper 664, 38 p., 14 pls., 37 figs.

——— 1970c, Mississippian dolomites from Lisburne Group, Killik River, Mount Bupto region, Brooks Range, Alaska: Am. Assoc. Petroleum Geologists Bull., v. 54, no. 2, p. 251–264, 10 figs.

——— 1972a, Biostratigraphy of Mississippian lithostrotionoid corals, Lisburne Group, arctic Alaska: U.S. Geol. Survey Prof. Paper 743–A, 28 p., 9 pls.

——— 1972b, Pennsylvanian carbonates, paleoecology, and rugose colonial corals, north flank, eastern Brooks Range, arctic Alaska: U.S. Geol. Survey Prof. Paper 747, 21 p., 8 pls., 16 figs. [1973]

——— 1973, *Lithostrotion reiseri* n. sp., a cerioid colonial coral from Meramec-age beds, Lisburne Group, arctic Alaska: U.S. Geol. Survey Jour. Research, v. 1, no. 2, p. 137–145.

Armstrong, A. K., and Mamet, B. L., 1970, Biostratigraphy and dolomite porosity trends of the Lisburne Group, *in* Adkison, W. L., and Brosgé, M. M., eds., Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Am. Assoc. Petroleum Geologists, Pacific Sec., p. N1–N16, 12 figs.

Armstrong, A. K., Mamet, B. L., and Dutro, J. T., Jr., 1970, Foraminiferal zonation and carbonate facies of Carboniferous (Mississippian and Pennsylvanian) Lisburne Group, central and eastern Brooks Range, Alaska: Am. Assoc. Petroleum Geologists Bull., v. 54, no. 5, p. 687–698, 4 figs.

——— 1971, Lisburne Group, Cape Lewis–Niak Creek, northwestern Alaska, *in* Geological Survey research 1971: U.S. Geol. Survey Prof. Paper 750–B, p. B23–B34, 9 figs.

Bowsher, A. L., and Dutro, J. T., Jr., 1957, The Paleozoic section in the Shainin Lake area, central Brooks Range, Alaska: U.S. Geol. Survey Prof. Paper 303–A, 39 p., 6 pls., 4 figs.

Brabb, E. C., 1969, Six new Paleozoic and Mesozoic formations in east-central Alaska: U.S. Geol. Survey Bull. 1274–I, 26 p., 10 figs.

Dobrolyubova, T. A., 1958, Nizhnekamennougol'nye kolonial'nye chetyrekhluchevye korally Russkoi platformy [Lower Carboniferous colonial tetracorals of the Russian platform]: Akad. Nauk SSSR Paleont. Inst. Trudy, v. 70, 216 p., 38 pls., 34 figs.

Douglass, R. C., 1971, Pennsylvanian fusulinids from southeastern Alaska: U.S. Geol. Survey Prof. Paper 706, 21 p., 9 figs., 7 pls.

Dunham, R. J., 1962, Classification of carbonate rocks according to deposition texture, *in* Classification of carbonate rocks—A symposium: Am. Assoc. Petroleum Geologists Mem. 1, p. 108–121.

Dutro, J. T., Jr., and Douglass, R. C., 1961, Pennsylvanian rocks in southeastern Alaska, *in* Geological Survey research 1961: U.S. Geol. Survey Prof. Paper 424–B, p. B239–B241, 1 fig.

Eberlein, G. D., and Churkin, Michael, Jr., 1970, Paleozoic stratigraphy in the northwest coastal area of Prince of Wales Island, southeastern Alaska: U.S. Geol. Survey Bull. 1284, 67 p.

Fomichev, V. D., 1953, Korally Rugosa i stratigrafiya srednei verkhnekamennougolnykh i permskikh otlozhenii Donetskogo basseina [Rugose corals and stratigraphy of the middle and upper Carboniferous and Permian deposits of the Donets basin]: Vses. Nauchno-Issled. Geol. Inst. Trudy, 622 p., 44 pls.

Groot, G. E. de, 1963, Rugose corals from the Carboniferous of northern Palencia (Spain): Leidse Geol. Mededel., pt. 29, 123 p. 26 pls., 39 figs.

Loney, R. A., Condon, W. H., and Dutro, J. T., Jr. 1963, Geology of the Freshwater Bay area, Chichagof Island, Alaska: U.S. Geol. Survey Bull. 1108–C, 54 p.

Macqueen, R. W., and Bamber, E. W., 1967, Stratigraphy of Banff Formation and lower Rundle Group (Mississippian), southwestern Alberta: Canada Geol. Survey Paper 67–47, 37 p., 3 pls. 9 figs.

——— 1968, Stratigraphy and facies relationships of the Upper Mississippian Mount Head Formation, Rocky Mountains and foothills, southwestern Alberta: Bull. Canadian Petroleum Geology, v. 16, no. 3, p. 225–287, 11 figs.

Mamet, B. L., and Armstrong, A. K., 1972, Lisburne Group, Franklin and Romanzof Mountains, northeastern Alaska, *in* Geological Survey research 1972: U.S. Geol. Survey Prof. Paper 800–C p. C127–C144.

Muffler, L. J. P., 1967, Stratigraphy of the Keku Islets and neighboring parts of Kuiu and Kupreanof Islands, southeastern Alaska: U.S. Geol. Survey Bull. 1241–C, 52 p., 15 figs.

Patton, W. W., Jr., and Dutro, J. T., Jr., 1969, Preliminary report on the Paleozoic and Mesozoic sedimentary sequence on St. Lawrence Island, Alaska *in* Geological Survey research 1969: U.S. Geol. Survey Prof. Paper 650–D, p. D138–D143, 5 figs.

Petryk, A., Mamet, B. L., and Macqueen, R. W., 1970, Preliminary foraminiferal zonation, lower Carboniferous Rundle Group, southwestern Alberta: Bull. Canadian Petroleum Geology, v. 18. no. 1, p. 84–103.

Rowett, C. L., 1969, Upper Palaeozoic stratigraphy and corals from east-central Alaska Range, Alaska: Arctic Inst. North America Tech. Paper 23, 120 p., 13 pls., 20 figs.

Sando, W. J., Mamet, B. L., and Dutro, J. T., Jr., 1969, Carboniferous megafossil and microfaunal zonation in the northern Cordillera of the United States: U.S. Geol. Survey Prof. Paper 613–E, 29 p., 7 figs.

Steidtmann, Edward, and Cathcart, S. H., 1922, Geology of the York tin deposits, Alaska: U.S. Geol. Survey Bull. 733, 130 p.

Tailleur, I. L., and Sable, E. G., 1963, Nuka Formation of Late Mississippian to Late Permian age, new formation in northern Alaska: Am. Assoc. Petroleum Geologists Bull., v. 47, no. 4, p. 632–642.

Wahrhaftig, Clyde, 1965, Physiographic divisions of Alaska: U.S. Geol. Survey Prof. Paper 482, 52 p., 6 pls., 6 figs. [1966]

——— 1968, Schists of the central Alaska Range: U.S. Geol. Survey Bull. 1254–E, 22 p., 4 figs.

Wood, G. V., and Armstrong, A. K., 1974, Diagenesis and stratigraphy of the Lisburne Group limestones of the Sadlerochit Mountains and adjacent areas, northeastern Alaska: U.S. Geol. Survey Prof. Paper 857. (In press.)

INDEX

[Italic page numbers indicate major references and descriptions]

Stratigraphic Distribution of Permian Corals in Alaska

By CHARLES L. ROWETT

PALEOZOIC CORALS OF ALASKA

GEOLOGICAL SURVEY PROFESSIONAL PAPER 823-D

Permian corals in Alaska comprise 10 families belonging to the Rugosa and 3 to the Tabulata. Strong provincialism makes interregional correlations difficult although local biostratigraphic zonation is possible

CONTENTS

ILLUSTRATIONS

[Plates follow index]

STRATIGRAPHIC DISTRIBUTION OF PERMIAN CORALS IN ALASKA

By CHARLES L. ROWETT [1]

ABSTRACT

Coral-bearing Lower Permian marine strata occur in most major regions in Alaska; however, the most numerous and diverse faunas have been found in the northwestern Brooks Range, the central and eastern Alaska Range, the western Wrangell Mountains, and the Alexander Archipelago. Southern and southeastern Permian rocks are volcaniclastic rocks and minor limestones that accumulated in a volcanic geosynclinal belt, but the clastic and carbonate rocks of the Brooks Range and east-central Alaska for the most part represent nearshore marine deposition.

Thus far, 34 genera of rugose and tabulate corals that represent 13 families have been identified from the Alaskan Permian: the Metriophyllidae, Laccophyllidae, Polycoeliidae, Lophophyllidiidae, Timorphyllidae, Hapsiphyllidae, Aulophyllidae, Cyathopsidae, Durhaminidae, Waagenophyllidae, Favositidae, Auloporidae, and Sinoporidae.

Interregional correlation of Permian strata based on corals is difficult for several reasons. Facies control of coral distribution is pronounced; small, simple nondissepimented corals dominated the nearshore neritic faunas, while large solitary and compound forms having dissepimental zones and complex axial structures seem to have been limited to deeper marine environments. In addition, the faunas of the Brooks Range and the Alaska Range are dominated by Asiatic genera, whereas faunas from east-central and southeastern Alaska contain elements of the indigenous North American faunal province. Consequently, there are very few genera in common upon which to base correlations between these regions. It has been possible, however, to recognize several coral zones in the Permian of the central and eastern Alaska Range.

INTRODUCTION

Permian nonmarine and marine coral-bearing strata are known from almost every major region in Alaska (fig. 18). Detrital marine rocks and minor carbonate rocks are exposed almost continuously throughout the length of the Brooks Range from Point Hope to the Yukon boundary. In east-central Alaska Permian strata have been mapped along the Porcupine, Nation, and Yukon Rivers. In southwestern Alaska, poorly differentiated marine and nonmarine rocks that range in age from Carboniferous to Jurassic occur in the lower Yukon-Kuskokwim region, in the Goodnews Bay area, and on Cape Kekurnoi. Throughout the central and eastern Alaska Range graded volcaniclastic rocks and limestones are present in the Delta River area, the Slana area, the Nabesna area, and in the eastern Wrangell Mountains. Dominantly detrital marine Permian strata also have been identified both on the mainland and on many islands of the Alexander Archipelago of southeastern Alaska.

MAJOR GEOLOGIC PROVINCES

The distribution of major lithofacies shown in figure 18 indicates that a volcanic eugeosynclinal belt occupied most of southeastern, southern, and southwestern Alaska during the Permian. Most stratigraphic units in these regions consist of silicified volcaniclastic rocks, graywacke sandstones (commonly graded), and andesitic flows and breccias. Limestones typically are impure and are laterally discontinuous; locally, however, they are highly fossiliferous. A miogeosynclinal facies, if such were recognizably developed during the Permian, presumably lay to the north of this belt in the region now termed the "Yukon-Tanana Upland." Other than the questionably Permian volcanic Rampart Group, however, few vestiges of these deposits have been preserved because of deep erosion north of the Denali fault, which parallels the axis of the Alaska Range for a distance of more than 1,000 miles.

Nearshore marine deposits, however, are present both in the Brooks Range and in east-central Alaska. The Siksikpuk Formation (Lower Permian) in the Brooks Range is dominantly a clastic marine deposit that accumulated not too distant from emergent land that lay to the north (Campbell, 1967; Patton, 1957; Patton and Tailleur, 1964; Tailleur and Kent, 1951; Tailleur and Sable, 1963). In east-central Alaska the Tahkandit Limestone also seems to represent nearshore deposition (Brabb, 1969; Brabb and Churkin,

[1] Texas Christian University, Fort Worth, Tex.

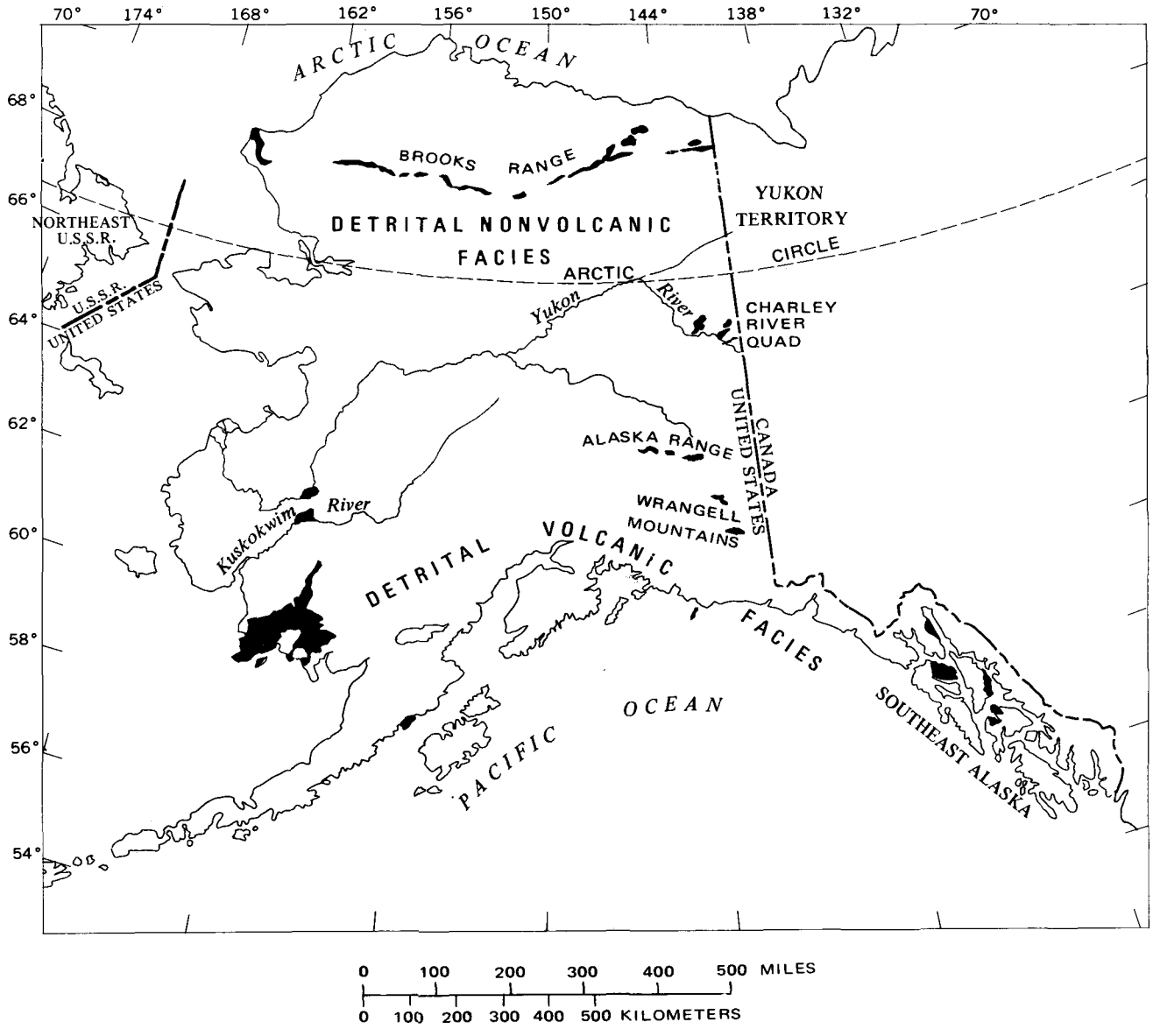


FIGURE 18.—Distribution of surface exposures of Permian rocks in Alaska and principal lithofacies.

1969; Brabb and Grant, 1971; R. E. Grant and E. E. Brabb in U.S. Geological Survey, 1970, p. 47).

It is within this regional tectonic setting that the distribution of Permian corals in Alaska should be considered, inasmuch as Permian paleoenvironments exerted a strong control over the distribution of certain types of corals. It can also be shown that the provincialism of Permian corals was a factor that influenced the geographic distribution of certain genera.

AGE DISTRIBUTION OF PERMIAN ROCKS

Most of the Permian of Alaska is limited to the lower part of this System (Sakmarian and Artinskian, or Wolfcampian and Leonardian of North American usage) (fig. 19). To date, the only definite Late Permian fossils (brachiopods) that have been identified were collected from the Sadlerochit Formation in the Brooks Range. This fauna is regarded as early Late Permian (Kazanian) in age (Detterman, 1970; Dutro, 1961; Tailleur and others, 1958). In east-central Alaska the upper part of the Tahkandit Limestone may be post-Artinskian in age, but the lower part definitely is Artinskian (R. E. Grant and E. E. Brabb in U.S. Geological Survey, 1970, p. 47; Brabb and Grant, 1971).

Elsewhere, virtually all marine Permian rocks seem to be limited to the Lower Permian. A Sakmarian and Artinskian Age has been securely established for the Mankomen Formation and its equivalents throughout the Alaska Range based on both fusulinids (Petocz, 1970) and corals (Rowett, 1969). A similar age is indicated for fossiliferous Permian

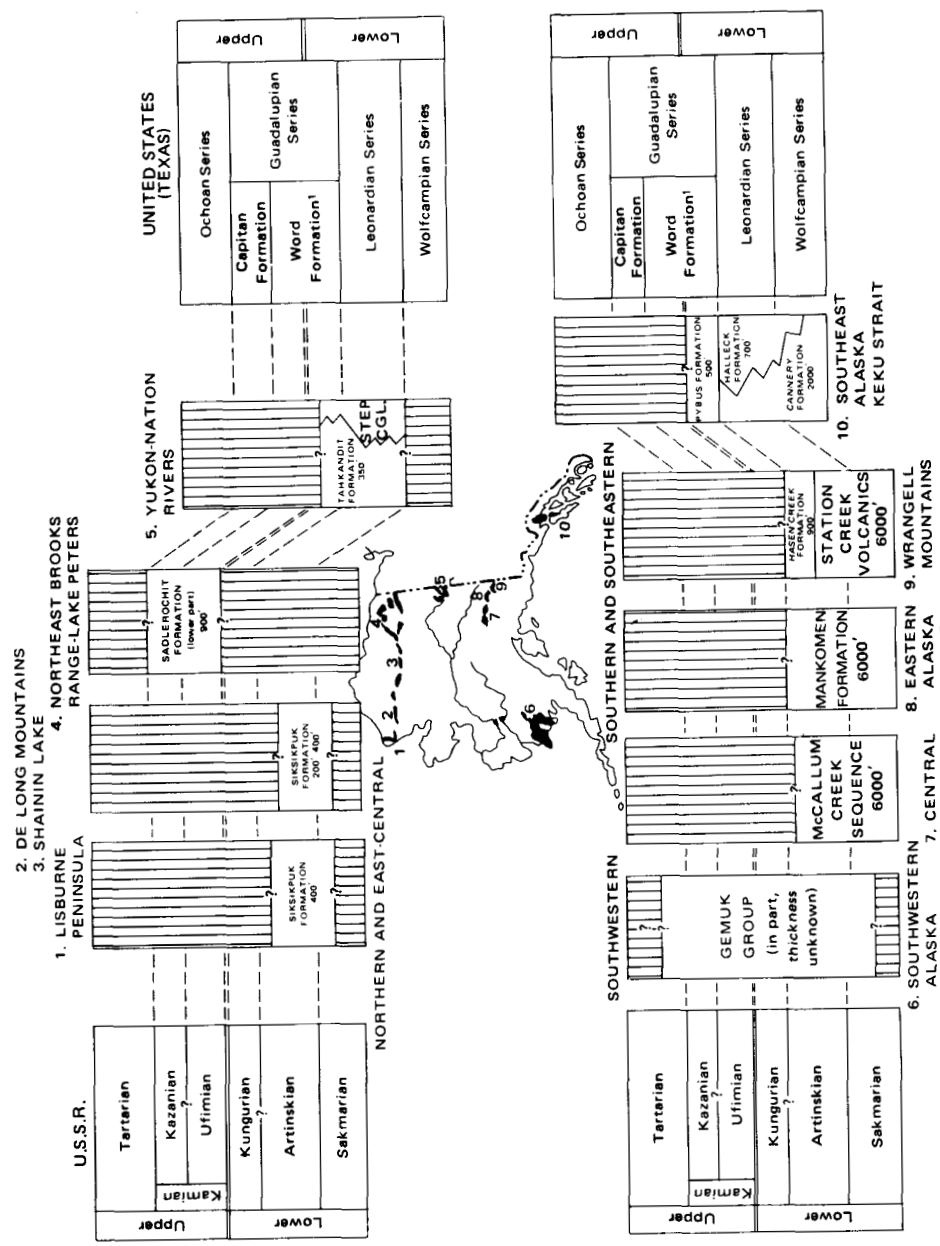


FIGURE 19.—Correlation of Permian strata in Alaska and comparison with North American and Soviet standards.

rocks in the Slana area (Rowett, 1971), in the Nabesna area, and for the Skolai Group in the eastern Wrangell Mountains. Recently identified corals from the Halleck and Cannery Formations in southeastern Alaska (Rowett, unpub. data) are also indicative of the Early Permian; the same is true for corals from the Siksikpuk Formation in the Brooks Range of northern Alaska.

COMPOSITION OF CORAL FAUNAS

Some of the principal kinds of solitary corals known from the Permian of Alaska are shown on plates 26 and 27. Solitary corals fall into two broad categories, namely, small, nondissepimented forms having simple axial structures and larger, dissepimented types, typically having complex axial structures. The first group includes genera such as *Stereocorypha, Euryphyllum, Ufimia, Lophophyllidium, Pseudobradyphyllum, Bradyphyllum,* and *Allotropiophyllum* (pl. 26, figs. 1–11). Larger solitary corals having dissepimental zones include *Timania, Bothrophyllum, Clisiophyllum, Auloclisia,* and *Caninia* (pl. 26, figs. 12–18; pl. 27, figs. 1–12). There is considerable faunal diversity among solitary corals of both types, however; in addition to the genera illustrated, 13 other genera have been identified from the Alaskan Permian—*Caninophyllum, Hornsundia, Neozaphrentis, Hapsiphyllum, Duplophyllum, Amplexizaphrentis, Tachylasma, Sochkineophyllum, Stereostylus, Calophyllum, Plerophyllum, Amplexocarinia,* and *Verbeekiella.* Thus, eight families are represented: the Aulophyllidae, Cyathopsidae, Metriophyllidae, Hapsiphyllidae, Polycoeliidae, Laccophyllidae, Timorphyllidae, and Lophophyllidiidae.

Plate 28 depicts some of the more common compound rugose corals and two common tabulate coral genera. However, there is less variety within these groups of corals. Only *Durhaminia* and *Heritschioides* (pl. 28, figs. 1–12) represent the family Durhaminidae, and *Syringopora* and *Sinopora* (pl. 28, figs. 13–18) represent the Auloporidae and Sinoporidae, respectively. The family Waagenophyllidae may be represented by *Wentzelella* (not illustrated). Other common tabulate corals not illustrated include the favositid coral *Michelinia* and the auloporid coral *Cladochonus.*

GEOGRAPHIC DISTRIBUTION OF PERMIAN CORALS

Figure 20 shows the geographic distribution of Permian corals by families throughout Alaska. In the far-western Brooks Range (fig. 20, area 1, Lisburne Peninsula), only a few polycoelid corals are known, including *Tachylasma* and *Ufimia.* In the western Brooks Range (fig. 20, area 2, De Long Mountains), the coral faunas are more varied and include representatives of the Metriophyllidae (*Stereocorypha*), Laccophyllidae (*Amplexocarinia*), Hapsiphyllidae (*Amplexizaphrentis*), and Cyathopsidae (*Hornsundia*). In the central Brooks Range (fig. 20, area 3) both polycoelid corals (*Sochkineophyllum* and *Tachylasma*) and hapsiphyllid corals (*Allotropiophyllum* and *Euryphyllum*) are present. This is the type area of the Siksikpuk Formation. Corals from the extreme northeastern part of the Brooks Range (Sadlerochit Formation) (fig. 20, area 4) are uncommon and represent only the Metriophyllidae (*Duplophyllum*) and Polycoeliidae (*Pseudobradyphyllum*).

Summarizing for this region, the coral faunas are strongly dominated by small, simple, nondissepimented corals that occur in clastic, commonly argillaceous nearshore marine facies. Similar nearshore marine facies in east-central Alaska (fig. 20, area 5) also contain small, nondissepimented corals, including Lophophyllidiidae (*Lophophyllidium*) and Hapsiphyllidae (*Euryphyllum, Hapsiphyllum, Neozaphrentis,* and *Amplexizaphrentis*). These strata comprise the Permian Tahkandit Limestone (Artinskian and Kungurian?) and a lateral equivalent, the Step Conglomerate. These coral faunas are in sharp contrast to the large solitary and colonial dissepimented corals that occur in southern and southeastern Alaska.

Only two corals have been studied from southwestern Alaska (fig. 20, area 6). These were collected from the poorly differentiated Gemuk Group, whose precise stratigraphic relations are unclear. The corals have been identified as belonging to the Hapsiphyllidae (*Euryphyllum*) and the Favositidae (*"Thamnopora"*).

In the Alaska Range (fig. 20, areas 7 and 8) and in the eastern Wrangell Mountains (fig. 20, area 9) fossil corals are common. These faunas are dominated by large dissepimented solitary and colonial corals. Solitary forms include representatives of the Lophophyllidiidae (*Lophophyllidium* and *Stereostylus*), Aulophyllidae (*Clisiophyllum, Auloclisia*), and Cyathopsidae (*Bothrophyllum, Timania, Caninophyllum,* and *Caninia*). Compound (fasciculate) dissepimented Rugosa are represented by the Durhaminidae (*Durhamina, Heritschioides*). Cerioid rugose corals are rare in Alaska and are known only from two small fragments recently identified in collections made more than 30 years ago as *Wentzelella,* a member of the family Waagenophyllidae. The Timorphyllidae may also be represented by *Verbeekiella,* also known from only one corallite. Some

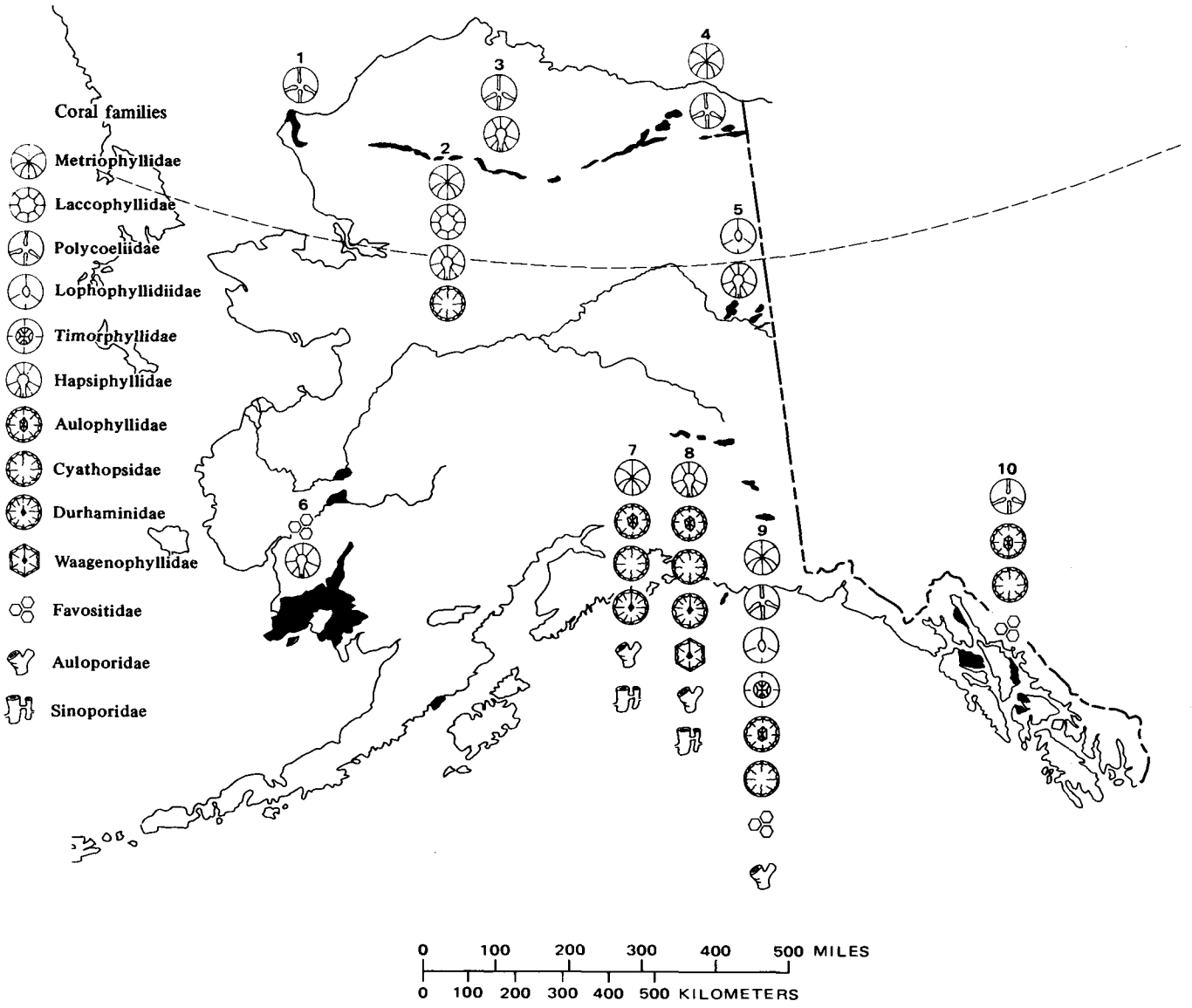


FIGURE 20.—Distribution of Permian rugose and tabulate coral families in Alaksa. Numbered areas keyed to stratigraphic columns in figure 19.

tabulate corals are common in this eugeosynclinal facies, including representatives of the Auloporidae (*Syringopora, Cladochonus*), Favositidae (*Michelinia*), and Sinoporidae (*Sinopora*) (Rowett, 1969).

Southeastern Alaska (fig. 20, area 10) also represents a eugeosynclinal environment in which volcanic activity was perhaps even greater than in the Alaska Range. The coralline faunas of the Hasen Creek Formation are similar to those of the Alaska Range and Wrangell Mountains and include representatives of the Aulophyllidae (*Clisiophyllum, Timania*) and the favositid *Michelinia*. Compound rugose corals have not yet been found in this region, however. The only nondissepimented coral known thus far from this region is *Calophyllum*, a polycoelid.

DISCUSSION

The foregoing detailed summary of coral distribution and regional lithofacies is presented to document one reason for the difficulty in attempting interregional correlations based on corals in the Permian of Alaska. As was originally suggested by Hill (1938), depositional environments had a strong segregating effect on the rugose corals such that in offshore, comparatively deep water marine environments, the coralline faunas were likely to be dominated by large solitary or compound dissepimented corals, while small nondissepimented forms were scarce or absent. Conversely, nearshore clastic depositional environments were preferred by small, solitary, morphologically simple, nondissepimented

corals. Figure 20 indicates that this factor may have controlled coral distribution in Alaska to a great extent. The biostratigraphic consequence is that there are few if any coral species or even genera in common upon which to base interregional correlations between these regions.

Regional differences in the composition of coral faunas in the Permian of Alaska are also due in part to faunal provincialism, or, more specifically, to a mixing of genera that perhaps were endemic to this region with others whose origin was in some other region. This is a very complex problem, and it is not yet possible to say with confidence which, if any, of the 30-odd coral genera now known from the Permian of Alaska may have been endemic. It is possible, however, to recognize elements of the North American midcontinent "cyathaxonid" fauna in genera such as *Lophophyllidium* and *Stereostylus*, as well as genera of western European origin such as the audophyllids *Clisiophyllum* and *Auloclisia*. However, Asiatic genera strongly dominate the Permian coral faunas of Alaska and include both solitary nondissepimented forms such as the polycoelids *Tachylasma* and many large dissepimented cyathopsids such as *Timania* and *Bothrophyllum*. The tabulate coral *Sinopora* may also fall into this category.

The genus *Hornsundia* is a cyathopsid coral known elsewhere only from the Lower Permian of West Spitsbergen. *Duplophyllum* is otherwise known from the Lower Permian of Timor, and *Euryphyllum* from the Permian of Australia and New Zealand. The genus *Heritschioides* occurs in Sakmarian strata and may be endemic to Alaska, inasmuch as reported occurrences of this genus elsewhere (western North America, Japan, Russia) are from younger (Artinskian) rocks. Genera such as *Allotropiophyllum, Sochkineophyllum, Ufimia,* and *Plerophyllum* are not endemic to North America, but their ultimate origin in Europe, Asia, or elsewhere is unknown.

Figure 20 also indicates that in general, genera of Asiatic origin are concentrated in northern and central Alaska, whereas the number of North American and European genera increases toward the east and south. Coupled with the segregation exerted by depositional environments discussed above, the provincialism of Alaskan coral faunas thus adds to the difficulty of interregional biostratigraphic correlations.

Within a single geologic province, however, Permian corals already have been used with some success as the basis of biostratigraphic correlations. For example, an identical stratigraphic sequence of coral zones characterized by *Auloclisia, Timania, Sinopora,* and *Durhamina* has been recognized in Lower Permian limestones in two widely separated parts of the Alaska Range—in the McCallum Creek sequence in the Delta River area and in Mankomen Formation equivalents in the Slana area (Rowett, 1969, 1971). Similar biostratigraphic correlations based on corals should be possible within other regions. Ultimately, it may be possible to identify a sufficient number of faunal elements common to several regions that would permit interregional correlations of the Alaskan Permian based on rugose and tabulate corals.

LOCALITY DESCRIPTIONS FOR PERMIAN CORALS IN ALASKA

[Information tabulated by major regions of Alaska is the result of a restudy of all available Permian rugose and tabulate corals from Alaska, completed in 1972. Most specimens were collected by members of the U.S. Geological Survey, beginning with corals collected by F. C. Schrader in 1902, but this list also includes collections of Permian corals made by the writer between 1963 and 1968. Almost half of the specimens studied required revised identifications at the generic level, primarily due to recent changes in taxonomy and classification. No attempt was made to identify specimens at the species level except for a comparatively few specimens which obviously were conspecific with described species and for species described by Rowett (1969). Stratigraphic and locality information provided by the original collectors also has been updated where possible by reference to more recent geologic studies and mapping in Alaska. Some stratigraphic and locality information nevertheless remains unclear. PC numbers refer to collections cataloged in the U.S. Geological Survey Permian-Carboniferous catalog; UA specimen numbers refer to specimens stored at the University of Alaska at College, Alaska]

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		Lisburne Peninsula		
20213–PC	60ACr130	Siksikpuk Formation, undetermined horizon; exposures along west bank of Ipewik River about 1 mile north of its confluence with the Kukpuk River; lat 68°23′ N., long 165°44′ W., Point Hope B–2 quad.	R. H. Campbell, 1960	*Ufimia* sp. *Tachylasma* sp.

Locality descriptions for Permian corals in Alaska—Continued

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		Western and central Brooks Range		
12753–PC	51ASa133f	Nuka Formation, precise stratigraphic position uncertain; listed as "Lisburne limestone, 4th (uppermost) unit" and stated to be correlative with "upper clastic unit" in the Nuka type area. Lat 68°35'50" N., long 160°55'30" W., ½ mile west of Cirque Fork, Driftwood Creek. (This specimen was probably collected from member m in a subsequent subdivision by Tailleur and Sable, 1963.)	E. G. Sable, 1951	?*Stereocorypha* sp.
12754–PC	51ASa135	Nuka Formation, precise stratigraphic position uncertain; hill ½ mile east of Kidney Fork; lat 68°35'20" N., long 160°30' W. (Probably corresponds to member m of Tailleur and Sable, 1963.)	---do	Metriophyllid coral, indet.
13213–PC	51ARr76	Nuka Formation, precise stratigraphic position uncertain; from "* * * a 100-foot section at about 68°42' N., and 158°25' W., Reiser's sta. 68" (Probably from member p of Tailleur and Sable, 1963.)	H. N. Reiser, 1951	*Amplexizaphrentis* sp.
12784–PC	51ARr79	Nuka Formation, "lower in section described above." (Probably corresponds to member m in subsequent subdivision of the Nuka by Tailleur and Sable, 1963.)	---do	*Hornsundia* cf. *H. lateseptata* Fedorowski, 1965.
13206–PC	51ATr342	Nuka Formation, precise stratigraphic position uncertain; from Kiligwa River valley; lat 68°35' N., long 158°12' W., Reiser's station T–91.	I. L. Tailleur and B. H. Kent, 1951.	*Amplexocarinia* sp.
11814–PC	50AKe238	Siksikpuk Formation, type (composite) section; siltstones in cutbank on east side of Skimo Creek; lat 68°17' N., long 151°53' W.	A. S. Keller, 1950	*Allotropiophyllum* sp. *Euryphyllum* sp.
11816–PC	50AKe242	---do	---do	?*Allotropiophyllum* sp. ?*Tackylasma* sp. *Sochkineophyllum* sp.
1452–PC	53APa122	---do	---do	*Sochkineophyllum* sp. ?*Euryphyllum* sp.
		Eastern Brooks Range		
15814–PC	51AKe104	Sadlerochit Formation, Echooka Member; limestone in east side of Flood Creek; between lat 69°02'40" N. and 69°03'20" N., long 147°53' W. (Coral	A. S. Keller, 1951	*Calophyllum* sp.

Locality descriptions for Permian corals in Alaska—Continued

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		Eastern Brooks Range—Continued		
		identified by Helen Duncan.)		
15815–PC	51AKe106	Sadlerochit Formation, Echooka Member; limy siltstone and limestone from lower contact to 400 ft above base of member on Saviukviayak River; lat 69° N., long 148°12′ W. (Coral identified by Helen Duncan.)	A. S. Keller, 1951	?*Verbeekiella* sp.
15832–PC	52AMo41	Sadlerochit Formation, Echooka Member; limestones about 166 ft above base of section on small northern tributary of Cache Creek; lat 69°30′ N., long 147°51′ W. (Coral identified by Helen Duncan.)	R. H. Morris, 1952	?*Euryphyllum* sp.
15425–PC	53AMg3	Sadlerochit Formation, lower limestone; east side of Kongakut River; lat 69°01′ N., long 142°04′ W.	M. D. Mangus, 1953	?*Duplophyllum* sp. ?*Pseudobradyphyllum* sp.
		East-central Alaska		
5839a–PC	25AMt186	Type section of the Tahkandit Limestone, "Southwest bank Yukon River, about 2¾ mi air-line upstream from Nation." Brabb and Churkin (1969) located these exposures in the northwest corner of sec. 17, T. 4 N., R. 30 E., Charley River A–2 quad.; lat 65°10.8′ N., long 141°41.9′ W.	J. B. Mertie, 1925	*Euryphyllum* sp.
2438–PC	79	Type section of the Tahkandit Limestone from "* * * transition beds below main white limestone." (Same locality as above; corals apparently from near base of upper limestone unit defined by Brabb and Churkin, 1969.)	G. H. Girty, 1918	*Lophophyllidium* sp.
2549–PC	81	Tahkandit Limestone, "from various horizons," from left bank of Yukon River, ¼ mile below mouth of Coal Creek. Brabb and Churkin (1969) located these small fault-bounded isolated exposures near McGregor in secs. 23 and 24, T. 6 N., R. 22 E., Charley River quad.; approx lat 65°20′ N., long 143°10′ W.	---do	*Euryphyllum* sp. ?*Amplexizaphrentis* sp.
23049–PC	67A2+47	Tahkandit Limestone, 47 ft above base of sandstone unit in slough section, southwest side of Yukon River near mouth of Nation River; lat	R. E. Grant, E. W. Bamber, A. K. Armstrong, and E. E. Brabb, 1967.	*Sochkineophyllum* sp. ?*Sochkineophyllum* sp. *Lophophyllidium* n. sp.

Locality descriptions for Permian corals in Alaska—Continued

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		East-Central Alaska—Continued		
		65°10.8′ N., long 141°41.9′ W., Charley River A–2 quad. (See Brabb and Grant, 1971.)		
23485–PC [1]	----------	Tahkandit Limestone; information limited to "RG–1 N60, unit 9, at 157°. Tahkandit sect. S side Yukon R." according to label.	R. Greggs, 1960	*Lophophyllidium* sp. *Hapsiphyllum* sp. Hapsiphyllid coral, indet. Cyathopsid coral, indet.
23486–PC [2]	----------	Tahkandit Limestone; information limited to "RG–1 N60, unit 8, at 144°. Tahkandit sect. S. side Yukon R." according to label.	---do	?*Hapsiphyllum* sp.
23487–PC [3]	----------	Tahkandit Limestone; information limited to "RG–1, N60, unit 8 at 142°. Tahkandit sect. S. side Yukon River, opposite mouth of Nation River" according to label.	---do	*Neozaphrentis* sp. *Lophophyllidium* n. sp. ?*Barytichisma* sp.
		Southwestern Alaska		
16645–PC	51ACd206	Gemuk Group, (in part); "upper part of 20–30 foot bed of tuffaceous limestone * * * 9.25 miles N. 53° W. of head of Goodnews Lake, 16 miles N. 62½° E. of outlet of Arolik Lake; lat approx 59°40′ N., long 160°30′ W."	J. M. Hoare, 1951	?*Euryphyllum* sp. "*Thamnopora*" sp.
		Central Alaska Range		
16697–PC	52APw64	McCallum Creek sequence; alluvial fan on west side of Rainbow Ridge near milepost 209.5, Richardson Highway; Mount Hayes A–4 quad., Delta River district.	T. L. Péwé, 1952	*Bothrophyllum* cf. *B. pseudoconicum* Dobrolyubova, 1937.
----------	----------	McCallum Creek sequence; about 3,900 ft stratigraphically above base of exposures in the southern Rainbow Mountain area at elevation of about 4,000 ft (see Rowett, 1969, text-fig. 3, loc MC–0).	C. L. Rowett, 1963–66	*Timania* sp. A. Rowett, 1969 (UA 1060–63). ?*Sinopora* sp. (UA 1079).
----------	----------	McCallum Creek sequence; about 1,600 ft above base of exposures in the southern Rainbow Mountain area at an elevation of about 4,600 ft (see Rowett, 1969, text-fig. 3, loc MC–1).	---do	*Bothrophyllum* sp. A Rowett, 1969 (UA 1071–73). ?*Pseudobradyphyllum* sp. A. Rowett, 1969 (UA 1002). ?*Bradyphyllum* sp. A Rowett, 1969 (UA 1001).

[1] Shell Oil Co. catalog No. 8339.
[2] Shell Oil Co. catalog No. 8342.
[3] Shell Oil Co. catalog No. 8351.

Locality descriptions for Permian corals in Alaska—Continued

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		Central Alaska Range—Continued		
----------	----------	McCallum Creek sequence; approx 1,000 ft stratigraphically above base of exposures in the southern Rainbow Mountain area at an elevation of approx 5,300 ft (see Rowett, 1969, text-fig. 3, loc. MC–3).	C. L. Rowett, 1963–66	*Bothrophyllum* cf. *B. pseudoconicum* Dobrolyubova, 1937 (UA 1064–1066).
----------	----------	McCallum Creek sequence; approx 950 ft stratigraphically above base of exposures in the southern Rainbow Mountain area at an elevation of approx 5,250 ft (see Rowett, 1969, text-fig. 3, loc MC–5).	---do	*Syringopora katoi* Rowett, 1969 (UA 1081, 1082).
----------	----------	McCallum Creek sequence; approx 370 ft stratigraphically above base of exposures in the southern Rainbow Mountain area at an elevation of about 5,900 ft on summit ridge (see Rowett, 1969, text-fig. 3, loc MC–6).	---do	*Heritschioides summitensis* Rowett, 1969 (UA 1024–1031).
----------	----------	McCallum Creek sequence; approx 300 ft stratigraphically above base of exposures in the southern Rainbow Mountain area at an elevation of about 5,850 ft on summit ridge (see Rowett, 1969, text-fig. 3, loc MC–7).	---do	*Bothrophyllum* cf. *B. pseudoconicum* Dobrolyubova, 1937 (UA 1067–1070). ?*Caninia* sp. *Michelinia* sp.
----------	----------	McCallum Creek sequence; approx 850 ft stratigraphically above base of exposures in the southern Rainbow Mountain area at an elevation of approx 5,300 ft (see Rowett, 1969, text-fig. 3, loc MC–13).	---do	*Timania rainbowensis* Rowett, 1969 (UA 1051–1055).
----------	----------	McCallum Creek sequence; approx 5,180 ft stratigraphically above base of exposures; south side of Rainy Creek about 1.4 miles upstream from confluence with Delta River; elev approx 3,200 ft, upper Delta River area (see Rowett, 1969, text-fig. 4, loc RC–17).	---do	*Caninia petoczi* Rowett, 1969 (UA 1032–1048, 1084).
----------	----------	McCallum Creek sequence; approx 5,480 ft stratigraphically above base of exposures; small knoll on terrace, south side of Rainy Creek about 0.3 mile west of locality RM-17 at an elevation of 3,300 ft, upper Delta River area (see Rowett, 1969, text-fig. 4, loc. RC–18).	---do	?*Clisiophyllum* sp. B Rowett, 1969 (UA 1024).
----------	----------	McCallum Creek sequence; approx 5,180 ft stratigraphically	---do	*Caninia petoczi* Rowett, 1969 (UA 1049, 1050).

Locality descriptions for Permian corals in Alaska—Continued

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		Central Alaska Range—Continued		
		above base of exposures; bluff on east side of Delta River 1.3 miles upstream from confluence with Rainy Creek; elev approx 2,700 ft, upper Delta River area (see Rowett, 1969, text-fig. 4, loc. DR–14).		
----------	----------	McCallum Creek sequence; approx 5,680 ft stratigraphically above base of exposures; bluff on west side of Delta River about 1.6 miles south of confluence with Rainy Creek; elev 2,700 ft (see Rowett, 1969, text-fig. 4, loc. DR–15).	C. L. Rowett, 1963–66 _	*Durhamina sutherlandi* Rowett, 1969 (UA 1006). *Sinopora* sp. (UA 1080).
----------	----------	McCallum Creek sequence; approx 5,480 ft above base of exposures; bluff on west side of Delta River about 0.1 mile north of locality DR–15 at same elevation; upper Delta River area (see Rowett, 1969, text-fig. 4, loc. DR–16).	---do ----------	*Auloclisia deltense* Rowett, 1969 (UA 1007–1020). *Clisiophyllum* sp. A Rowett, 1969 (UA 1021, 1022).
----------	----------	McCallum Creek sequence; approx 5,510 ft stratigraphically above base of exposures; north side of small west-flowing tributary of McCallum Creek about 1.1 miles east of confluence; elev 4,150 ft, McCallum Creek area (see Rowett, 1969, text-fig. 4, loc. VV–21a).	---do ----------	*Timania* cf. *T. schmidti* Stuckenberg, 1895 (UA 1056–1059).
----------	----------	McCallum Creek sequence; approx 50 ft stratigraphically higher than strata at locality VV–21a; elev 4,200 feet, McCallum Creek area (see Rowett, 1969, text-fig. 4, loc. VV–21b).	---do ----------	*Durhamina alaskaensis* Rowett, 1969 (UA 1004, 1005). *Sinopora minatoi* Rowett, 1969 (UA 1078).
		Eastern Alaska Range		
8014–PC _____	35AM–F3 _____	Mankomen Formation equivalents; NE¼SE¼ quad 621. 3½ miles N. 15° E. from north end of Suslota Lake; lat approx 62°46′ N., long 143°30′ W.	F. H. Moffit, 1935 _____	*Bothrophyllum* cf. *B. pseudoconicum* Dobrolyubova, 1937. *Wentzlella* sp.
8016–PC _____	35AM–F5 _____	Mankomen Formation equivalents; NW¼SE¼ quad 621, head of Fossil Creek near site of USGS 8014–PC.	---do ----------	*Wentzelella* sp.
8022–PC _____	35AM–F11 _____	Mankomen Formation equivalents; NW¼SE¼ quad 621, 5½ miles N. 4° E. from mouth of Ahtell Creek; lat approx 62°47′ N., long 143°56′ W.	---do ----------	*Amplexizaphrentis* sp. *Allotropiophyllum* sp.

Locality descriptions for Permian corals in Alaska—Continued

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		Eastern Alaska Range—Continued		
5875–PC	1620	Mankomen Formation equivalents; 3 miles northnortheast of Suslota Lake; same locality as colln. 7046 collected by F. H. Moffit in 1931 (Moffit, 1954, p. 117). *Lithostrotion* probably accidentally mixed with this collection.	F. C. Schrader, 1902	*Clisiophyllum* sp. *Bothrophyllum* sp. ?*Lithostrotion* sp.
8023–PC	35AM–F12	Mankomen Formation equivalents; NW¼SE½ quad 621; "top of ridge above gulch where 8022–PC was collected. 3.7 miles N. 8° E. from mouth of Ahtell Creek" according to original specimen label. Lat approx 62°47′ N., long 143°56′ W.	F. H. Moffit, 1935	*Durhamina alaskaensis* Rowett, 1969. *Timania* cf. *T. multiseptata Fedorowski*, 1965. ?*Cladochonus* sp.
		Mankomen Formation equivalents; ridge separating Porcupine and Cottonwood Creeks, 3.9 miles south-southeast from Indian Pass Lake and about 3.5 miles northeast from mouth of Ahtell Creek. (Probably the same locality as USGS 8023–PC above.)	C. L. Rowett, 1968	*Durhamina alaskaensis* Rowett 1969 (UA 1088, 1092–94, 1096, 1101). *Timania* cf. *T. multiseptata* Fedorowski, 1965 (UA 1085, 1086, 1089, 1091, 1095, 1098, 1099, 1100). *Auloclisia deltense* Rowett, 1969 (UA 1087). *Sinopora minatoi* Rowett, 1969 (UA 1097, 1097a).
		WRANGELL MOUNTAINS		
		Skolai Creek area		
		[Locality information for collections 6431a–PC to 6442b–PC is limited to that obtained from Moffit's specimen labels]		
6431a–PC	27AM–F17	"Chitina Valley. Skolai Creek Valley, south side, 1.5 miles from Skolai Creek and on west side of small glacier opposite mouth of Fredericka Creek."	F. H. Moffit, 1927	?*Lophophyllidium* sp.
6434–PC	27AM–F22	"Skolai Creek Valley, south side, elevation 6,250 feet, 2 miles west of Fredericka Creek."	---do	*Bothrophyllum* cf. *B. permicum Fedorowski*, 1965. *Bothrophyllum* cf. *B. baeri* Stuckenberg, 1895.
6437a–PC	27AM–F26	"Chitina Valley. Skolai Creek Valley, north side a short distance north of 27 A.M.–F24." (This locality is described as "* * * 5 miles west of Fredericka Creek, elevation 4,830 feet.")	---do	Metriophyllid coral, indet.
6438–PC	27AM–F28	"Skolai Creek Valley, north side, north of 27 A.M.–F24, 25, and 26, at elevation of 6,000 ft." (See description of USGS	---do	Do.

Locality descriptions for Permian corals in Alaska—Continued

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		WRANGELL MOUNTAINS—Continued		
		Skolai Creek area—Continued		
		6437a–PC, above.)		
6439–PC	27AM–F30	"Chitina Valley. Nizina Glacier, ledges along glacier east of Chimney Mountain."	F. H. Moffit, 1927	?*Stereocorypha* sp. *Cladochonus* sp.
6441–PC	27AM–F34	"Chitina Valley. Nizina Glacier, Valley, east side, 2 miles south of Lower Skolai Lake."	---do	*Plerophyllum* sp.
6441a–PC	27AM–F35	"Same locality as 34." (See USGS 6441–PC, above.)	---do	*Stereostylus* sp . ?*Stereostylus* sp.
6442a–PC	27AM–F37	"Same locality as 36." (Locality F36 is described as "Chitina Valley, Nizina Glacier Valley, east side, 1.5 miles south of Skolai Lake. These fossils are lower in the section than F34, 35.)"	---do	*Clisiophyllum* sp. ?*Verbeekiella* sp.
6442b–PC	27AM–F38	Same locality as F37, above	---do	*Michelinia* sp.
23372–PC	62AMk231	Hasen Creek Formation, Golden Horn Limestone Lentil; south of Skolai Creek, 0.55 mile N. 21° W. of triangulation station FULCRUM; lat 61°40'06" N,. long 142°21'51" W.	E. M. MacKevett, Jr., H. C. Berg, and George Plafker, 1962.	*Lophophyllidium* aff. *L. vidriensis* Ross and Ross, 1962.
22378a–PC	62Bg270F	Hasen Creek Formation; west-central part of McCarthy C–4 quad. east of Nisina glacier; lat 61°38'09" N., long 142°24'55" W.	---do	*Clisiophyllum* sp.
22378b–PC	62Bg270F	---do	---do	*Lophophyllidium* cf. *L. solidum* Ross and Ross, 1962.
22378c–PC	62Bg270F	---do	---do	*Caninophyllum* sp.
22380–PC	62APr–11E	Hasen Creek Formation; slabby limestones about 200 ft S 9° E. of locality 62APr–11D and "probably lower stratigraphically." Lat 61°31'01"N., long 142°15'56" W.	---do	*Lophophyllidium* cf. *L. solidum* Ross and Ross, 1962.
22382–PC	62APr–25E	Hasen Creek Formation, Golden Horn Limestone Lentil; near Golden Horn, 0.75 mile S. 74½° W. from triangulation station COAL; lat 61°41'27" N., long 142°16'15" W.	---do	*Stereocorypha cf. S. spissata* Moore and Jeffords, 1945.
		Nabesna area		
		[Locality information provided by D. H. Richter (written commun., 1972)]		
23432–PC	69–DW–15	"Nabesna A–4 quad., lat. 62°08' N., long 142°45' W., elev 5600'. SW¼ sec 18, T. 4 N., R. 15 E. From massive dark gray limestone."	D. H. Richter, 1960	?*Sochkineophyllum* sp.
23878–PC	68ARh–360	"Nabesna A–4 quad., lat 62°08.0' N., long 142°38.1' W., elev 6800'. NE¼ sec. 15, T. 4 N., R. 15 E. From massive gray	---do	?*Clisiophyllum* sp.

Locality descriptions for Permian corals in Alaska—Continued

USGS fossil colln. No.	USGS field loc. No.	Stratigraphic unit and location	Collector and year of collection	Identified corals
		WRANGELL MOUNTAINS—Continued		
		Nebesna area—Continued		
		recrystallized limestone."		
23879–PC	68ACk–14R	"Nabesna A–4 quad., lat 62°11.0′ N., long 142°45.6′ W., elev 6900′. SE¼ sec. 26, T. 5 N., R. 14 E. From massive recrystallized limestone."	D. H. Richter, 1960	*Clisiophyllum* sp.
23881–PC	68ARh–78	"Nabesna B–5 quad., lat 62°24.6′ N., long 143°02.5′ W., elev 3600′. SE¼ sec. 5, T. 7 N., R. 13 E. From thin-bedded gray and gray-green argillite."	---do	Polycoelid coral, indet.
23882–PC	68ARh–344	"Nabesna A–3 quad., lat 62°05.5′ N., long 142°26.7′ W., elev 6400′. NE¼ sec. 34, T. 4 N., R. 16 E. From massive dark limestone."	---do	*Timania* sp.
		Southeastern Alaska		
3700–PC		Information limited to "Keku Islet No. 1, northwest corner" and "* * * sandy beds below whitish cherty limestone" NE½SE¼ of 561."	A. E. Waters, Jr., and G. H. Girty, 1918.	*Calophyllum* sp. *Michelinia* sp.
5452–PC	2349	Information on original report limited to "* * * collections * * * near Klawak and on Kuiu Island * * *"	A. F. Buddington, 1924	*Timania* sp. ?*Clisiophyllum* sp.
23443–PC	63AMp–389	Halleck Formation(?); northeast shore Saginaw Bay, ¾ mile from southeast entrance to Halleck harbor, northern Kuiu Island, Port Alexander D–1 quad.; lat 56°54′13″ N., long 134°12′39″ W.	J. P. Muffler, 1963	*Timania* cf. *T. mosquensis* Dobrolyubova, 1937. *Michelinia* sp.
23442–PC	63AMp–354	Halleck Formation(?); northeast side of Saginaw Bay, 1.78 miles S. 26° E. from tip of islet, ½ mile south of abandoned cannery, Port Alexander D–1 quad. The coordinates originally given by the collectors (lat 56°31′31″ N., long 134°07′71″ W.) do not agree with the coordinates given for this locality in a later report by Muffler (1967).	---do	*Timania* cf. *T. mosquensis* Dobrolyubova, 1937.
18491–PC	59ALy38	Cannery Formation; massive graywacke in stream 2.0 miles from mouth of stream flowing into west end of Snug Cove, Gambier Bay, Admiralty Island; lat 57°24′ N., long 134°03′ W.	R. A. Loney, 1964	*Allotropiophyllum* sp.

REFERENCES CITED

Brabb, E. E., 1969, Six new Paleozoic and Mesozoic formations in east-central Alaska: U.S. Geol. Survey Bull. 1274–I, 26 p., 10 figs.

Brabb, E. E., and Churkin, Michael, Jr., 1969, Geologic map of the Charley River quadrangle, east-central Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I–573, scale 1:250,000.

Brabb, E. E., and Grant, R. E., 1971, Stratigraphy and paleontology of the revised type section for the Tahkandit Limestone (Permian) in east-central Alaska: U.S. Geol. Survey Prof. Paper 703, 26 p., 2 pls., 11 figs.

Campbell, R. H., 1967, Areal geology in the vicinity of the Chariot site, Lisburne Peninsula, northwestern Alaska: U.S. Geol. Survey Prof. Paper 395, 71 p.

Detterman, R. L., 1970, Sedimentary history of the Sadlerochit and Shublik Formations in northeastern Alaska, *in* Adkison, W. L., and Brosgé, M. M., eds., Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Am. Assoc. Petroleum Geologists, Pacific Sec., p. O1–O13.

Dutro, J. T., Jr., 1961, Correlation of the Arctic Permian, *in* Short papers in the geologic and hydrologic sciences: U.S. Geol. Survey Prof. Paper 424–C, p. C225–C228.

Hill, Dorothy, 1938, A monograph on the Carboniferous rugose corals of Scotland, Part 1: Palaeontographical Soc., v. 91, p. 1–78, 2 pls., 2 figs.

Moffit, F. H., 1954, Geology of the eastern part of the Alaska Range and adjacent area: U.S. Geol. Survey Bull. 989–D, p. 65–218.

Muffler, L. J. P., 1967, Stratigraphy of the Keku Islets and neighboring parts of Kuiu and Kupreanof Islands, southeastern Alaska: U.S. Geol. Survey Bull. 1241–C, 52 p. 15 figs.

Patton, W. W., Jr., 1957, A new upper Paleozoic formation, central Brooks Range, Alaska: U.S. Geol. Survey Prof. Paper 303–B, p. 40–45.

Patton, W. W., Jr., and Tailleur, I. L., 1964, Geology of the Killik-Itkillik region, Alaska: U.S. Geol. Survey Prof. Paper 303–G, p. 409–500, 2 pls., 26 figs.

Petocz, R. G., 1970, Biostratigraphy and lower Permian Fusulinidae of the upper Delta River area, east-central Alaska Range: Geol. Soc. America Spec. Paper 130, 94 p., 7 figs., 10 pls.

Rowett, C. L., 1969, Upper Paleozoic stratigraphy and corals from the east-central Alaska Range, Alaska: Arctic Inst. North America Tech. Paper 23, 120 p., 13 pls., 20 figs.

——— 1971, Reconnaissance biostratigraphy of the lower Permian in the Slana area, eastern Alaska Range, Alaska: Pacific Geology, v. 3, p. 31–44.

Tailleur, I. L., and Kent, B. H., 1951, Stratigraphy and structure of the southern foothills section between Etivluk and Kiligwa Rivers: U.S. Geol. Survey open-file report, 28 p.

Tailleur, I. L., and Sable, E. G., 1963, Nuka Formation of Late Mississippian to Late Permian age, new formation in northern Alaska: Am. Assoc. Petroleum Geologists Bull., v. 47, no. 4, p. 632–642.

Tailleur, I. L., Sable, E. G., and Dutro, J. T., Jr. 1958, Unusual upper Paleozoic rock sequence in northern Alaska [abs.]: Geol. Soc. America Bull., v. 69, no. 12, pt. 2, p. 1746–1747.

U.S. Geological Survey, 1970, Geological Survey research, 1970: U.S. Geol. Survey Prof. Paper 700–A, 426 p.

* U.S. GOVERNMENT PRINTING OFFICE: 1975 O—585–475/95

INDEX

[Italic page numbers indicate major references and descriptions]

PLATES 26-28

[Contact photographs of the plates in this report are available, at cost, from U.S. Geological Survey Library, Federal Center, Denver, Colorado 80225]

PLATE 26

[See p. 64–72 for locality descriptions]

FIGURES 1–11. Small solitary nondissepimented corals.

1. *Stereocorypha* Moore and Jeffords, 1945 (Metriophyllidae). Transverse section, ephebic stage (inked), × 2; Early Permian, Skolai Creek area, Wrangell Mountains. USGS colln. 22382–PC.
2. *Euryphyllum* Hill, 1927 (Hapsiphyllidae). Transverse section, ephebic stage (inked), × 2; Early Permian, Tiglukpuk Creek (type section of Siksikpuk Formation), central Brooks Range. USGS colln. 11814–PC.
3. *Ufimia* Stuckenberg, 1895 (Polycoeliidae). Transverse section, ephebic stage (inked), × 2; Early Permian, lower Kukpuk valley, Lisburne Peninsula. USGS colln. 20213–PC.
4. *Lophophyllidium* Grabau, 1928 (Lophophyllidiidae). Transverse section, ephebic stage (inked), × 2; Early Permian, south of Skolai Creek, western Wrangell Mountains. USGS colln. 22380–PC.
5. *Allotropiophyllum* Grabau, 1928 (Hapsiphyllidae). Transverse section, ephebic stage (inked), × 2; Early Permian, Tiglukpuk Creek, central Brooks Range. USGS colln. 11814–PC.

6–9. ?*Bradyphyllum* Grabau, 1928 (Hapsiphyllidae). Transverse sections of neanic through ephebic stages (inked), × 2; Early Permian, McCallum Creek sequence, southern Rainbow Mountain area, central Alaska Range. Rowett (1969) loc. MC–1.

10, 11. ?*Pseudobradyphyllum* Dobrolyubova, 1940 (Polycoeliidae). × 2; Early Permian, McCallum Creek sequence, southern Rainbow Mountain area, central Alaska Range. Rowett (1969) loc. MC–1.

10. Transverse section, early ephebic stage (inked).
11. Transverse section, ephebic stage (inked).

12–18. Large solitary dissepimented corals.

12–14. *Timania* Stuckenberg, 1895 (Cyathopsidae). × 1; Early Permian, McCallum Creek sequence.

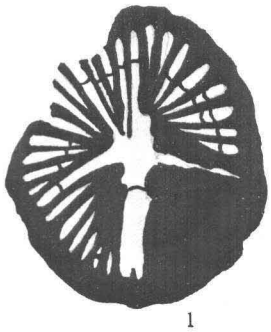
12. Transverse section, ephebic stage; McCallum Creek area. Rowett (1969) loc. VV–21a.

13, 14. Transverse and longitudinal sections, ephebic stage; Rainbow Mountain area. Rowett (1969) loc. MC–13.

15–18. *Bothrophyllum* Trautschold, 1879 (Cyathopsidae). Early Permian, McCallum Creek sequence, southern Rainbow Mountain area, central Alaska Range.

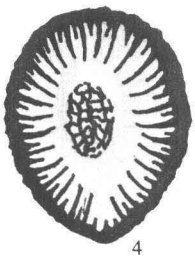
15, 16. Transverse sections of early ephebic and ephebic stages (inked), × 1. Rowett (1969) loc. MC–1.

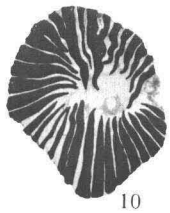
17, 18. Longitudinal (inked) and transverse sections, × 2. Rowett (1969) loc. MC–7.


1


2


3

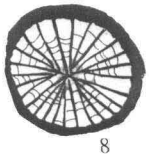

4

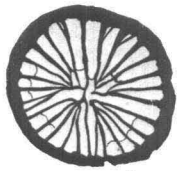

10


5

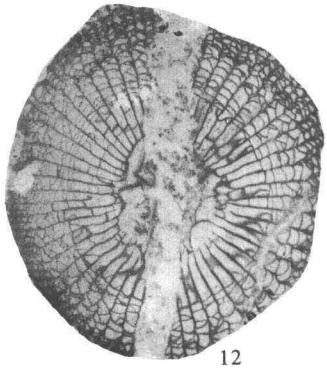

6

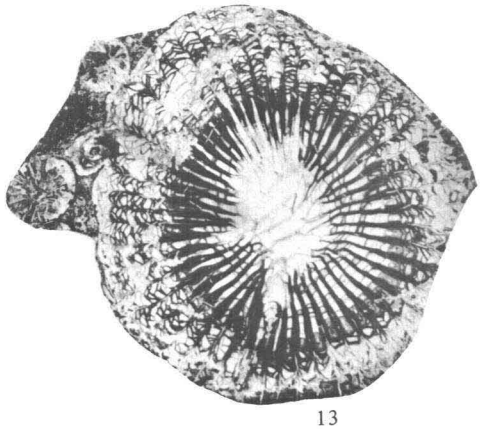

7

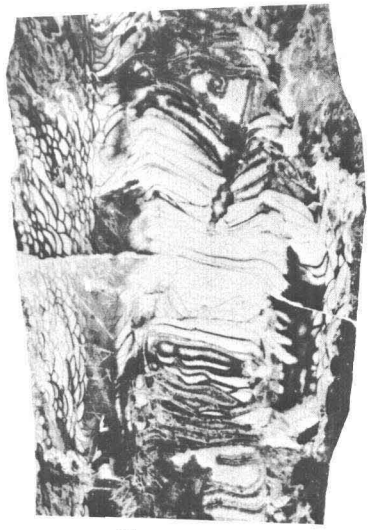

8

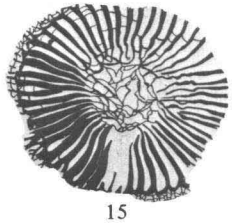

9

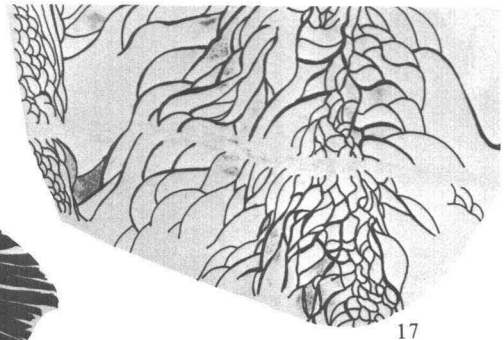

11

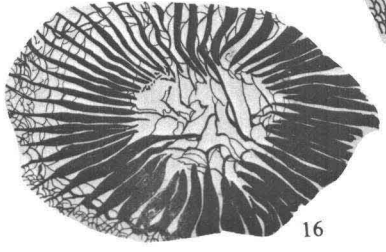

12

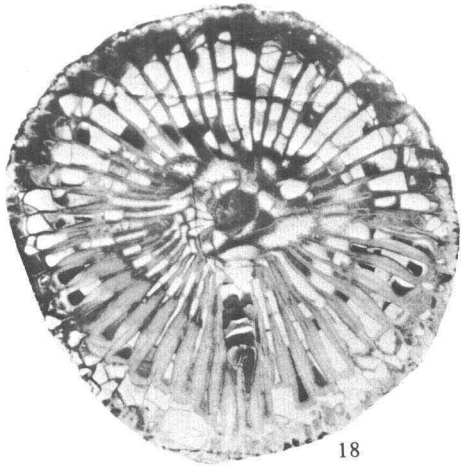

13


14


15


17


16


18

PERMIAN SOLITARY CORALS FROM ALASKA

PLATE 27

[See p. 64–72 for locality descriptions]

FIGURES 1–5. *Auloclisia* Lewis, 1927 (Aulophyllidae). × 2; Early Permian, McCallum Creek sequence, upper Delta River area. Rowett (1969) loc. DR–16.

1, 2. Transverse sections, ephebic stage.

3, 4. Transverse sections, early ephebic stage.

5. Longitudinal section.

6–9. *Clisiophyllum* Dana, 1846 (Aulophyllidae). × 2; Early Permian, McCallum Creek sequence, upper Delta River area, central Alaska Range. Rowett (1969) loc. DR–16.

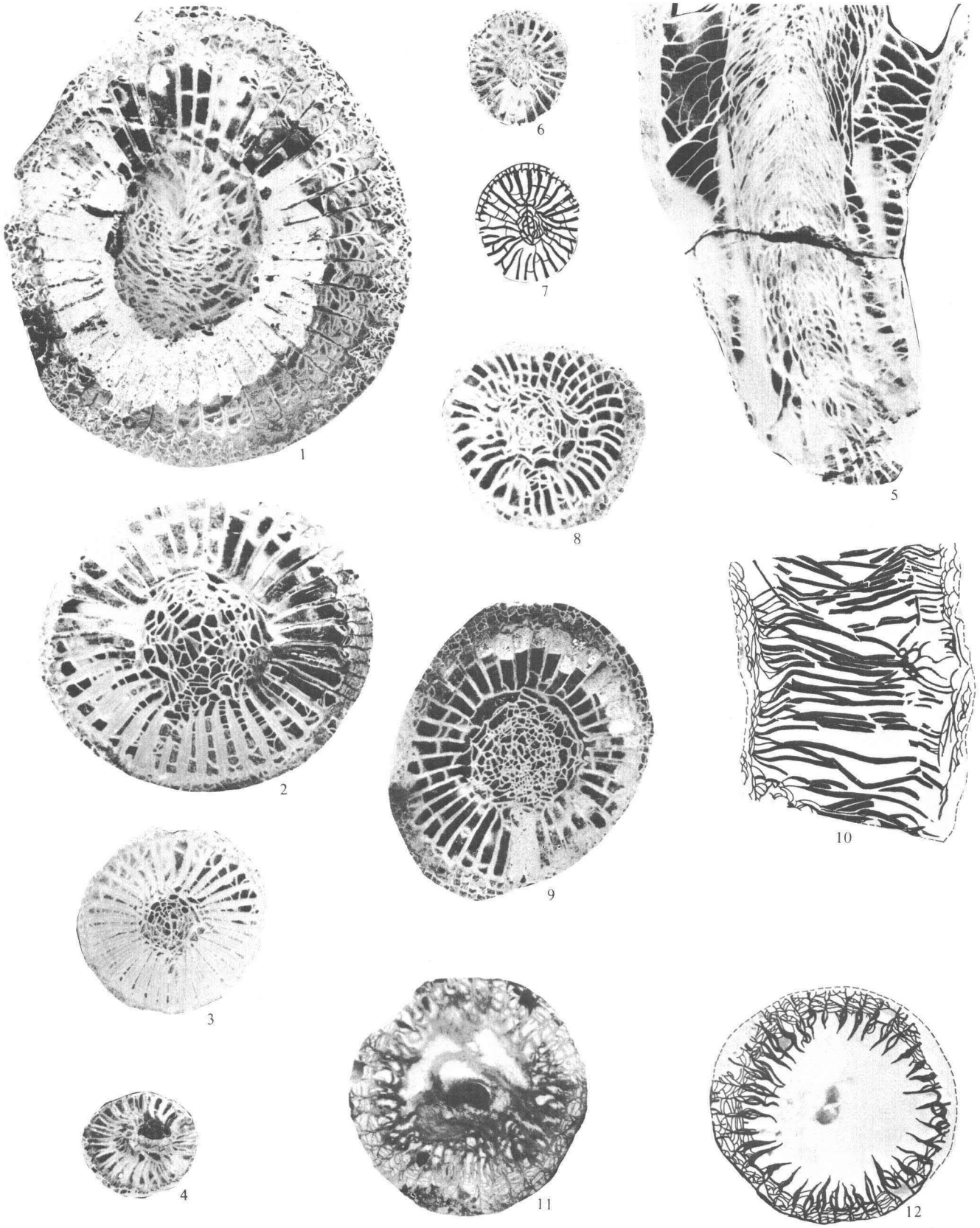
6, 7. Transverse section and inked duplicate print, early ephebic stage.

8, 9. Transverse sections, ephebic stage.

10–12. *Caninia* Michelin *in* Gervais, 1840 (Cyathopsidae). × 1; Early Permian, McCallum Crek sequence, upper Delta River area, central Alaska Range. Rowett (1969) loc. RC–17.

10. Longitudinal section (inked).

11, 12. Transverse section and inked duplicate print, ephebic stage.



LARGE SOLITARY DISSEPIMENTED CORALS FROM THE PERMIAN OF ALASKA

PLATE 28

[See p. 64–72 for locality descriptions]

FIGURES 1–12. Fasciculate colonial rugose corals.

1–5. *Durhamina* Wilson and Langenheim, 1962 (Durhaminidae). × 2.

1, 2. Transverse and longitudinal sections of *D. sutherlandi*, ephebic stage. Upper Delta River area. Rowett (1969) loc. DR–15.

3–5. Transverse and longitudinal sections and inked duplicate print of *D. alaskaensis*, ephebic stage. Early Permian, McCallum Creek sequence, McCallum Creek area, central Alaska Range. Rowett (1969) loc. VV–21b.

6–12. *Heritschiodes* Yabe, 1950 (Durhaminidae). × 2; Early Permian, McCallum Creek sequence, southern Rainbow Mountain area, central Alaska Range. Rowett (1969) loc. MC–6.

6, 7. Transverse section and inked duplicate print, ephebic stage.

8. Transverse section, early ephebic stage.

9, 10. Transverse section and inked duplicate, ephebic stage.

11. Transverse section, early ephebic stage.

12. Longitudinal section.

13–18. Tabulate corals.

13–15. *Syringopora* Goldfuss, 1826 (Auloporidae). × 5; Early Permian, McCallum Creek sequence, southern Rainbow Mountain area, central Alaska Range. Rowett (1969) loc. MC–5.

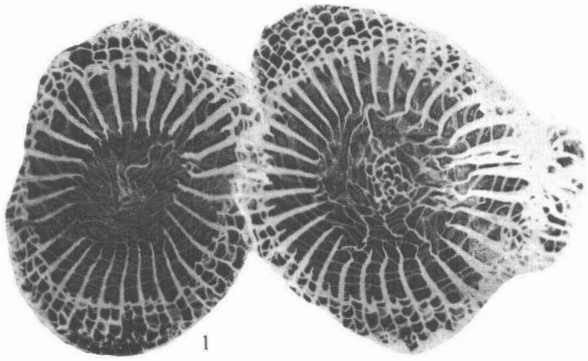
13. Transverse section of corallum, ephebic stages.

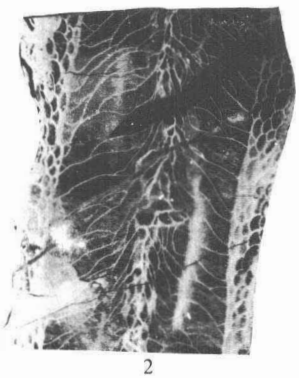
14, 15. Longitudinal section and inked duplicate print of corallite.

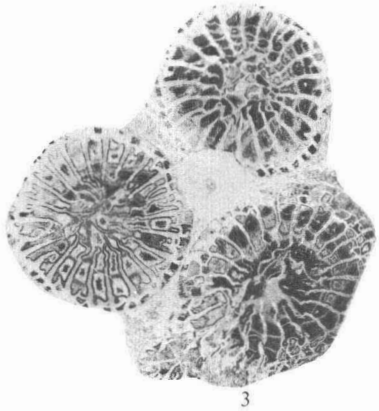
16–18. *Sinopora* Sokolov, 1955 (Sinoporidae). × 5; Early Permian, McCallum Creek sequence, McCallum Creek area, central Alaska Range. Rowett (1969) loc. VV–21b.

16. Transverse section of corallum.

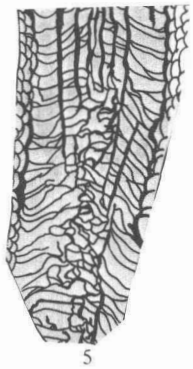
17, 18. Longitudinal section and inked duplicate print of single corallite.

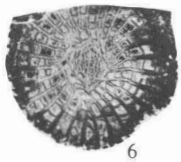

1

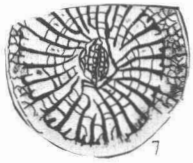

2

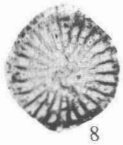

3

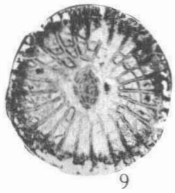

4

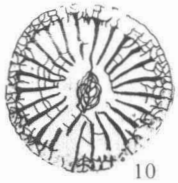

5


6


7

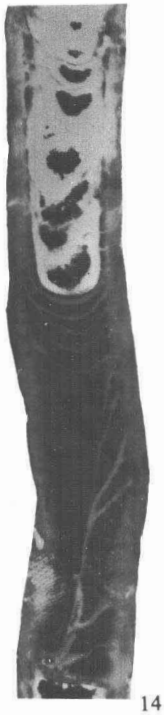

8

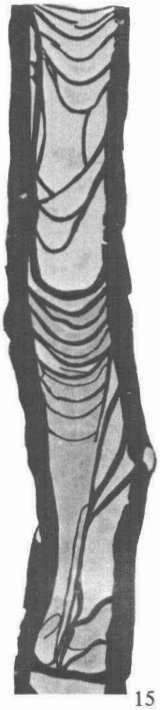

9

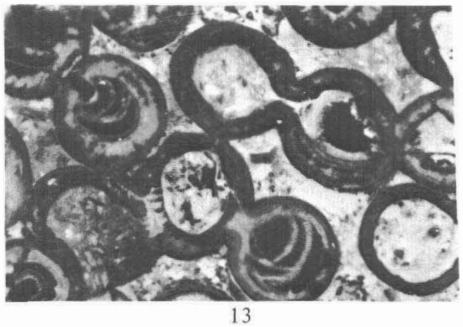

10

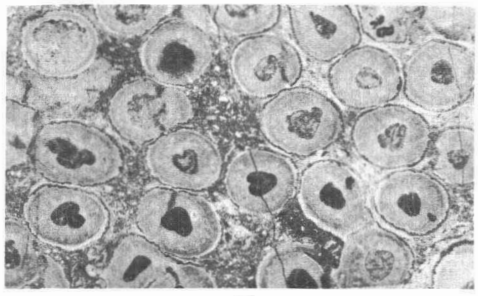

11


12


14


15


13


16


17


18

COLONIAL RUGOSE AND TABULATE CORALS FROM THE PERMIAN OF ALASKA