LOWER CAMBRIAN ARCHAEOCYATHA FROM THE YUKON TERRITORY

by

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ABSTRACT

Archaeocyatha from the Lower Cambrian of Wolf Lake and Quiet Lake areas in the Yukon Territory are described and illustrated. The fossils occur in carbonate rocks and are well preserved. Much of the necessary structural detail of the fossils is clearly observed in thin-sections and on polished surfaces of the specimens.

The collection contains twenty-three species, twelve of which are new species. The new species described are: Ajacicyathus yukonensis, Coscinocyathus multiporus, Coscinocyathus cassiariensis, Coscinocyathus inequivallus, Coscinocyathus serratus, Coscinocyathus veronicus, Coscinocyathus tubicornus, Carinacyathus perforatus, Pycnoidocyathus solidus, Loculicyathus ellipticus, Metacoscinus poolensis, and Claruscyathus ketzaensis.

The genera Carinacyathus and Loculicyathus are reported for the first time in North America.

The Yukon fauna is dominated by Coscinocyathidae and Pycnoidocyathidae, showing close relationship to faunae in the Cordilleran region of British Columbia. It also shows relationship to Siberian and Australian faunae. This fauna is very different from the archaeocyathid

assemblages in Nevada and California, where the dominant forms are Ethmophyllidae and Ajacicyathidae.

Archaeocyatha have been instrumental in determining the age of rocks underlying a large area of the Yukon Territory.

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Mr. J. McGraw assisted in the photography of polished sections.

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INTRODUCTION

This thesis is based on a study of Lower Cambrian Archaeocyatha collected by A. Aho and W. Padgham of the British Yukon Exploration Company, and by W.H. Poole of the Geological Survey of Canada in the Yukon Territory. Through the courtesy of Aho and of the Geological Survey of Canada, these collections were made available for study. Another collection from the same area, kindly presented by H. Trettin, was examined but not studied in detail. About twenty-four specimens were in Aho's and Padgham's collection and over fifty in the collection made by Poole. The fossils, which occur in dark, fine-grained carbonate rocks, were, for the most part, well preserved and relatively large. Their study was thus made easier.

The present work consists mainly of detailed descriptions and identifications of the specimens. The ever

perplexing problems on the causes of the explosive, world wide distribution and the sudden disappearance of Archaeocyatha in Cambrian time, and the studies of ecology, ontogeny, or physiology are not discussed here. These problems have been dealt with elsewhere by Hinde, Taylor, Vologdin, the Bedfords, Simon, Okulitch, and other leading palaeontologists. No attempt is made in this thesis to discuss the pros and cons of their theories and hypotheses. The general, basic characteristics of Archaeocyatha are given in the first chapter of this thesis. In the second chapter the methods and criteria used in classifying the archaeocyathids are discussed. Also, the fossil localities and the geology of the area are described briefly. The greater part of the thesis, as stated earlier, concerns the systematic description of the archaeocyathids from the Yukon. In Chapter III, twenty-three species, of which twelve are new, are described. From the investigation of these fossils, conclusions are drawn in the final chapter.

Originally, it was hoped, by the study of these fossils, to establish faunal zones of the Lower Cambrian. This was found to be impossible because no data on the detailed stratigraphy were available and because the fossils were not collected in a systematic manner. With detailed stratigraphic work in conjunction with systematic collections

of fossils, it may be possible to set up archaeocyathid faunal zones. This zoning, if it can be established, will be invaluable in resolving some of the above mentioned problems, such as phylogeny, of Archaeocyatha.

This small contribution to the palaeontological studies of Archaeocyatha, it is hoped, will be of value in further studies.

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CHAPTER I

GENERAL CHARACTERISTICS OF THE ARCHAEOCYATHA

Introduction

Archaeocyathids, now classified as an independent phylum Archaeocyatha, in the Sub-Kingdom Parazoa, were exclusively Cambrian marine organisms with world wide distribution (Figure 1). They inhabited every Cambrian sea in large numbers and in extremely diverse forms indicative of an explosive evolution. They lived a sessile, benthonic life on calcareous bottoms, forming in some localities almost reef-like structures.

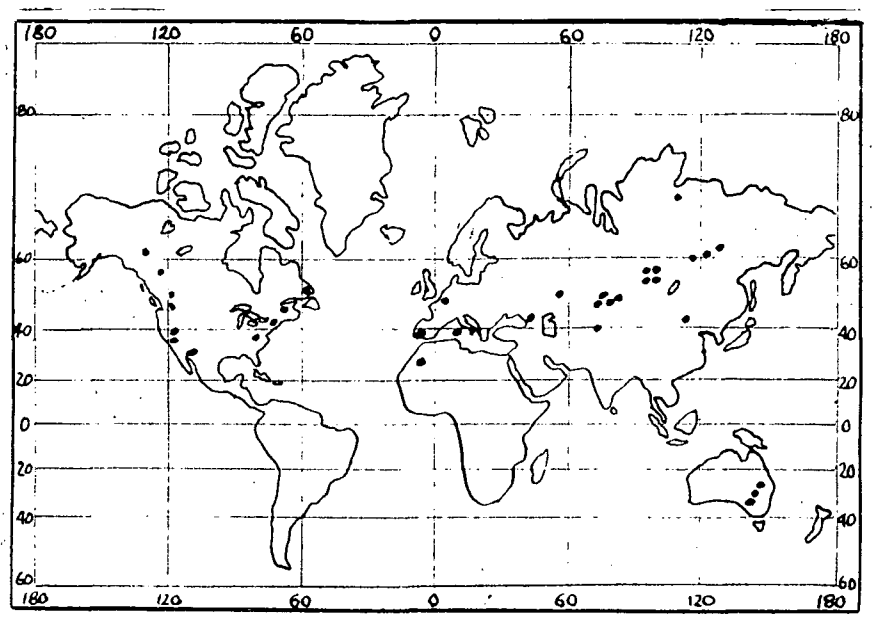


Figure 1. Outline Map Showing World Wide Distribution of Archaeocyatha

It seems indisputable that archaeocyathids lived in great numbers in shallow, relatively clear water zones parallel to the coastlines of the Cambrian seas.

However, the extraordinary and robust development of this phylum was short-lived. Archaeocyathids apparently could not tolerate muddy-water conditions nor defend themselves against the encroachment of the algae. In North America and Australia, archaeocyathids became extinct,

leaving no recognizable descendants at the close of the Lower Cambrian. In Eurasia, Archaeocyatha may have continued to the end of Middle Cambrian, but recent Russian reports by Zhuravleva seem to indicate their extinction at the close of the Lower Cambrian. Archaeocyatha made a sudden, catastrophic disappearance.

Morphology

The delicate and fragile skeletons of Archaeocyatha are composed of calcium carbonate but some, like the Australian specimens, are silicified. Size and shape of skeletons are extremely variable. The shape of the skeletons varies from regular conical and cylindrical cups to flat, expanding saucer-shaped forms. In cross-section, cups are quite often elliptical while others are crenulated. Although great diversity in form exists, the most typical skeletons are goblet- or vase-shaped.

In size, skeletons may range from a few millimeters to over 50 centimeters in diameter in the flat expanding types, but the majority are less than 30 millimeters in diameter. Usually, only short fragments are collected but Archaeocyatha may grow considerably in length. Specimens of two or three feet in length with diameters of four inches have been reported by Billings.

The more common, simpler type of Archaeocyatha skeletons consists of an outer cup or cone and an inner cup so that the skeleton is double walled (Figure 2). The inner wall is generally concentric with the outer wall, but it may be incomplete towards the apex or spitz area of the cone. The space between the walls, called the

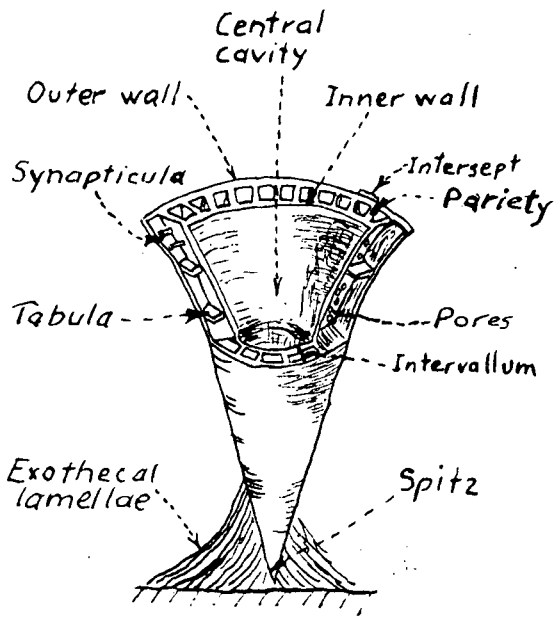


Figure 2. Diagrammatic Sketch of a Typical Archaeocyathid Showing the Major Skeletal Elements

intervallum, is occupied by several different structural elements which support the inner wall some distance away from the outer wall and also subdivide the space into compartments. These supports may be in the form of straight, vertical, radial plates called parieties; curved, irregular and anastomosing parieties or taeniae; and horizontal or arched tabular plates called tabulae. These elements may be further complicated and strengthened by dissepiments, synapticulae, cellular or tubular structures, and vesicular tissues. In nearly all cases, these structural elements and walls are perforated by numerous pores and canal-like channels.

The inner wall encloses the central cavity which is present in most genera. The central cavity, completely open upwards, was in all probability free of living tissue though lined by it. In some genera, however, the lower parts of the cavity is occupied by irregular vesicular tissues. Minor structures may occasionally project a short distance from the inner wall into the central cavity region.

On some specimens of Archaeocyatha are preserved exothecal lamellae, which are irregular masses of tissue, filaments, or fibers attached to the outer side of the skeletal cup. The exact nature and function of these extraneous, cancer-like growths are not fully understood, but they may have, in part, served as hold-fast or anchoring

devices and as protection for the cup.

Affinities

Archaeocyathid affinities have been a controversial subject ever since Billings described and named the first Archaeocyatha. They have been classed with sponges, corals, protozoans, and calcareous algae. In 1889, Hinde, reviewing all archaeocyathids known at that time, disproved their affinities with the protozoans (Foraminifera). Later, Taylor (1910) made his memorable contribution to the knowledge of Archaeocyatha by pointing out the absence of relationship between them and algae. In subsequent years, Archaeocyatha were classified with either corals or sponges until Okulitch (1935) showed that Archaeocyatha do not belong with corals but are a separate class of the phylum Porifera. Recently, a critical reviewwas made by Okulitch and De Laubenfels (1953) as to the validity of this separate class. Because they found that it was impossible to place the Archaeocyatha either with the phylum Porifera or with any other defined major group of organisms, they erected a new phylum called Archaeocyatha.

Because archaeocyathids are still mistaken at times for sponges or solitary corals, their main similarities and

differences will be briefly discussed here. At a casual glance, archaeocyathids greatly resemble corals and sponges, especially in superficial features. The general conical form and symmetrically arranged radial parieties of Archaeocyatha are strikingly similar in appearance to the structure of solitary corals, while the form, central cavity, canal system, and perforated skeleton are reminiscent of some present-day sponges. However, dissimilarities of Archaeocyatha from sponges and corals greatly outweigh these superficial resemblances. Okulitch (1955a) has listed the essential differences as follows:

Dissimilarities from Corals

(1) presence of porous inner wall;
(2) soft parts probably confined to intervallum and possibly a lining on outer and inner walls, very unlike anthozoan polyps;
(3) lack of regularity in plan of the parieties, which may be increased or reduced in haphazard manner;
(4) structure of parieties, indicating lack of homology with septa of corals;
(5) absence of parieties in all nepionic skeletons (spitzes) and in some adult individuals;
(6) nearly constant width of the intervallum;
(7) perforated nature of tabulae in contrast to imperforated tabulae of corals;
(8) wide dissimilarity in form of many archeaocyathids from corals; and
(9) geologic antiquity of archaeocyathids and separation from oldest known corals by a great time span.

Dissimilarities from Sponges

(1) sponges invariably lack parieties and none have laminar outer and inner walls such as are possessed by archaeocyathids;

(2) although a few fossil sponges seem to have stiffened cloacal walls, these probably represent post-mortem alteration;
(3) although some sponges possess a cortex, this consists of spicules which do not form a wall;
(4) the granular-lamellar skeleton of archaeocyathids differs greatly from the spicular skeleton of sponges both in mode of development and general structure;
(5) the Archaeocyatha are confined to Cambrian rocks, whereas the oldest known calcareous sponges occur in the Devonian; and
(6) in archaeocyathids an initially imperforate spitz gives rise to perforated walls in which increasing size of pores may leave only slender rods between them, but the sponge skeleton is built up from somewhat widely separated needle-like spicules in early ontogeny to a more or less compact structure of crowded spicules in mature growth.

With careful observation, these differences between archaeocyathids and sponges or corals can easily be detected.

Classification

Classifications of archaeocyathids have been proposed by Walcott (1886), Taylor (1910), Okulitch (1935, 1943), Vologdin (1937, 1940), Bedford and Bedford (1939), and Simon (1939). The earlier proposed classifications are now disregarded. The classification adopted by Okulitch, Vologdin, and the Bedfords are basically similar. The latest classification of archaeocyathids has been proposed by

Okulitch (1955a), which is a modified version of his earlier (1943) work.

In this thesis, the classification proposed by Okulitch (1955a) was strictly adhered to in order to avoid confusing the already overloaded nomenclature with invalid genus names. He has divided Phylum Archaeocyatha into three classes - Monocyathea, Archaeocyathea, and Anthocyathea - and has made systematic descriptions of all known genera of the classes. He has also given after each genus, its homonyms, synonyms, and type species with its author and date of first publication.

CHAPTER II

METHODS OF STUDY AND FOSSIL LOCALITIES

Introduction

Fossils of the two collections studied for this thesis came from a number of localities in the Yukon Territory. One collection was made by A. Aho and W. Padgham, and the other by W.H.Poole. Archaeocyatha occur mainly in dark carbonate rocks which are fine-grained, massive to oolitic in texture. Some specimens are partially and a few completely weathered out from the lime matrix. On the whole, the fossils are well preserved, with a few replaced by calcite and a few fragmental because of the slaty nature of some limestone.

Because the recognition of the different genera and species depends on the details of the skeleton, thin-sections and polished sections were made. Transverse and longitudinal sections were cut of each specimen, and oblique sections were cut in some. The acid etching technique, which can be applied to silicified specimens, could not be used for these specimens because of their calcareous nature.

The Aho and Padgham Collection

In the summer of 1955, Aho and Padgham discovered Lower Cambrian fossils while doing detailed mapping of the Kay Group mining claims for the British Yukon Exploration Company. The claims straddle the ridge which separates the head waters of White Creek and Ketza River in the Pelly Mountains in the Quiet Lake Area (Department of Mines and Technical Surveys, National Topographic Series, Map Sheet 105F), Whitehorse Mining District, Yukon Territory. This area is easily accessible from two lakes on which planes can land: (a) Bruce Lake, from which thirty miles of good trail leads up Ketza River, and (b) Grayling Lake, from which it is a fifteen mile hike up White Creek. The area can also be reached in two days by horse from the Canol Road, which runs in a north-south direction about thirty miles to the east.

The exact fossil locality (latitude $61^{\circ}31'$; longitude $132^{\circ}15'$) is approximately 1000 feet northwest from the northwest corner of the Kay No. 31 claim and on the trail leading to the Conwest camp which is eight miles northerly from this area. The locality is marked on a map accompanying Aho's (1955) report, "Geologic Report on the Kay Group of Claims and Upper White Creek, Ketza River Area, Yukon Territory", which was submitted to the Department of Mines as assessment work.

Rocks of the Kay Group of claims and adjacent upper White Creek area, as reported by Aho, consist chiefly of marine sediments which have been folded, faulted, and weakly metamorphosed. Phyllite, limestone, dolomite, and quartzite are the main rock types. The Lower Cambrian rocks of limestone and phyllite are exposed along a N 70° W anticlinal fold. The following stratigraphic sequence of the area, in descending order, is reported by Aho:

Apparent Stratigraphic Section at Upper White Creek	Thickness
White, brown, and gray massive pyritic quartzite, minor greenish gray chert, limestone and phyllite with ankerite (?) impure quartzite and gradations to limy schists and minor green phyllite forming the bottom of this section.	Several hundred feet
Black phyllite or slate (may contain local slaty limestones)	100 feet
Massive to thin bedded, buff weathering dolomite with local chert nodules and thin ribbon chert beds.	100 to 200 feet
Thin bedded slaty limestone and oolitic limestone. Locally absent.	50 feet ?
Brown phyllite (locally limy) grading downward to gray and black phyllite.	500 feet
Blue-gray, massive fossiliferous Lower Cambrian limestone (locally overlain by 50 feet of brown phyllite).	150 to 200 feet
Several beds of slaty or shaly limestone alternating with grayish brown phyllite and grading downward into gray phyllite at least several hundred feet thick with minor limy and sandy beds.	500 feet

Aho states that the section holds for this locality, but does not preclude some degree of thickening by thrusting or isoclinal drag folding, especially in the incompetent phyllite members. More regional geology of the area is not known at the present time.

The Geological Survey of Canada Collection

During the field seasons of 1951 to 1954 inclusive, W.H.Poole of the Geological Survey of Canada mapped the Wolf Lake Area, Yukon Territory (Department of Mines and Technical Surveys, Sheet 105B; Geological Survey of Canada Preliminary Map 55-21). With the construction of the Alaska Highway, this area is now readily accessible. Areas remote from the highway can be reached by suitably equipped aircraft, which can land on any one of the numerous lakes. Pack horses can be used to great advantage anywhere in the area.

In the course of his field work, Poole collected a number of Lower Cambrian fossils from different localities, which are marked on the Preliminary Map 55-21 of the Wolf Lake Area. Fossils studied for this thesis came from the following places:

(a) Geological Survey of Canada collection nos. 24035, 24040, and 24041; at latitude 69°03', longitude 130°21'; 3.0 miles S 30° E from Veronica Lake near milepost 702 Alaska Highway. Fossils were collected from Lord's Group C sediments, and

(b) Geological Survey of Canada collection no. 24036; at latitude 60°12'30", longitude 131°11'30"; 1.0 mile due northeast from northeast end of Crescent Lake. Fossils were collected from Lord's Group B sediments.

Detailed stratigraphy of the fossil localities is not immediately available, but Poole reports that the fossils occur in carbonate rocks of Lord's (1944) Group B and Group C sediments. Lord, doing earlier geological reconnaissance work in this area for the Geological Survey of Canada, devised a table of formation shown in Table 1.

Era	Period	Lithology
Cenozoic	Tertiary ?	Basalt
Mesozoic	Jurassic or later	Granite, granodiorite, and allied rocks; undifferentiated schist and gneiss
		Peridotite and dunite; serpentine
	Jurassic (?)	Group D: tuff, andesite, agglomerate, argillite, and schist
Palaeozoic	Carboniferous (?)	Group C: limestone, dolomite, argillite, slate, phyllite, quartzite, and schist
Palaeozoic (?)		Group B: argillite, slate, phyllite, chert, quartzite, arkose, conglomerate, and limestone
Palaeozoic and/or Pre-Cambrian		Group A: gneiss, schist, limestone, dolomite, quartzite, and greenstone

Table 1. Table of Formations

Lord (1944) states that the age of the highly altered and metamorphosed strata of Group C is unknown, as no fossils were found in them. He reports that rocks in Group B contain fossils suggestive of crinoid stems, and therefore considered to be Palaeozoic (?) in age. In Group C were found fossils identified as Lophophyllum ? cascadenses Warren ? and Hapsiphyllum cacareforme (Hall) ? and a cup coral too poorly preserved to be identified. On palaeontological evidence, Lord suggests Group C belongs to the Carboniferous (?) period. It is reported by him that Group B and Group C differ lithologically, but their relative age relationship is unknown because they are separated by the Cassiar Batholith.

Preparation and Study of Fossils

Most of the specimens were individual fragments, but a number which were imbedded in limestone blocks were cut out with a diamond saw. Transverse and longitudinal thin-sections, usually taken from the upper part, were made for all specimens except the highly fragmental ones. Polished sections were made from all specimens. The specimens were first cut with the saw, then ground smooth on a steel lap with carborundum as the abrasive, and finally polished on a cloth-covered lap.

Dimensions of the specimens were carefully measured, especially the total diameter, diameter of the central cavity, and the width of the intervallum. The number of parieties (when regular) at the measured diameter were counted and the perforation arrangements of the skeleton were determined from examinations of thin-sections. The intervallum coefficient, that is, the ratio of the width of the intervallum in millimeters to the diameter of the central cavity in millimeters, and the parietal coefficient - the ratio of number of parieties to the diameter at which the parieties were counted - were calculated. These coefficients, along with the nature of the inner and outer walls and the intervallum, were the main criteria used to classify the specimens. It must be noted that the coefficients may be of doubtful value in rapidly expanding, irregular cups, in which case, the general appearance becomes an important factor.

Photographs of polished sections and naturally weathered out specimens were taken to illustrate and supplement the written descriptions. Thin-sections were used as negatives and pictures were printed directly from them.

CHAPTER III

SYSTEMATIC DESCRIPTIONS OF ARCHAEOCYATHA FROM THE YUKON

Faunal List

PHYLUM ARCHAEOCYATHA

CLASS ARCHAEOCYATHEA

ORDER AJACICYATHIDA

Family Ajacicyathidae

Ajacicyathus purcellensis Okulitch
Ajacicyathus yukonensis n. sp.

Family Ethmophyllidae

Ethmocoscinus sp.

Family Coscinocyathidae

Coscinocyathus dentocanis Okulitch
Coscinocyathus multiporus n. sp.
Coscinocyathus cassiariensis n. sp.
Coscinocyathus inequivallus n. sp.
Coscinocyathus serratus n. sp.
Coscinocyathus veronicus n. sp.
Coscinocyathus tubicornus n. sp.
Coscinocyathus sp.
Carinacyathus perforatus n. sp.

ORDER METACYATHIDA

Family Archaeocyathidae

Archaeocyathus cf. *atlanticus* Billings
Archaeocyathus (?) sp.

Family Pycnoidocyathidae

Pycnoidocyathus amourensis (Okulitch)
Pycnoidocyathus columbianus (Okulitch)
Pycnoidocyathus cf. occidentalis (Okulitch)
Pcynoidocyathus cf. dissepimentalis (Okulitch)
Pycnoidocyathus solidus n. sp.
Loculicyathus ellipticus n. sp.

Family Metacoscinidae

Metacoscinus poolensis n. sp.
Metacoscinus sp.
Claruscyathus ketzaensis n. sp.

The above list includes archaeocyathids of both collections. In the following description of species, fossils collected by Aho and Padgham are designated by letters "AP" and the specimen number. Fossils from the Geological Survey of Canada collection are marked with the letter "Y" preceded by a two digit number and followed by the specimen number, for example, 35-Y-1. The first number is taken from the last two digits of the Geological Survey of Canada collection number, 24035, and 1 is the specimen number of that collection.

Description of Species

Order AJACICYATHIDA Bedford and Bedford, 1939

Family Ajacicyathidae Bedford and Bedford, 1939

Ajacicyathus purcellensis Okulitch

Plate I ; Fig. 1

Ajacicyathus purcellensis Okulitch, 1947

Description

General Shape and Size

This is a common species found in the Lower Cambrian formations of the northern Cordilleran region. The specimens from the Wolf Lake Area, Yukon are short fragments of a form originally gently tapered and conical with a naturally elliptical cross-section. The following are the average dimensions taken from four specimens:

Diameter	25 mm.
Diameter of central cavity	16 mm.
Width of intervallum	6 mm.
Number of parieties	73
Intervallum coefficient	0.38
Parietal coefficient	2.92

Outer Wall

The outer wall is thin, simple, and perforated by numerous fine pores, about 3 or 4 per intersept.

Intervallum

The medium wide intervallum is crossed by a moderate number of straight, radiating parieties. Parieties, spaced about 1 mm. apart, are thin, simple, and perforated by a number of small pores.

Inner Wall

The inner wall appears simple and perforated by pores, about 2 to 3 per intersept. In all specimens examined,

the inner wall and parts of the intervallum are replaced by calcite. Thus much of the pore arrangements are obliterated.

Collection

Geological Survey of Canada, collection no. 24035

Specimen nos. 35-Y-5, 6, 7 and 8.

Collected by W.H. Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

The specimens of Ajacicyathus purcellensis Okulitch from the Yukon are almost identical in characteristics to those found in the Donald formation of the Dogtooth Mountains and in the Upper Wolverine complex of Aiken Lake Area. No addition or amendments can be made to the original description.

Ajacicyathus yukonensis n. sp.

Plate I ; Fig. 2

Description

General Shape and Size

Description of this species is based on a single specimen from which a transverse thin-section was prepared, and appears on the same glass slide as Cosinocyathus multiporus n. sp. It is a relatively small conical form which is slightly elliptical in transverse section.

Diameter	7-9 mm.
Diameter of central cavity	3.2 mm.
Width of intervallum	2-2½ mm.
Number of parieties	17
Intervallum coefficient	0.71
Parietal coefficient	2.21

Outer Wall

The outer wall is thin, simple, and perforated by numerous small pores, up to six per intersept. The closely spaced fine pores give the wall, in cross-section, a minute "ripply" chain-like appearance. Stirrup pores are located along the intersection of the parieties with the outer wall.

Intervallum

The intervallum is relatively wide and crossed by seventeen straight, radiating parieties of which two are short, incomplete, and interstitial. The parieties appear to be imperforated, but may have pores near the inner wall. Thickening of the parieties occurs where they join the outer wall and also slight thickening occurs at the inner wall.

Inner Wall

The inner wall is thickened and perforated by pores in a vertical series of about three per millimeter. Stirrup pores appear to be present.

Collection

Geological Survey of Canada; collection no. 24035.

Holotype is specimen 35-Y-13 I.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments), Wolf Lake Area, Yukon.

Discussion

The widely spaced, almost imperforated parieties and the pore arrangements of the walls resemble Archaeocyathellus, but the lack of distinct flutings or furrows of the outer wall opposite the parieties and the larger size undoubtedly place this specimen with Ajacicyathus. The wide intervallum region and low parietal coefficient of this species are unlike any known Ajacicyathus except possibly for the larger Ajacicyathus khemtschikensis (Vologdin), but they differ in the form of the loculi. The low parietal coefficient of Ajacicyathus yukonensis n. sp. may not be of specific importance because recent investigations made by Zhuravleva (1955) on the growth stages of Ajacicyathus khemtschikensis (Vologdin) have revealed that at small diameters, this species has a very high parietal coefficient, but as the diameter increases, the parietal coefficient decreases accordingly. At a diameter of 2.0 mm. the parietal coefficient was found to be 5.5, at 4.5 mm., 4.0, and at 5.0 mm., diameter at maturity, the parietal coefficient was 3.0. From this she concludes that the coefficient becomes constant only when the organism has reached maturity; therefore, it is not a reliable criterion to use in identifying this species in the adolescent stages. This statement is

worth noting because it may be applicable to other species but was not studied on Ajacicyathus yukonensis n. sp. The pore patterns and the appearance of the intervallum of the latter are sufficiently distinct from other species to justify the new species.

Family Ethmophyllidae Okulitch, 1943

Ethmocoscinus (?) sp.

Plate I ; Fig. 3

Description

General Shape and Size

A single, subcylindrical fossil fragment with an elliptical cross-section is noted in this collection. It is about 45 mm. long with the lower portion missing.

Diameter	19-22 mm.
Diameter of central cavity	4 mm.
Width of intervallum	8-8½ mm.
Number of parieties	35
Spacing of tabulae	1-6 mm.
Intervallum coefficient	2-2¼
Parietal coefficient	1.7

Outer Wall

The outer wall of this specimen is relatively thick and perforated by large pores, about 1 or 2 per intersept.

Intervallum

The very wide intervallum region is crossed by irregular parieties which are perforated by large pores and thickened near the inner wall. The intervallum is further occupied by porous tabulae spaced at irregular intervals.

Inner Wall

The Ethmophyllum-type inner wall is the most characteristic feature of this specimen. The inner wall is wide and perforated by very coarse oblique canals. In transverse section, these oblique canals appear as 3 or 4 rows of vesicular tubes lining the inner wall.

Collection

Department of Geology, University of British Columbia; specimen no. AP 7.

Collected by Aho and Padgham, 1955.

Horizon and Locality

Lower Cambrian limestones; Pelly Mountains, Quiet Lake Area, Yukon.

Discussion

This specimen is tentatively placed in the genus Ethmocoscinus because of the nature of the inner wall and the presence of tabulae in the intervallum. The very wide intervallum and the much thickened, complicated vesicular inner wall may warrant erection of a new genus, at least a new species, but until more specimens can be studied to show that these characteristics are distinct and consistent, such a conclusion would be premature.

Family Coscinocyathidae Taylor, 1910

Coscinocyathus dentocanis Okulitch

Plate I ; Figs. 4, 5 and 6

Coscinocyathus dentocanis Okulitch, 1943

Description

This species is very common in the northern Cordilleran province of North America and was first discovered in the Dogtooth Range of Purcell Mountains, British Columbia. The original description of the species by Okulitch is as follows:

> The specimen is a naturally weathered out longitudinal section in light-grey limestone.
> General Shape: Tubular, with very slight taper. Reconstructed diameter must have been about 22 mm., and height about 60 or 70 mm., of which 50 mm. is visible. Width of intervallum is 5 mm. where diameter of central cavity is 12 mm., giving an intervallum coefficient of 5 mm. : 12 mm.
> Outer Wall: Probably thin and simple.
> Intervallum: Intervallum is crossed by radial vertical parieties and slightly convex upward tabulae. Resultant rectangular cells or loculi are about twice as high as wide; 14 parieties occur in space of 1 cm., giving parietal coefficient of about 4.5; tabulae are about 1.5 mm. apart.
> Inner Wall: Inner wall is apparently smooth and simple, without any structures projecting into central cavity.

The specimens of this collection agree closely in specifications to that of the original except that the parieties may be slightly thicker and fewer in number at a

given diameter. The following measurements are the average taken from the present collection:

Diameter	21-31 mm.
Diameter of central cavity . . .	11-19 mm.
Width of intervallum	5-7 mm.
Number of parieties	90
Spacing of tabulae	1½ mm.
Intervallum coefficient	0.4
Parietal coefficient	3.46

The only addition which can be made to the original description is that Coscinocyathus dentocanis Okulitch appears to be generally elliptical in cross-section.

The small differences in parietal coefficient are not considered to be of specific importance.

Collection

Geological Survey of Canada; collection nos. 24040 and 24041; specimen nos. 40-Y-4 and 61-Y-1, and 41-Y-1.

Collected by W.H. Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Coscinocyathus multiporus n. sp.

Plate I ; Figs. 7, 8 and 9

Description

General Shape and Size

This species is based on a single large specimen which was 118 mm. long before it was cut. The specimen is partially weathered away, thus exposing a longitudinal

section which shows numerous tabulae crossing the intervallum. The fossil is shaped like a large tapering cone. Dimensions, taken 35 mm. down from the larger end, are only approximate estimations because of the incomplete nature of the cup due to weathering.

Diameter	38 mm.
Diameter of central cavity	16 mm.
Width of intervallum	10 mm.
Number of parieties	100
Spacing of tabulae	1-2 mm.
Intervallum coefficient	0.63
Parietal coefficient	2.63

Outer Wall

The outer wall appears to be thin, simple, and perforated by numerous pores, about 2 to 4 per intersept.

Intervallum

The intervallum of the upper portion of the specimen is relatively wide with an intervallum coefficient of 0.63, but in the lower regions, the intervallum becomes extremely wide with its ratio to the central cavity equal to 7:4 or 1.75. It is crossed by very porous parieties and tabulae. The parieties, many of which are the short, interstitial type growing in from the outer wall, are thin, straight, radiating, and perforated by extremely fine pores closely spaced. In a random cross-section of a pariety, 22 or more may be present. Tabulae, also perforated by a great number of fine pores which produce a sieve-like appearance, are essentially horizontal and regularily spaced about 1 to 2 mm. apart.

Inner Wall

A slightly oblique, longitudinal thin section reveals clearly, the pore pattern of the inner wall. Large, oblate, oval-shaped pores, which are as wide as the intersept and occur, arranged in a vertical series, 3 to 4 in number within the spacing of two tabulae, perforate the inner wall. The area of the void is, therefore, much greater than the area of the solid.

Collection

Geological Survey of Canada; collection no. 24035.

Holotype is marked 35-Y-13II

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

The exceedingly numerous fine pores of the parieties and tabulae, and the large pores of the inner wall are unlike the porous nature of any previously described species. Because the spitz of this specimen is missing, its nature is not known, but the smallest end present shows a very narrow central cavity and a wide intervallum crossed by very thick and bifurcated parieties.

Coscinocyathus cassiariesis n. sp.

Plate I ; Figs. 10, 11, 12 and 13

Description

General Shape and Size

These specimens, approximately 40 to 50 mm. in length, are not complete archaeocyathids but are long, tubular shaped fragments. They are elliptical in cross-section. Specimen no. 35-Y-7 is taken as the holotype with dimensions as follows:

Diameter	15-20½ mm.
Diameter of central cavity . . .	9-13 mm.
Width of intervallum	4 mm.
Number of parieties	75
Spacing of tabulae	2 mm. or more
Intervallum coefficient	0.36
Parietal coefficient	4.15

The dimensions of no. 35-Y-9 are slightly larger, but its coefficients are almost identical with those of the holotype. Although no. 35-Y-8 has a relatively wide intervallum, it is included in this group because it is similar in general appearance.

Outer Wall

The outer wall is not preserved; consequently, no accurate description can be given. It is possible that the wall was thin and simple.

Intervallum

The intervallum is crossed by numerous straight, radiating parieties and curved, net-like tabulae. The

parieties may bifurcate, but are usually radial, straight, and perforated by many pores, up to ten in a random cross-section. The tabulae are arched, widely spaced, and perforated by many coarse pores which produce a sieve-like texture. The longitudinal section of no. 35-Y-7, showing structures better than the others, is not quite parallel to the central axis of the specimen. This fact, combined with the fact that the tabulae are not horizontal but dipping, accentuates the curved, irregular appearance of the tabulae.

Inner Wall

The inner wall is slightly thickened and perforated by large pores, about one to two per intersept. In vertical direction, they are spaced approximately 0.7 to 0.8 mm. apart.

Collection

Geological Survey of Canada; collection no. 24035.

Holotype is no. 35-Y-7; paratypes are nos. 35-Y-8 and 9.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

The porous nature, the thick inner wall with almost canal-like pores, and the irregular, curved tabulae of this species distinguish it from other Coscinocyathus.

Coscinocyathus inequivallus n. sp.

Plate II ; Figs. 1,2,3,4,5 and 6.

Description

General Shape and Size

Description is based on six long, cylindrical shaped specimens of which the longest was 45 mm. before it was cut. The outer wall shows weak, regular, transverse annulations or constrictions where it is joined by the tabulae. Dimensions are as follows:

Diameter	10-15	mm.
Diameter of central cavity . .	3-8	mm.
Width of intervallum	3½-5	mm.
Number of parieties	55	
Spacing of tabulae	1-2½	mm.
Average intervallum coefficient	0.72	
Average parietal coefficient .	4.45	

Outer Wall

The outer wall is simple and appears to be perforated by large pores, but the pore pattern could not be determined. The wall is slightly constricted transversally at regular intervals where it is joined by the tabulae.

Intervallum

The wide intervallum region is crossed by parieties and tabulae. The parieties are thick, straight, radiating, and perforated by small pores. Up to seven or eight pores have been counted in a random cross-section of a pariety. A few parieties bifurcate towards the outer wall, and in well preserved specimens, they appear to extend a short

distance into the central cavity. Very finely porous tabulae, which cross the intervallum, are slightly curved convex-upward, and are spaced about 1 to 2½ mm. apart. The intersection of tabulae with parieties form rectangular loculi of which the height, in longitudinal section, is about 2 to 3 times the width.

Inner Wall

Like the outer wall, the inner wall is simple and perforated by large pores which appear to be one per intersept. However, parieties project a short distance from the inner wall into the central cavity, and in this respect the inner wall differs from the outer wall.

Collection

Department of Geology, University of British Columbia.

No. AP-14 is designated as the holotype; paratypes are nos. AP-13, 15, 16, 19, and 21.

Collected by Aho and Padgham, 1955.

Horizon and Locality

Lower Cambrian limestone from Pelly Mountains, Quiet Lake Area, Yukon.

Discussion

The intervallum and parietal coefficients of this species are almost identical with those of Coscinocyathus equivallum Taylor. They differ, however, in that the pores of this species are much coarser and that the parieties

project into the central cavity making the inner wall dissimilar in appearance to the outer wall, hence the name Coscinocyathus inequivallus as opposed to Coscinocyathus equivallum Taylor.

The general appearance of Coscinocyathus inequivallus n. sp. closely resembles Coscinocyathus dentocanis Okulitch, but is much smaller. The width of the intervallum to the diameter of the central cavity ratio is much larger, and the parieties appear to be thicker in this species.

Okulitch (1948) has described a Coscinocyathus sp. from the Dogtooth Range of British Columbia as follows:

> It is an acutely conical fragment exposing a pleosponge in a natural longitudinal section. The specimen is entirely recrystallized and no details of its structure, except a few upward arching tabulae, are visible. The intervallum coefficient is 4:6 or 0.6; the tabulae are spaced from 1½ mm. to 2 mm. apart. The total length of the specimen is 40 mm. and the maximum diameter is 14 mm. An exposed portion of the inner wall indistinctly shows numerous, crowded, very fine pores. The outer wall is worn smooth and does not show the pores. In one portion of the specimen are faintly visible thin straight parieties spaced about one-third of a millimeter apart. The poor preservation of the specimen does not permit its specific determination beyond the fact that it is a Coscinocyathus with elongated rectangular loculi.

This description seems to fit closely, except possibly for the inner wall, that of Coscinocyathus inequivallus n. sp. Until better specimens can be found in the Donald Formation of the Dogtooth Range, or other

localities, no definite conclusion can be made as to whether Coscinocyathus inequivallus n. sp. is a widely distributed species.

Coscinocyathus serratus n. sp.

Plate II ; Figs. 7 and 9

Description

General Shape and Size

Description is based on a single specimen, AP-17, which was about 50 mm. in length before it was cut. It is a fragment of an acute conical cup with a slightly elliptical cross-section. The diameters of the lower, middle, and upper parts are 18, 23, and 28 mm., respectively. Weak, transverse annulations of the outer wall, similar to those of Coscinocyathus inequivallum n. sp., are present. Complete dimensions of the upper, middle, and lower portions are as follows:

	Upper	Middle	Lower
Diameter	28 mm.	23 mm.	18 mm.
Diameter of central cavity	15 mm.	10 mm.	8 mm.
Width of intervallum	7-8 mm.	7 mm.	5 mm.
Number of parieties	105	80	70
Spacing of tabulae	3-3½ mm.	3-3½ mm.	3-3½ mm.
Intervallum coefficient	0.5	0.7	0.63
Parietal coefficient	3.75	3.5	3.9

Outer Wall

Much of the outer wall has been replaced by calcite, but it appears to be thin, simple, and perforated by large

pores. Pore arrangement could not be determined.

Intervallum

The relatively wide intervallum region is crossed by a number of straight, radiating parieties which are perforated by a few small pores. An occasional pariety may bifurcate. Up-arching tabulae, perforated by numerous small circular pores, crossed the intervallum at relatively widely spaced intervals.

Inner Wall

The characteristic feature of this species is its inner wall. In transverse section, the inner wall, in part, appears thin, simple, and perforated by small pores, but in greater part, appears complicated by hook-like structures projecting into the central cavity. In longitudinal section, the hooked elements give the inner wall a serrated appearance. The inner wall structure of this species resembles that of Von Toll's Archaeocyathus Sibiricus and Taylor's Archaeocyathus Wirrialpensis.

Collection

Department of Geology, University of British Columbia.

Holotype is specimen AP-17.

Collected by Aho and Padgham, 1955.

Horizon and Locality

Lower Cambrian limestone, Pelly Mountains, Quiet Lake Area, Yukon.

Discussion

Superficially, this species resembles Coscinocyathus inequivallus n. sp. and Coscinocyathus dentocanis Okulitch, but it is much larger than the former. Its widely spaced tabulae and complicated inner wall distinguish it from previously described species.

Coscinocyathus veronicus n. sp.

Plate II ; Fig. 8

Description

General Shape and Size

The shape of this species, judged from a fragment about 40 mm. long, is that of a gently tapering cone. In cross-section, it has an elliptical outline.

Diameter	20-30 mm.
Diameter of central cavity	12-21 mm.
Width of intervallum	5 mm.
Number of parieties	110
Spacing of tabulae	1-1½ mm.
Intervallum coefficient	0.29
Parietal coefficient	4.4

Outer Wall

The outer wall appears to be thin and simple; the pore pattern is not clearly visible.

Intervallum

The narrow intervallum region is crossed by straight, radiating parieties and closely spaced, finely porous tabulae. The parieties are perforated by a few fine

pores and thickened by secondary calcite. Loculi are rectangular, slightly higher than wide.

Inner Wall

The inner wall, perforated by relatively large pores, appears to be very thin and simple. Because the specimen is not well preserved, the pore pattern could not be determined.

Collection

Geological Survey of Canada; collection nos. 24040 and 24041.

Holotype is marked 40-Y-2; paratypes are 41-Y-2 and 4.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

This species is similar in parietal coefficient to Coscinocyathus dentocanis Okulitch, but differs in the intervallum coefficient and in the spacing of the tabulae. The almost quadrate loculi of this species resembles those of Coscinocyathus rhyacoensis Okulitch and Coscinocyathus quadratus Bedford and Bedford, but the new species differs from the latter two in the coefficients.

Coscinocyathus tubicornus n. sp.

Plate II ; Figs. 10 and 11.

Description

General Shape and Size

This species is represented by a single specimen, a slightly curved tubular form partially weathered out. Its diameter decreases from 21 to 12 mm, in a length of 60 mm. The lower portion is missing on this specimen. It is replaced to some extent by calcite, which obliterates the finer details of the skeleton.

Diameter	21-22 mm.
Diameter of central cavity	8-9 mm.
Width of intervallum	6-7 mm.
Number of parieties	80
Spacing of tabulae	1½-2 mm.
Intervallum coefficient	0.77
Parietal coefficient	3.81

Outer Wall

The outer wall appears thin and simple. The pore pattern cannot be determined from this specimen.

Intervallum

The wide intervallum is crossed by parieties and tabulae. The parieties are thin, straight, radiating, and perforated by numerous fine pores. Tabulae, spaced about 1½ to 2 mm. apart, are porous mesh-like and slightly arched convex-upward.

Inner Wall

The inner wall is very thin, simple, and perforated by possibly two pores per intersept. The exact pore

arrangement of the inner wall is not known. In part, the wall appears to be invaded and pushed in by foreign material, causing the parieties to project slightly into the central cavity.

Collection

Geological Survey of Canada; collection no. 24036. Holotype is marked 36-Y-11.

Collected by W.H. Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group B sediments); Wolf Lake Area, Yukon.

Discussion

The thin, simple, radiating parieties and closely set tabulae of this specimen place it in the genus Coscinocyathus. However, the wide intervallum, the narrow central cavity, and in the main, the general appearance of this species are quite different from those of the other species. Coscinocyathus cylindricus Boremann and Coscinocyathus tuba Bornemann also have a wide intervallum, but in general appearance, this new species is quite unique.

Coscinocyathus sp.

Plate II ; Fig. 12

Description

General Shape and Size

This species is represented by a very short frag-

ment of a long cylindrical form. Because its general appearance is not known and much of the fossil is replaced by calcite, a specific determination can not be made.

Diameter	25-32 mm.
Diameter of central cavity	15 mm.
Width of intervallum	5-9 mm.
Number of parieties	106
Spacing of tabulae	1-1½ mm.
Intervallum coefficient	0.47
Parietal coefficient	3.72

Outer Wall

The outer wall is a simple thin mesh, perforated by fine pores.

Intervallum

Extremely thin, radiating parieties perforated by very fine pores, and flat, closely spaced, net-like tabulae cross the intervallum region.

Inner Wall

The inner wall appears very thin and possibly perforated by numerous fine pores.

Collection

Geological Survey of Canada; collection no. 24036.

Specimen is marked 36-Y-10.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group B sediments); Wolf Lake Area, Yukon.

Discussion

The general appearance and the salient features

can not be determined on this small fragment, but the very thin and delicate nature of the walls and skeletal elements is the striking characteristic. The fineness of the skeleton resembles that of Coscinocyathus tubicornus n. sp. but it differs in intervallum coefficient. If other specimens of the former can be found to show that larger diameters give smaller intervallum coefficients, then the specimen under consideration could certainly be classified as Coscinocyathus tubicornus n. sp.

The coefficients of this specimen are similar to those of Coscinocyathus dentocanis Okulitch, but in general appearance there seems to be no resemblance.

Carinacyathus perforatus n. sp.

Plate III ; Figs. 1-5

Description

General Shape and Size

Naturally weathered out specimens of this species were up to 110 mm. long and tubular in shape before they were cut. In cross-section, they are elliptical. Specimen 35-Y-12, being the best preserved, was chosen as the holotype.

Diameter	21-35 mm.
Diameter of central cavity	16 mm.
Width of intervallum	4-8 mm.
Number of parieties	100
Spacing of tabulae	$1\frac{1}{2}$-$2\frac{1}{2}$ mm.
Intervallum coefficient	0.38
Parietal coefficient	3.57

Outer Wall

The outer wall is not well preserved, but appears to be thin, simple, and perforated by numerous small pores. The pore pattern is not known.

Intervallum

The intervallum is crossed by numerous straight, radiating parieties and by weakly up-arched tabulae. The parieties, spaced about 0.8 mm. apart, are perforated, in a random cross-section, by twelve or more very fine pores about 0.1 mm. in diameter. The tabulae, spaced $1\frac{1}{2}$ to $2\frac{1}{2}$ mm. apart, are perforated by numerous fine pores, resulting in a fine meshed net. The intersection of tabulae with parieties form rectangular loculi, which are about twice as high as they are wide.

Inner Wall

The most characteristic feature of this species is its inner wall. It is composed of continuous annular, sigmoidally curved plates spaced about 0.5 mm. apart in longitudinal direction. They project about 0.3 to 0.4 mm. into the central cavity and line it with horizontal annular shelves.

Collection

Geological Survey of Canada; collection no. 24035. Holotype is no. 35-Y-12; paratypes are nos. 35-Y-6 and 10.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

These specimens, with well developed tabulae and straight, radiating parieties, undoubtedly belong to the family Coscinocyathidae Taylor and are classified as genus Carinacyathus Vologdin because of their complex inner wall. The Bedfords (1936a) have described a new genus Sigmocoscinus with Sigmocoscinus sigma Bedford and Bedford as genotype. The coefficients and description of the skeletal structure, except for the outer wall, closely resemble those of Carinacyathus perforatus n. sp. The outer wall of Sigmocoscinus sigma is described as follows by Bedford and Bedford,

> outer wall-pores are small, about 4 to one mm., about three rows to each intersept, and are covered externally by overlapping annular plates, about 4 of these occurring in each mm. of length.

An outer wall, composed of sigmoidal annular plates, is not present on these specimens, perhaps the result of poor preservation. If this is the case, then the fossils here described are Sigmocoscinus sigma.

Since the term Sigmocoscinus is not listed in Treatise Of Invertebrate Paleontology, Part E by Okulitch, it is considered as an invalid name. Genus Carinacyathus includes all Coscinocyathidae with complex inner walls, irrespective of the nature of the outer wall. Hence, if better specimens can be found from the same locality to prove that these specimens are conspecific with Sigmocoscinus sigma, then they should be classed as Carinacyathus sigma (Bedford and Bedford).

Carinacyathus perforatus n.sp. closely resembles Coscinocyathus dentocanis Okulitch but it differs in the nature of the inner wall.

Specimen no. 35-Y-10 is similar to the holotype, except that it has a larger central cavity. The inner wall is complicated by elements projecting into the cavity region, but the arrangement is not clearly visible; therefore specimen 35-Y-10 is provisionally classed as Carinacyathus perforatus n. sp.

Occurrences of this genus have been reported from Siberia and Australia but this is its first occurrence in North America.

Order METACYATHIDA Bedford and Bedford, 1936

Family Archaeocyathidae Taylor, 1910

Archaeocyathus cf. atlanticus Billings

Plate III ; Figs. 6 and 7

Archaeocyathus atlanticus Billings, 1861

Description

General Shape and Size

The specimen is a large, flattened archaeocyathid about 135 mm. long. It is conceivable that it was originally long, acute conical in form with an elliptical cross-section. Because of extreme deformation and the partially weathered away condition at the upper end, dimensions are only estimates.

	Upper	Lower
Diameter	44 mm.	30 mm.
Diameter of central cavity . . .	15-16 mm.	9 mm.
Width of intervallum	9-18 mm.	5-15 mm.
Intervallum coefficient	0.87	0.94

Outer Wall

Due to replacement by calcite and to weathering away, the characteristic of the outer wall cannot be readily seen. It appears to be thin and delicate, but no pore arrangements are known.

Intervallum

The intervallum is relatively wide with an inter-

vallum coefficient of about 0.9, which is identical with that of the original Geological Survey of Canada holotype no. 369 described by Billings in 1861. The intervallum is crossed, in part, by wavy parieties and, in part, by irregular taeniae and synapticulae. In the lower portions, taeniae are bifurcated, anastomosed, and perforated by large pores, and appear to be thickened.

Inner Wall

Poor preservation makes it impossible to see the exact nature of the inner wall, but it appears to be slightly thicker than the outer wall. The pore pattern could not be determined.

Collection

Geological Survey of Canada; collection no. 24035, specimen no. 35-Y-14.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

A definite identification cannot be made because of poor preservation and extreme deformation of the original general appearance. The intervallum coefficient and the irregular nature of the intervallum skeletal elements of this specimen resemble those of Archaeocyathus atlanticus Billings. Until better and more revealing specimens of

this archaeocyathid are made available, a new species will not be erected here.

Archaeocyathus (?) sp.

Plate III ; Figs. 8

Description

General Shape and Size

This specimen is a fragment about 30 mm. long, of a large conical shaped cup with an elliptical cross section. It is cut by calcite stringers and much of the fossil is replaced by carbonate.

Diameter	35-41 mm.
Diameter of central cavity	16-21 mm.
Width of intervallum	8-10 mm.
Intervallum coefficient	0.49

Outer Wall

The outer wall appears thick, simple, and possibly perforated by fine pores.

Intervallum

The intervallum is crossed by irregular bifurcating and anastomosing taeniae, and in part by wavy Pycnoidocyathus-type parieties. Parieties and taeniae are thick and perforated by large pores.

Inner Wall

The inner wall is slightly thicker than the outer wall, but the replacement by calcite makes the determination of the pore pattern impossible.

Collection

Geological Survey of Canada; collection no. 24041; specimen no. 41-Y-3.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

The intervallum is crossed in part by thick wavy parieties as found in Pycnoidocyathus, and in part by irregular taeniae characteristic of Archaeocyathus. In general appearance, the intervallum, in both transverse and longitudinal view, resembles that of the latter. The classification, beyond the fact that it belongs to the order Metacyathida, is not definite and no specific determination is possible from this fragment.

Family Pycnoidocyathidae Okulitch, 1950

Pycnoidocyathus amourensis (Okulitch)

Plate IV ; Fig. 1

Cambrocyathus amourensis Okulitch, 1943

Description

General Shape and Size

In the Yukon collections, this common Labrador

species is represented by a single small fragment. The general shape cannot be determined from this small piece, but the dimensions are as follows:

Diameter	20 mm.
Diameter of central cavity	5 mm.
Width of intervallum	7 mm.
Number of parieties	36
Intervallum coefficient	1.4
Parietal coefficient	1.8

Discussion

The salient features of the outer and inner walls are obliterated by calcite recrystallization. The narrow central cavity and the nature of the intervallum are definitely related to Pycnoidocyathus amourensis (Okulitch) but the general shape, which is the main criterion used in identification of this species, is not known for the specimen under discussion. The low parietal coefficient is not of specific importance because even in the holotype, the coefficient varies to some extent at different diameters.

Collection

Geological Survey of Canada; collection no. 24036; specimen no. 36-Y-9.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group B sediments); Wolf Lake Area, Yukon.

Pycnoidocyathus columbianus (Okulitch)

Plate IV ; Fig. 2

Cambrocyathus columbianus Okulitch, 1943

Description

General Shape and Size

Description is based on two specimens which are short fragments of large, conical cups. Largest specimen is about 70 mm. in diameter and 60 mm. in length, which is too short to show annulations of the outer wall.

Diameter	65-70 mm.
Diameter of central cavity	34-36 mm.
Width of intervallum	16-18 mm.
Number of parieties	90
Intervallum coefficient	0.48
Parietal coefficient	1.35

Outer Wall

The nature of the outer wall of these specimens are indeterminable because parieties diffuse out into the limestone matrix leaving no wall visible.

Intervallum

The relatively wide intervallum is crossed by numerous thin, wavy, perforated parieties. Radiating parieties, supplied with abundant synapticulae, are slightly thickened near the inner wall.

Inner Wall

The inner wall is slightly thickened and perforated by large pores but pore pattern could not be determined. Thickening of the inner wall and of the parieties where

they join the inner wall may be due to replacement by calcite.

Collection

Department of Geology, University of British Columbia; specimens AP-22 and 23.

Collected by Aho and Padgham, 1955.

Discussion

These specimens are identified as Pycnoidocyathus columbianus (Okulitch) on general appearance and intervallum characteristics. They are very similar to Pycnoidocyathus columbianus from the McDame Area described by Okulitch (1955). The McDame specimens have a fairly constant intervallum coefficient between 0.41 and 0.45, but the parietal coefficient is quite variable. Therefore, the low parietal coefficient of these specimens is not of specific importance. These specimens are closely related to Pycnoidocyathus occidentalis (Okulitch) in size and shape but the latter has a much higher intervallum coefficient.

Pycnoidocyathus cf. occidentalis (Okulitch)

Plate IV ; Figs. 3,4,5 and 6

Cambrocyathus occidentalis Okulitch, 1943

Description

General Shape and Size

This species, a large, conical, expanding form,

is represented in the Geological Survey of Canada Collection by specimens approximately 130 mm. long. The lower portion of the cone is weakly to strongly annulated transversally, but annulations are not prominent or are completely lacking in the upper parts. Dimensions of the larger end are, on the average, as follows:

Diameter	55.65 mm.
Diameter of central cavity	25-32 mm.
Width of intervallum	18 mm.
Number of parieties	120
Intervallum coefficient	0.63
Parietal coefficient	2.0

Towards the apex of the cone, the diameter of the central cavity, width of the intervallum, and the number of parieties decrease correspondingly with the decrease in diameter of the outer cone. The transverse annulations of the walls near the base cause some variations in the coefficients; the intervallum coefficients ranging from 0.60 to 1.0 with an extreme case of 0.43, and the parietal coefficients, from 1.3 to 2.0.

Outer Wall

The poor preservation of the outer wall makes the determination of its pore pattern impossible. The outer wall is transversally annulated at the smaller end of the cone.

Intervallum

The wide intervallum is crossed by wavy to bifurcating parieties which are perforated by numerous pores and supplied with abundant synapticulae. Parieties are relatively thickened towards the inner wall.

Inner Wall

Near the upper end of the organism, the inner wall appears to be thin, simple, and perforated by pores. Pore characteristics could not be determined because of calcite replacement. In the lower end, the inner wall appears to be complicated by irregular, transverse annulations and is perforated by numerous fine pores which give a serrated effect to the wall in random sections.

Collection

Geological Survey of Canada; collection no. 24036.

Specimen nos. 36-Y-1, 2, 3, 4 and 12.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group B sediments); Wolf Lake Area, Yukon.

Discussion

The intervallum and parietal coefficients, size, and general appearance of these specimens are almost identical to specifications of the holotype described by Okulitch (1943). Specimen no, 36-Y-3 of this collection shows irregularities and numerous perforations of the inner wall towards the smaller end but replacement by calcite obliterates some of the finer details. This species is related to Pycnoidocyathus columbianus (Okulitch) but has a much larger intervallum coefficient.

Pycnoidocyathus cf. dissepimentalis (Okulitch)

Plate IV ; Fig. 7

Cambrocyathus dissepimentalis Okulitch, 1943

Description

General Shape and Size

True shape of the cup can not be given accurately from the two fragments here described, but they appear to be tapering conical cups. Longitudinal sections show very shallow transverse annulations of the outer wall.

Diameter	35 mm.
Diameter of central cavity	14-16 mm.
Width of intervallum	7-8 mm.
Number of parieties	75
Intervallum coefficient	0.5
Parietal coefficient	2.14

Outer Wall

The outer wall is not preserved. The outer wall of the holotype from Labrador is described by Okulitch (1943) as follows:

> Outer Wall: Of average thickness, penetrated by numerous fairly large pores. Some of the pores open directly into interparietal spaces; others open into oblique canals penetrating wall at an angle. In some cases a cluster of pores appears to open into same canal. Wall is crenulated by transverse bulges, as is typical of the genus. Spacing of the bulges is about 5 or 6 mm.

Intervallum

The most characteristic feature of this species is the intervallum region. It is completely filled with dissepimental tissue and synapticulae, and is crossed by

relatively thin, wavy radiating parieties which occasionally bifurcate. The parieties are very porous, with eight or more pores visible in random cross section, and about seven in five millimeters of a longitudinal section.

Inner Wall

In oblique section, the inner wall appears as a thin, finely porous mesh. No definite pore pattern could be seen in these specimens, but it appears irregular.

Collection

Department of Geology, Unitersity of British Columbia; specimen nos. AP-23 and 24.

Collected by Aho and Padgham, 1955.

Discussion

These specimens are compared with Pycnoidocyathus dissepimentalis (Okulitch) because of the dense tissue fillings of the intervallum. The coefficients of these specimens are nearly the same as that of the holotype, but parieties are thinner and more porous. These slight differences may not be of specific importance to justify erection of a new species.

Pycnoidocyathus solidus n. sp.

Plate IV ; Figs. 8 and 9

Description

General Shape and Size

Description is based on a single specimen about

37 mm. long. The cup is conical in shape, the larger end averaging 34 mm. in diameter and the smaller end, 25 mm. The lower portion of the cone is missing. The dimensions of the upper elliptical cross-section are as follows:

Diameter	28-39 mm.
Diameter of central cavity	7 mm.
Width of intervallum	10-18 mm.
Number of parieties	67
Intervallum coefficient	2.0
Parietal coefficient	1.97

Outer Wall

The outer wall appears to be thin, simple, and perforated by one or two large pores per intersept. The walls are thickened by calcite replacement.

Intervallum

The very wide intervallum and the extremely narrow central cavity are the most noteworthy features of this species. The intervallum is crossed by relatively thick, wavy parieties which are penetrated by a few small pores. The parieties bifurcate and anostomose toward the outer wall but are straight and closely crowded near the inner wall. They are supplied with occasional synapticulae.

Inner Wall

Another characteristic feature of this species is its inner wall. At the larger diameter, the wall appears to be thin, simple, and possibly perforated by small pores. Towards the base, the inner wall is thickened considerably and penetrated by large canal-like pores. The central cavity here is indefinable because it is completely filled

with irregular extraneous rod-like material.

Collection

Geological Survey of Canada; collection no. 24040.

Holotype is marked 40-Y-7.

Collected by W.H. Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

The generic classification of this specimen is uncertain because many of its features seem to resemble Pycnoidocyathus as well as Metaldetes and Paranacyathus. The central cavity, filled with trabecular elements, shows affinity to the last two genera, but this specimen is classed as Pycnoidocyathus because of its relatively regular but wavy parieties characteristic of this species.

Although no conclusions can be made here, there is a possibility that either or both Metaldetes and Paranacyathus could be classed with the genus Pycnoidocyathus.

The extremely wide intervallum, narrow central cavity which is undefinable at the base, and the thick wavy parieties are the main features of the species. The narrow central cavity resembles that of Pycnoidocyathus amourensis (Okulitch) but they differ radically in general appearance.

Loculicyathus ellipticus n. sp.

Plate V ; Figs. 1 - 6

Description

General Shape and Size

The specimens are tapering, conical cups about 60 to 70 mm. long on the average, but specimen no. 35-Y-2 was 130 mm. in length before it was cut. They are elliptical in cross section. The average dimensions are:

Diameter	20 mm.
Diameter of central cavity	10-11 mm.
Width of central cavity	4½-5½ mm.
Number of parieties	55-65
Intervallum coefficient	0.45-0.55
Parietal coefficient	2.75-3.25

Specimen 35-Y-2 is much larger, but the diameter and coefficients taken at mid-point of length are comparable to dimensions of the others. At the upper end of this specimen, where the diameter is 24 by 34 mm., the intervallum is very narrow, giving an intervallum coefficient of 4½:19 or 0.24. This variation is coefficient, even within a single, long, conical specimen, throws doubt on the validity of the coefficient as a criterion for classifying species. Another peculiar feature of this specimen is that in the upper regions, part of its intervallum is filled with dense vesicular tissue while other parts are not. It is not known whether this is due to preservation or to parasitic or symbiotic activities. Also the bottom 20 mm. of this

specimen is bent at right angles to the axis of the main cone, indicating that this animal had a strange life history.

Outer Wall

Much of the outer wall is worn away, but poorly preserved parts indicate a thin, simple, perforated wall. The pore pattern is not known.

Intervallum

The most characteristic feature of this species is its intervallum region. It is crossed by coarsely perforated, straight, radial parieties and is completely filled with vesicular tissue (except upper portions of 35-Y-2). Vesicles are obliquely elongated. The parieties can be seen distinctly even within the vesicular mass.

Inner Wall

The inner wall is simple and has about the same thickness as the parieties. The wall is perforated by one or two coarse pores per intersept.

Collection

Geological Survey of Canada; collection no. 24035.

Holotype is 35-Y-1; paratypes are 35-Y-2, 3, 4, 5 and 11.

Collected by W.H.Poole, 1953.

Discussion

Genus Loculicyathus was first found in Siberia and described by Vologdin (1931). These specimens are the first to be found outside of Siberia and are different from

the Siberian species. In transverse section, Loculicyathus ellipsis n. sp. looks much like Metacoscinus deasensis Okulitch in its coarsely perforated radial walls and intervallum of dense vesicular and dissepimental tissues. They differ in that the former has no tabulae.

Family Metacoscinidae Bedford and Bedford, 1932

Metacoscinus poolensis n. sp.

Plate V ; Figs. 7 - 11

Description

General Shape and Size

This species is represented by four long, tapering conical fragments. They are elliptical in cross-section. The largest fragment is crenulated at the top and is 45 mm. in length, but it could easily have been two or three times as long.

Diameter	28-34 mm.
Diameter of central cavity	14-20 mm.
Width of intervallum	8 mm.
Number of parieties	80
Spacing of tabulae	1-1½ mm.
Intervallum coefficient	0.47
Parietal coefficient	2.6

The above are average measurements of the larger end of the specimens. Towards the base, width of the intervallum does not decrease correspondingly, giving a higher intervallum coefficient.

Outer Wall

The outer wall is marked with gentle, transverse annulations where the wall is joined by the tabulae. The wall appears to be thin, delicate, and perforated by fine pores, up to six per intersept. The walls being poorly preserved, exact determination of the pore pattern is impossible.

Intervallum

The presence of tabulae, parieties, and vesicular tissues is the characteristic feature of the relatively wide intervallum region. The parieties, supplied with few synapticulae, are thin, straight, radiating and occasionally birfurcating. They seem to be almost imperforated and to project a short distance into the central cavity. Tabulae, spaced about 1 to 1½ mm. apart, are perforated by extremely fine, closely set pores. Towards the smaller diameter, the intervallum region becomes filled with very fine vesicular dissepimental tissue. The upper regions and the central cavity appear to be free of this tissue.

Inner Wall

Features of the inner wall are not clear, but the wall appears to be invaded and pushed in by foreign material. The wall is thin and perforated by large pores which lead into the loculi. Very thin parieties project into the central cavity, but the cavity is free of other elements.

Collection

Geological Survey of Canada; collection no. 24040.

Holotype is 40-Y-5; paratypes are 40-Y-1,3, and 611.

Collected by W.H.Poole, 1953.

Horizon and Locality

Lower Cambrian (Lord's Group C sediments); Wolf Lake Area, Yukon.

Discussion

The radial parieties, tabulae, and vesicular tissue in the intervallum indicate that these specimens belong to genus Metacoscinus, but the imperforated nature of the parieties is not typical of this genus. This fact is not considered to be of generic importance. This species resembles Metacoscinus deasensis Okulitch, but differs in the nature of the parieties and the intervallum coefficient.

The specific name is proposed in honour of Dr. Poole of the Geological Survey of Canada.

Metacoscinus sp.

Plate V ; Fig. 12

Description

General Shape and Size

This species is represented by a single poorly preserved conical fragment about 25 mm. long.

Diameter	18 mm.
Diameter of central cavity	6 mm.
Width of intervallum	6 mm.
Number of parieties	42
Spacing of tabulae	?
Intervallum coefficient	1.0
Parietal coefficient	2.3

Outer Wall

The outer wall is simple and perforated by large pores. The pore pattern could not be determined.

Intervallum

The intervallum width is equal to the diameter of the central cavity. The intervallum is crossed by regular, wavy parieties which are perforated by pores and supported by synapticulae. In transverse thin-section, porous tabulae can be seen, but the spacing of the tabulae could not be determined in longitudinal section.

Inner Wall

The inner wall is simple, slightly thickened, and perforated by large pores. The pore pattern is not known.

Collection

Department of Geology, University of British Columbia; specimen no. AP-6.

Collected by Aho and Padgham, 1955.

Horizon and Locality

Lower Cambrian limestone; Pelly Mountains, Quiet Lake Area, Yukon.

Discussion

This specimen is provisionally assigned to the genus Metacoscinus, but its specific name is not determined. The parietal and intervallum coefficients are different from the coefficient of known species.

Claruscyathus ketzaensis n. sp.

Plate V ; Figs. 14 - 16

Description

General Shape and Size

The specimens are small horn-shaped fragments, the largest being about 35 mm. long. The tips on some are sharply curved. Few show weak transverse annulations. The average measurements are:

Diameter	18 mm.
Diameter of central cavity	5½ mm.
Width of intervallum	6½ mm.
Number of parieties	40?
Spacing of tabulae	1-2 mm.
Intervallum coefficient	1.2
Parietal coefficient	2.4?

Outer Wall

The outer wall is relatively thick and perforated by large canal-pores. The arrangement of the pores is not known.

Intervallum

The very wide intervallum region is the most

characteristic feature of this species, giving an intervallum coefficient of 1.2. It is also filled with extremely coarse, curving and branching taeniae. These structural elements start out as parieties from the inner wall but break up into irregular elements as they extend out into the intervallum. The intervallum is crossed by porous, uparching tabulae 1 to 2 mm. apart. In longitudinal section, the tabulae can be seen to depart horizontally from the inner wall. The tabulae abut the outer wall at an acute angle.

Inner Wall

The inner wall is thickened considerably and penetrated by coarse oblique pore-canals. In transverse section, the inner wall appearance approaches the vesicular inner wall of Ethmophyllum.

Collection

Department of Geology, University of British Columbia.

Specimen AP-2 is designated as the holotype. Paratypes are AP-1, 3, 4, 81, 811, 8, 10 and 11.

Collected by Aho and Padgham, 1955.

Horizon and Locality

Lower Cambrian limestone; Pelly Mountains, Quiet Lake Area, Yukon.

Discussion

This species is closely related to Eucyathus obliquus Okulitch from the Dogtooth Mountains, B.C. It

differs in that the latter has Pycnoidocyathus-type parieties, while this has irregular Archaeocyathus-type parieties. The skeletal structure of Claruscyathus ketnaensis n.sp. is unique.

CHAPTER IV

SUMMARY AND CONCLUSION

Affinities To Other Faunae

Six families, the Ajacicyathidae, the Ethmophyllidae, the Coscinocyathidae, the Archaeocyathidae, the Pycnoidocyathidae, and the Metacoscinidae of the Phylum Archaeocyatha are represented in the fossil collections from the Yukon. In all, twenty-three species, of which twelve are new, are here described. The Yukon fauna is dominated by Coscinocyathus and Pycnoidocyathus.

The dominance of Coscinocyathus and Pycnoidocyathus, which is characteristic of faunae to the south in British Columbia, suggests that the Yukon fauna has affinities with the faunae in British Columbia. The presence of Coscinocyathus dentocanis Okulitch, Pycnoidocyathus columbianus Okulitch, and Ajacicyathus purcellensis Okulitch shows close relationship among the faunae. Metacoscinus, which is a common genus in the McDame collection, is also present in the collections studied. The occurrence of Loculicyathus and Carinacyathus suggests relationship between this fauna and the Siberian and Australian faunae. There appears to be a complete lack of relationship between the Yukon fauna and the California-Nevada faunae, which are dominated by Ethmophyllidae.

It was surprising to find a large number of new species in the collections. The fossil localities in the Yukon are only two to three hundred miles northwest of the McDame locality of British Columbia. Similar species were therefore expected, but in this distance a great number of new species become present. Archaeocyathids are very abundant in the Yukon and every new collection seems to produce new species.

Age of the Rocks

Archaeocyathids in Lord's (1944) Groups B and C sediments definitely date the rocks, in part, as upper Lower Cambrian. The relative age relation between Groups B and C was not known to Lord, but it can now be asserted positively that both groups contain fossiliferous zones of the same age.

The rock groups defined by Lord are large and may contain a number of units. Poorly preserved fossils suggestive of crinoid stems and cup corals were found in Groups B and C sediments, respectively. Lord, therefore, suggested that Group C may be of Carboniferous ? age. It is quite possible that these large groups contain strata of different ages, certainly rocks of early Cambrian age.

Sedimentary rocks at the head waters of the Ketza River in the Pelly Mountains are also of upper Early Cambrian age. The regional geology of this area is largely unknown, but the rocks here are probably a continuation of the Lower Cambrian rocks exposed in the Wolf Lake Area 120 miles to the southeast. It is apparent that a large area in the Yukon is underlain by Lower Cambrian Rocks.

Well preserved Lower Cambrian archaeocyathids, Ordivician graptolites, and Palaeozoic corals were collected by H. Trettin in the Pelly Mountains. These fossils were not studied in detail, but they indicate that good Palaeozoic sections are present in the Ketza River area.

Suggestions for Further Studies

Archaeocyathids from the Yukon are excellent material for study because of their abundance and good preservation. A systematic collection of archaeocyathids should be made in conjunction with detailed stratigraphic work and regional geology. If possible, archaeocyathid faunal zones should be erected. Further collections from the Yukon will undoubtedly furnish new species. Better specimens may provide additional information or amendments to the species of the present collections. Studies on ecology, ontogony, and phylogeny of Archaeocyatha are recommended if large collections of well

preserved fossils can be made. Explanations for their sudden appearance and equally sudden extinction may then become apparent.

BIBLIOGRAPHY

Aho, A. (1955) Geologic Report on the Kay Group of Claims and Upper White Creek, Ketza River Area, Yukon Territory; unpublished report.

Bedford, R. and Bedford, J. (1936) Further Notes on Cyathospongia from the Lower Cambrian of Beltana, South Australia; Kyancutta Museum Memoir 3, pp. 21-26.

(1937a) Anatomy and Classification of the Cyathospongia (Archaeos) from the Lower Cambrian of Beltana, South Australia; mimeographed copy, pp. 1-11.

(1937b) Further Notes on Archaeos (Pleospongia) from the Lower Cambrian of South Australia; Kyancutta Museum Memoir 4, pp. 27-38.

(1939) Development and Classification of Archaeos (Pleospongia); Kyancutta Museum Memoir 6, pp. 67-82.

Bedford R. and Bedford W.R. (1934) New Species of Archaeocyathinae and Other Organisms from the Lower Cambrian of Beltana, South Australia; Kyancutta Museum Memoir 1, pp. 1-7.

(1936) Further Notes on Archaeocyathi (Cyathospongia) and Other Organisms from the Lower Cambrian of Beltana, South Australia; Kyancutta Museum Memoir 2, pp. 9-20.

Billings, E. (1865) Paleozoic Fossils; Geol. Survey of Can., vol. 1, pp. 3-6, 354-357, 419.

Chi, Y.S. (1940) Cambrian Archaeocyathina from the Gorge District of the Yangtze; Geol. Soc. China, Bull., vol. 20, no. 2, pp. 121-142.

Ford, S.W. (1873a) On Some New Species of Fossils from the Primordial or Potsdam Group of Rensselaer County, New York (Lower Potsdam); Am. Jour. Sci. 3rd. ser., vol. 5, pp. 211-213.

Ford, S.W. (1873b) Remarks on the Distribution of the Fossils in the Lower Potsdam Rocks at Troy, New York, with Descriptions of a few New Species; Am. Jour. Sci., 3rd. ser., vol. 6, p. 135.

(1878) Description of Two New Species of Primordial Fossils; Am. Jour. Sci., 3rd. ser. vol.5 pp. 124.

Girling, V. (1954) Ecology of the Archaeocyatha; Bachelor of Arts Thesis, University of British Columbia.

Hinde, G.J. (1889) On Archaeocyathus and Other Genera from the Cambrian Strata of North America, Spain, Sardinia, and Scotland; Geol. Soc. London, Quart. Jour., vol. 45, pp. 125-148.

Lord, G.S. (1944) Geological Reconnaissance Along the Alaska Highway Between Watson Lake and Teslin River, Yukon and British Columbia; Geol. Survey Can., Paper 44-25, pp. 1-20.

Matthew, G.F. (1885) Illustrations of the Fauna of the St. John Group; Roy. Soc. Can. Trans., sec. 4, pp. 29-30.

(1887) Illustrations of the Fauna of the St. John Group; Roy. Soc. Can. Trans., sec. 4, pp. 160-165.

(1890) Illustrations of the Fauna of the St. John Group; Roy. Soc. Can. Trans., sec. 4, p. 123.

Meek, F.B. (1868a) Preliminary Notice of a Remarkable New Genus of Corals, Probably Typical of a New Family; Am. Jour. Sci., 2nd. ser., vol. 45, pp. 62-64.

(1886b) Note on Ethmophyllum and Archaeocyathus; Am. Jour. Sci., 2nd. ser., vol. 46, p. 144.

Okulitch, V.J. (1935) Cyathospongia --- A New Class of Porifera to Include the Archaeocyathinae; Roy. Soc. Can. Trans., 3rd, ser., sec. 4, vol. 29, pp. 75-106.

(1940) Revision of Type Pleospongia from Eastern Canada; Roy. Soc. Can. Trans., 3rd. ser. sec. 4, vol. 34, pp. 75-87.

Okulitch, V.J.(1943) North America Pleospongia; Geol. Soc. Am., Paper 48, pp. 1-112.

(1946) Exothecal Lamellae of the Pleospongia; Roy. Soc. Can. Trans., 3rd. ser., sec. 4, vol. 40, pp. 73-86.

(1948) Lower Cambrian Pleospongia from the Purcell Range of British Columbia, Canada; Jour. Pal. vol. 22, no. 3, pp. 340-349.

(1952) Pleospongia, in Cambrian Stratigraphy and Paleontology near Caborca, Mexico; Smithsonian Misc., Coll., vol. 119, no. 1, pp. 25-37.

(1954) Archaeocyatha from the Lower Cambrian of Inyo County, California; Jour. Pal., vol. 28, no. 3, pp. 293-296.

(1955a) Archaeocyatha; Treatise on Invertebrate Paleontology, Part E, edited by Moore, R.C. pp. E1-E20.

(1955b) Archaeocyatha from the McDame Area of Northern British Columbia; Roy. Soc. Can. Trans., 3rd. ser., sec. 4, vol. 44, pp. 47-64.

Okulitch, V.J. and de Laubenfels, M.W. (1953) The Systematic Position of Archaeocyatha (Pleospongia); Jour. Pal., vol. 27, no. 3, pp. 481-485.

Okulitch, V.J., and Roots, E.F. (1947) Lower Cambrian Fossils from the Iaken Lake Area, British Columbia; Roy. Soc. Can. Trans., 3rd, ser., sec. 4, vol. 41, pp. 37-46.

Poole, W.H. (1955) Preliminary Map of Wolf Lake Area, Yukon Territory; Geol. Survey Can., Preliminary Map 55-21.

Raymond, P.E. (1931) Systematic Position of the Archaeocyathinae; Mus. Comp. Zool., Harvard Univ., vol. 56, p. 172.

Shimer, H.W. and Shrock, R.R. (1943) Index Fossils of North America, pp. 56-57.

Simon, W. (1939) Archaeocyathacea. I. Kritische Sichtung der Superfamilie. II. Die Fauna im Kambrium der Sierra Morena (Spanien); Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft; Adbhandlung 448, pp. 1-87.

Taylor, T.G. (1907) Preliminary Note on Archaeocyathinae from the Cambrian Coral Reefs of South Australia; Austr. Assoc. Adv. Sci., pp. 1-15.

(1910) The Archaeocyathinae from the Cambrian of South Australia; Roy. Soc. S. Austr., Mem. vol. 2, pt. 2, pp. 55-188.

Vologdin, A.G. (1931) Archaeocyathae of Siberia, Pt. 1. Faunas of the Limestone of Ulus Bei-Buluk and Kameshki Village, Minusinsk Region, and of Nijnaya Ters River, Kuznetsk District; United Geol. Prosp. Survey, U.S.S.R., pp. 1-119.

(1932) Archaeocyathinae of Siberia, Pt. 2. Fossils of the Cambrian Limestone of Altai Mountains; United Geol. Prosp. Survey, U.S.S.R., pp. 1-106.

(1937) Archaeocyatha and the Results of Their Study in the U.S.S.R.; Problems in Pal., vols. 2-3, Lab. of Pal., Moscow Univ. pp 453-500.

(1939) Middle Cambrian Archaeocyatha and Algae from the South Urals; Problems in Pal., vol. 5, Lab. of Pal., Moscow Univ., pp. 209-276.

(1940) Subtype Archaeocyatha: Atlas of Leading Forms of the Fossil Faunas of the U.S.S.R. vol. 1, Cambrian; State Editorial Office for Geol. Literature, Moscow.

Walcott, C.D. (1886) Cambrian Faunas of North America; U.S. Geol. Survey, Bull. 30, pp. 72-89.

Zhuravleva, I.T. (1955) Archaeocyatha of the Cambrian of the East Slope of Kuznetzk Ala-Tau; Academy of Sci. of U.S.S.R. Contributions of the Paleontological Institute, vol. 56, pp. 7-56.

EXPLANATION OF PLATES

PLATE I

Figs.

1. Ajacicyathus purcellensis Okulitch X 1½, No. 36-Y-6, G.S.C. Transverse thin section showing walls and parieties.

2. Ajacicyathus yukonensis n. sp. X4, Holotype, No. 35-Y-13I, G.S.C. Transverse thin section showing inner and outer walls and simple parieties.

3. Ethmocoscinus sp. X 1½. No. AP-7, U.B.C. Transverse thin section showing wide intervallum and thick, vesicular inner wall.

4. Coscinocyathus dentocanis Okulitch X 1½. No. 40-Y-4, G.S.C. Transverse thin section.

5. Coscinocyathus dentocanis Okulitch X 1½. No. 40-Y-4, G.S.C. Longitudinal thin section showing tabulae.

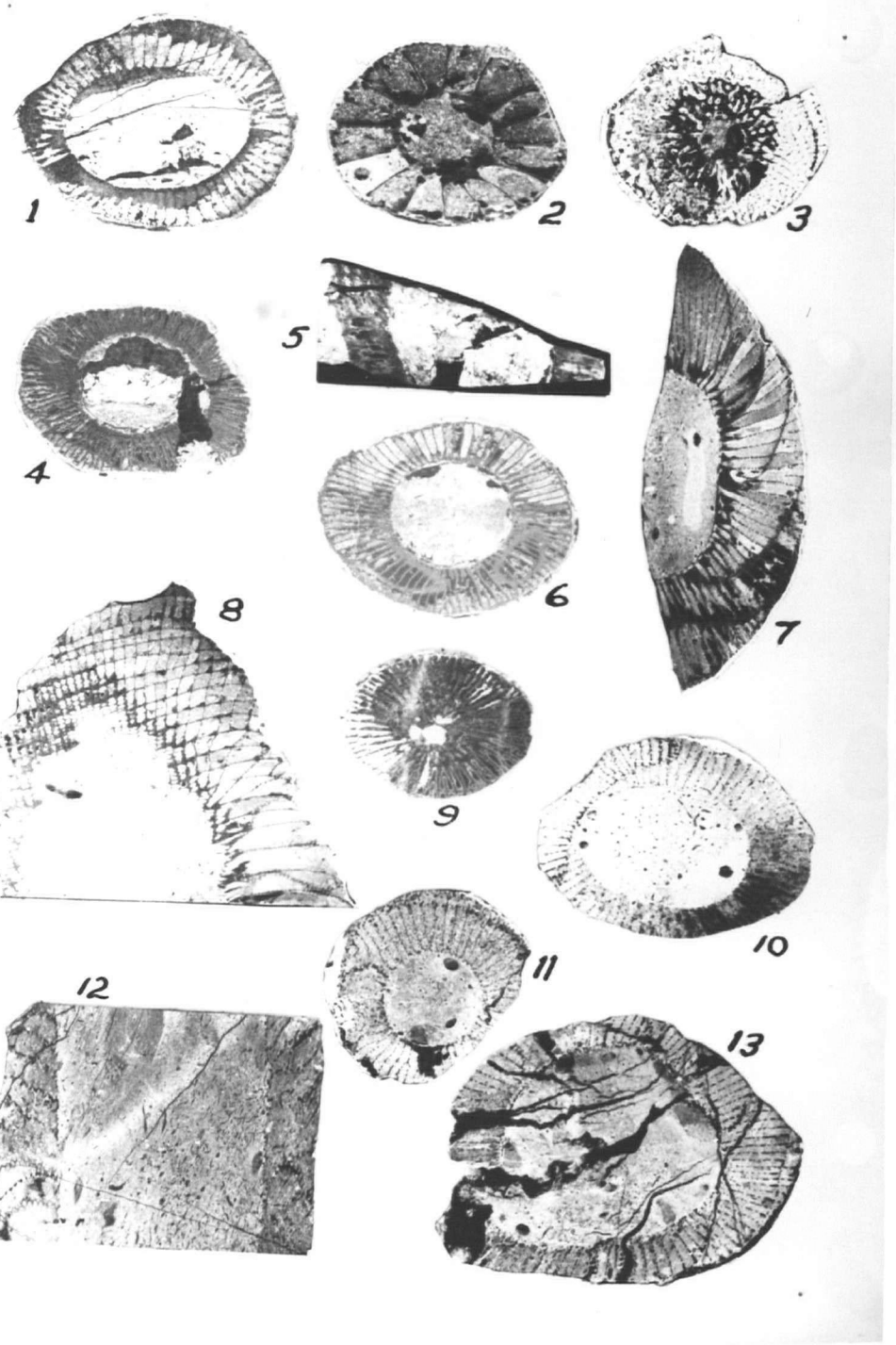
6. Coscinocyathus dentocanis Okulitch X 1½. No. 40-Y-6, G.S.C. Transverse thin section showing elliptical shape and simple radial parieties crossing the intervallum.

7. Coscinocyathus multiporus n. sp. X 1½. Holotype, No. 35-Y-13II, G.S.C. Transverse thin section showing porous parieties and tabulae.

8. Coscinocyathus multiporus n. sp. X 1½. Holotype, No. 35-Y-13II, G.S.C. Longitudinal thin section showing inner wall, parieties, and tabulae.

9. Coscinocyathus multiporus n. sp. X 1½. Holotype, No. 35-Y-13II, G.S.C. Transverse thin section, taken near the base of the specimen, showing narrow central cavity and thickened parieties.

PLATE I



10. Coscinocyathus cassiariensis n. sp. X2. Holotype, No. 35-Y-7, G.S.C. Transverse thin section showing porous radial parieties.

11. Coscinocyathus cassiariensis n. sp. X 2. Paratype, 35-Y-8, G.S.C. Transverse thin section showing radial parieties.

12. Coscinocyathus cassiariensis n. sp. X 2. Holotype, No. 35-Y-7, G.S.C. Longitudinal thin section showing tabulae and parieties.

13. Coscinocyathus cassiariensis n. sp. X 2. Paratype, No. 35-Y-9, G.S.C. Transverse thin section of large fragmental specimen.

PLATE II

Figs.

1. Coscinocyathus inequivallus n. sp. X 1.75. Holotype, No. AP-14, U.B.C. Longitudinal section showing tabulae, parieties, and central cavity.

2. Coscinocyathus inequivallus n. sp. X 3. Holotype, No. AP-14, U.B.C. Transverse thin section showing radial parieties, tabulae, and inner wall.

3. Coscinocyathus inequivallus n. sp. X 3. Paratype, No. AP-13, U.B.C. Transverse thin section.

4. Coscinocyathus inequivallus n. sp. X 1½. Paratype, No. AP-19, U.B.C. Longitudinal section showing parieties.

5. Coscinocyathus inequivallus n. sp. X 3. Paratype, No. AP-15, U.B.C. Transverse thin section of large specimen, and oblique section of smaller one showing tabulae.

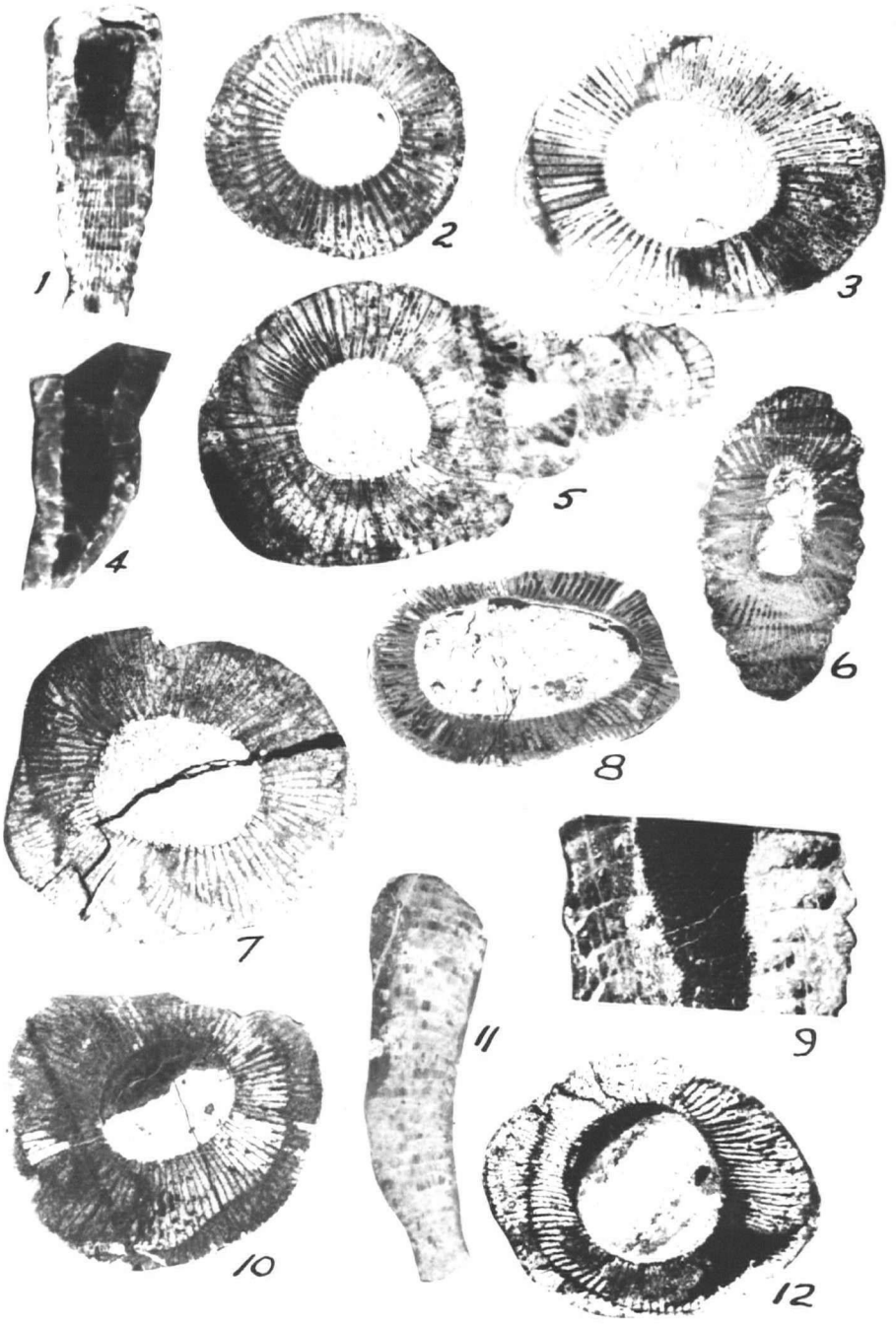
6. Coscinocyathus inequivallus n. sp. X 2. Paratype, No. AP-16, U.B.C. Oblique thin section showing weak annulation of outer wall.

7. Coscinocyathus serratus n. sp. X 2. Holotype, No. AP-17, U.B.C. Transverse thin section showing radial parieties and complex inner wall.

8. Coscinocyathus veronicus n. sp. X 1½. Holotype, No. 40-Y2, G.S.C. Transverse thin section showing narrow intervallum and radial parieties.

9. Coscinocyathus serratus n. sp. X 1.8. Holotype, No. AP-17, U.B.C. Longitudinal section showing tabulae and inner wall.

PLATE II



10. Coscinocyathus tubicornus n. sp. X 2. Holotype, No. 36-Y-11, G.S.C. Transverse thin section showing wide intervallum and porous parieties.

11. Coscinocyathus tubicornus n. sp. X 0.75 Holotype, No. 36-Y-11, G.S.C. Naturally weathered out specimen showing general form and tabulae.

12. Coscinocyathus sp. X 1½. No. 36-Y-10, G.S.C. Transverse thin section showing delicate, radial parieties, and tabulae. Width of intervallum is about half the diameter of the central cavity.

PLATE III

Figs.

1. Carinacyathus perforatus n. sp. X 1. Holotype No. 35-Y-12, G.S.C. Naturally weathered out specimen.

2. Carinacyathus perforatus n. sp. X 1½. Holotype No. 35-Y-12, G.S.C. Transverse thin section showing radial parieties and porous tabulae crossing the intervallum.

3. Carinacyathus perforatus n. sp. X 1½. Paratype, No. 35-Y-10, G.S.C. Transverse thin section showing parieties and tabulae crossing the intervallum.

4. Carinacyathus perforatus n. sp. X 1½. Paratype, No. 35-Y-10, G.S.C. Longitudinal thin section showing tabulae, parieties, and inner wall.

5. Carinacyathus perforatus n. sp. X 3. Holotype, No. 35-Y-12, G.S.C. Longitudinal thin section showing complex inner wall, and perforated parieties and tabulae.

6. Archaeocyathus cf. atlanticus Billings X 1½. No. 35-Y-14, G.S.C. Transverse thin section, taken from the upper portion of the specimen, showing intervallum.

7. Archaeocyathus cf. atlanticus Billings, X 1½. 35-Y-14, G.S.C. Transverse thin section taken from near the base of the specimen. Intervallum of flattened specimen is filled with irregular wavy taeniae.

8. Archaeocyathus (?) sp. X 1½. No. 41-Y-3, G.S.C. Transverse thin section showing intervallum crossed, in part, by irregular taeniae, and in part, by wavy parieties. Much of the intervallum region is replaced by calcite.

PLATE III

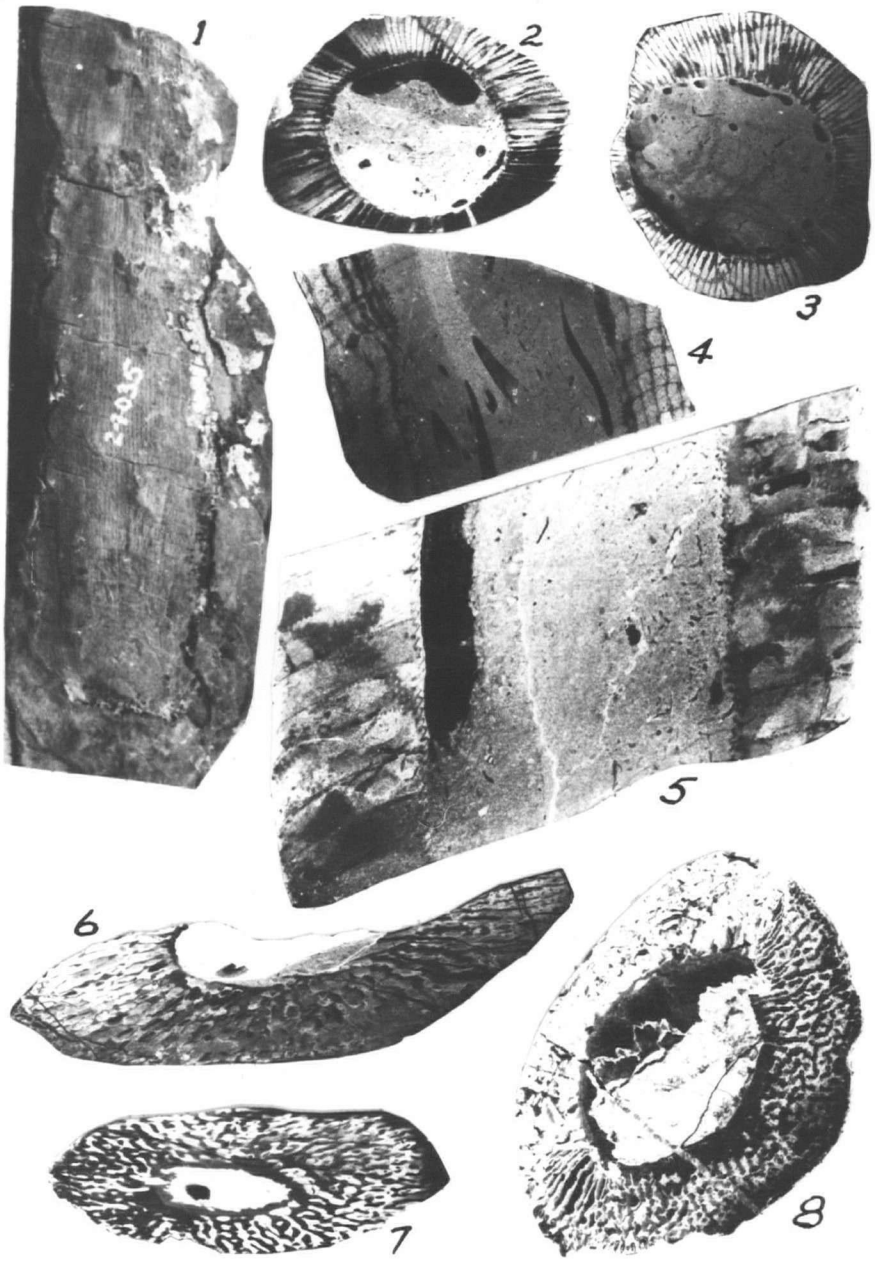


PLATE IV

Figs.

1. Pycnoidocyathus amourensis (Okulitch) X 2. No. 36-Y-9, G.S.C. Cross section showing wide intervallum. Inner wall is replaced by calcite.

2. Pycnoidocyathus columbianus (Okulitch) X 1. No. AP-22, U.B.C. Cross section showing wavy parieties with synapticulae.

3. Pycnoidocyathus cf. occidentalis (Okulitch) X 0.6. No. 36-Y-12. G.S.C. Naturally weathered out conical-shaped specimen.

4. Pycnoidocyathus cf. occidentalis (Okulitch) X 1½. No. 36-Y-3, G.S.C. Transverse thin section showing radial parieties with synapticulae.

5. Pycnoidocyathus cf. occidentalis (Okulitch) X 1½. No. 36-Y-2, G.S.C. Transverse thin section, taken from near the base, showing narrower central cavity.

6. Pycnoidocyathus cf. occidentalis (Okulitch) X 1½. No. 36-Y-1, G.S.C. Transverse thin section showing parieties and pores of inner wall.

7. Pycnoidocyathus cf. dissepimentalis (Okulitch) X 1.25. No. AP-25, U.B.C. Cross section showing parieties and dissepiments.

8. Pycnoidocyathus solidus n. sp. X 2. Holotype, No. 40-Y-7, G.S.C. Transverse thin section, taken from near the base of the specimen, showing nature of central cavity.

9. Pycnoidocyathus solidus n. sp. X 2. Holotype. No. 40-Y-7, G.S.C. Transverse thin section showing narrow central cavity, and wide intervallum crossed by wavy parieties with synapticulae.

PLATE IV

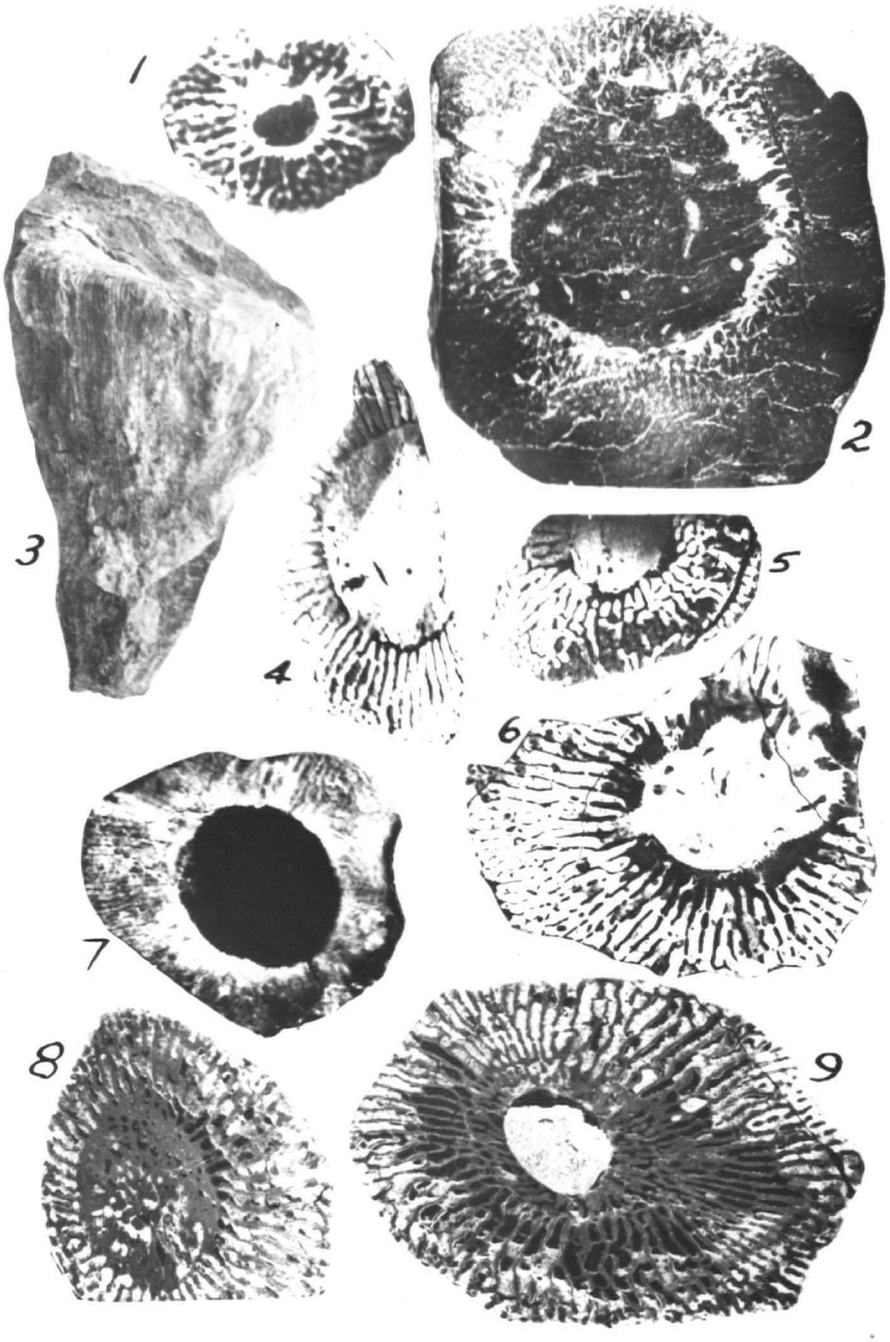


PLATE V

Figs.

1. Loculicyathus ellipticus n. sp. X 1½. Holotype, No. 35-Y-1, G.S.C. Transverse section showing parieties and dissepiments in the intervallum.

2. Loculicyathus ellipticus n. sp. X 2. Holotype, No. 35-Y-1, G.S.C. Longitudinal thin section showing vesicular tissue.

3. Loculicyathus ellipticus n. sp. X 1½. Paratype, No. 35-Y-2, G.S.C. Transverse thin section showing intervallum partly filled with dissepiments and partly clear.

4. Loculicyathus ellipticus n. sp. X 1½. Paratype, No. 35/y-2, G.S.C. Longitudinal thin section showing intervallum region.

5. Loculicyathus ellipticus n. sp. X 2. Paratype, No. 35-Y-3, G.S.C. Transverse thin section showing radial parieties and dissepiments.

6. Loculicyathus ellipticus n. sp. X 2. Paratype, No. 35-Y-3, G.S.C. Longitudinal thin section showing porous parieties.

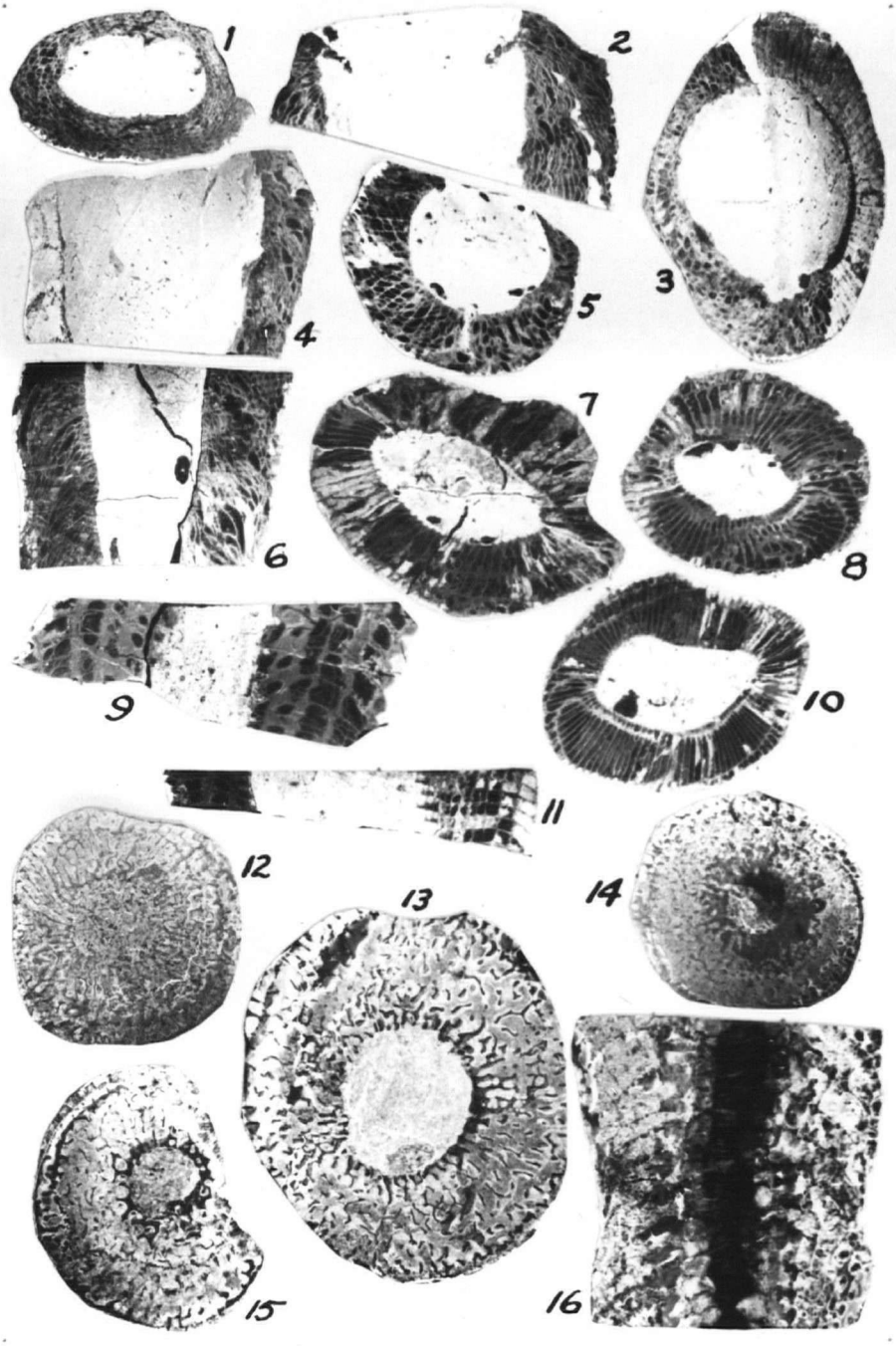
7. Metacoscinus poolensis n. sp. X 1½. Holotype, No. 40-Y-5, G.S.C. Transverse thin section showing parieties and dissepiments in the intervallum.

8. Metacoscinus poolensis n. sp. X 1½. Paratype, No. 40-Y-3, G.S.C. Transverse thin section showing parieties, dissepiments, and inner wall.

9. Metacoscinus poolensis n. sp. X 3. Paratype, No. 40-Y-3, G.S.C. Longitudinal thin section showing tabulae and dissepiments.

10. Metacoscinus poolensis, n. sp. X 1. Paratype, No. 40-Y-1, G.S.C. Transverse thin section showing thin parieties and porous tabulae.

PLATE V



11. Metacoscinus poolensis n. sp. X 1½. Paratype, No. 40-Y-1, G.S.C. Longitudinal thin section showing tabulae.

12. Metacoscinus sp. X 2. No. AP-6, U.B.C. Transverse thin section.

13. Claruscyathus ketzaensis n. sp. X 3, Holotype, No. AP-2, U.B.C. Transverse thin section showing irregular taeniae.

14. Claruscyathus ketzaensis n. sp. X 2. Paratype No. AP-1, U.B.C. Transverse thin section showing thick inner wall and irregular mass in the intervallum.

15. Claruscyathus ketzaensis n. sp. X 3. Paratype, No. AP-3, U.B.C. Transverse thin section showing Ethmophyllum-like inner wall.

16. Claruscyathus ketzaensis n. sp. X 3. Paratype, No. AP-1, U.B.C. Longitudinal thin section showing steeply dipping tabulae.