NEW PALEOZOIC FOSSILS FROM SOUTHERN HOKKAIDO, JAPAN

by

(with 1 Text-figure and 3 plates)

M. MINATO and C. L. ROWETT*

(Contribution from the Department of Geology and Mineralogy, Faculty of Science, Hokkaido University, No. 1052)

Geological mapping by members of the Geological Survey of Tokyo in 1966 resulted in the collection of a number of fossiliferous limestone samples from a small area in the southwestern part of Hokkaido, the northern island of Japan. This material was brought to the attention of Professor M. MINATO, Department of Geology and Mineralogy at Hokkaido University in Sapporo.

Paleontological study of these specimens has revealed that the fossils include representatives upper Paleozoic fusulinidae, chaetetid corals and the first known examples of Rugosa from Hokkaido. The rugose corals are described in this journal as *Carinthiaphyllum yezoense* n. sp. and the chaetetid corals as *Chaetetes* sp. The fusulinidae, although of value in establishing an approximate age for the strata in this area are too poorly preserved to warrant a detailed description.

The specimens in question were collected from four localities, by Mr. T. YOSHIDA and Mr. S. YAMAGUCHI of the Geological Survey, who provided the following locality information.

Localities 1, 2 and 3 (see map, fig. 1) are located on a small tributary of the Sumikawa River, about 13 km NNW from the town of Fukushima, Matsumae-gun, Hokkaido. Locality 4 is located in the upper part of the Tsuratsura River, near the village of Shiriuchi, Kamiiso-gun, Hokkaido. Both the Shiriuchi and Tsuratsura Rivers are tributary to the larger Shiriuchi River, which flows eastward across this part of Hokkaido (41°35′. 17 N Lat., 140°12′. 52 E Long).

Unfortunately, none of the four specimens were collected *in situ*, although limited limestone outcrops occur throughout this area. At localities 1 and 2, the limestones are dark gray to reddish colored crystalline bioclastic calcarenites and are associated with basic tuffs (" schalstein "), while at localities 3 and 4 the limestones are associated primarily with cherts and, although also bioclastic, tend to be black. All of the localities are within a radius of 1500 meters of each other.

* Visiting Professor of the Department of Geology and Minereralogy, Hokkaido University; University of Alaska, College, Alaska.

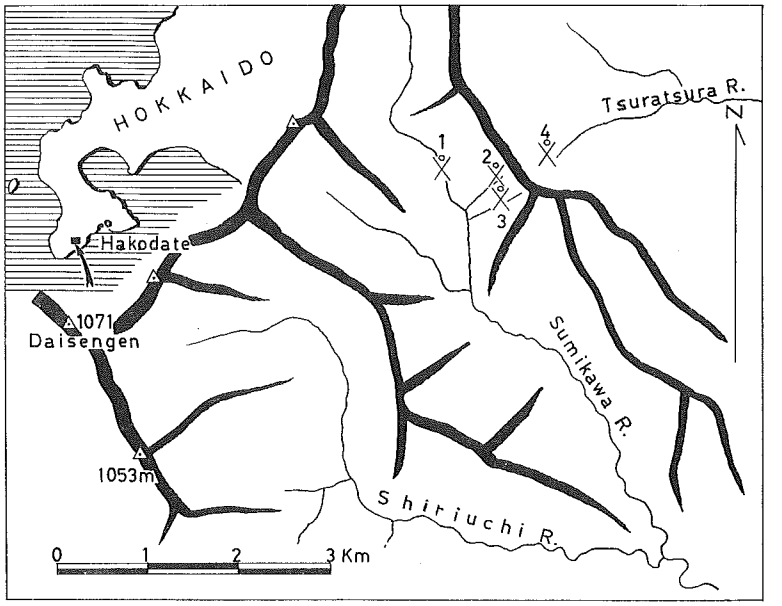

Fig. 1
Index map showing localities at which Paleozoic fossils were found in S. W. Hokkaido.

List of the new Paleozoic fossils from S.W. Hokkaido

	Loc. 1	Loc. 2	Loc. 3	Loc. 4
Carinthiaphyllum yezoense MINATO and ROWETT	$\times_1$			
Chaetetes sp		$\times_2$	$\times_6$	$\times_8$
?*Fusulinella* sp. A		$\times_3$	$\times_7$	$\times_9$
Fusulinella sp. B		$\times_4$	$\times_5$	

$\times_1$: UHR. nos/.17891, 18792, 18793, 18794, 18795, 18796a, b, c, d, e.
$\times_2$: UHR. nos/.18798, 18799.
$\times_3$: UHR. no. 18799
$\times_4$: UHR. no. 18798
$\times_5$: Geol. Surv. Tokyo, reg. no. 66278
$\times_6$: UHR. nos/.18812, a, b, d, d, e, f, g, h and UHR. no. 18813 (6)
$\times_7$: UHR. nos/.18813 (1) (3) (4) (7).
$\times_8$: UHR. no. 18797.
$\times_9$: UHR. no. 18797.

It is hoped that detailed mapping of this area next year will establish the precise stratigraphic relations of these localities, although it seems likely that they represent nearly equivalent horizons.

Material. The limestone fragment from locality 1 contains examples of *Carinthiaphyllum* and chaetetid corals. Two of the thin sections of corals, one tangental (Reg. no. 18798) and one longitudinal (Reg. no. 18799) were provided by T. YOSHIDA

(originally labeled Daisengen 66139b and 66139c respectively); one of these, however, (Reg. no. 18799) is almost completely recrystallized and is of limited value.

A thin section from locality 2, also provided by T. YOSHIDA (Daisengen 66278) contains only an oblique section of a fusulinid. This has been identified as *Fusulinella* sp.

From locality 3 a limestone slab was collected that contains a water-worn fragment of a chaetetid coral colony. This specimen was cut into four blocks that were polished on three or four mutually perpendicular surfaces. In addition, three thin sections were prepared, including one transverse section (Reg. no. 18812e), one longitudinal section (Reg. no. 18812g) and a tangental section (Reg. no. 18812f).

From locality 4 a transverse thin section (Reg. no. 18797), provided by T. YOSHIDA, was also available.

The authors wish to thank Messers T. YOSHIDA and S. YAMAGUCHI of the Geological Survey of Tokyo, who kindly placed their fossil material at the disposal of the senior author. Thanks are also due to Dr. M. KATO who was of assistance in various ways in the description of the corals and to Dr. S. HONJO, who provided measurements of the associated fusulinidae.

Description

Carinthiaphyllum yezoense n. sp.

Pl. 39, figs. 1-5; pl. 40, figs. 1-6.

Material.—Limestone slab containing fasciculate corals from which three transverse thin sections (Reg. nos. 18791, 18792 and 18793) were made (Holotype). A second slab (Paratype) was collected at the same locality as the holotype specimen and was cut and polished to observe longitudinal structures in the corallites. Five replicas (Reg. nos. 18796a—e) were obtained from this specimen.

Locality.—No. 1

Specific diagnosis.—Carinthiaphyllum with only slightly expanded axial end of cardinal septum. Pinnate arrangement of major septa retained throughout the ephebic stage. Without lonsdaleoid dissepiments.

Derivation of specific name.—These specimens are the first Paleozoic rugose corals to be discovered in Hokkaido, the northern island of Japan. The old name of Hokkaido was *Yezo*, which is chosen as the basis of the species name.

Description.—The growth form of this coral is imperfectly known owing to the incomplete specimens, but is definitely fasciculate and probably phacelloid. Corallites are quite closely spaced and in some instances are in contact with each other, even in the mature stages of growth. Young individual corallites are observable to be both in contact with mature specimens with an intervening common wall and without any trace of an intervening wall where laterel increase (budding) occurs.

Corallites observed in transverse sections are round or subround in outline, although some deformed and obliquely cut specimens are irregularly elliptical. The outer walls of corallites are moderately thick (up to 0.3–0.2 mm) from the earliest stages observed and are composed of fibrous skeletal tissue arranged perpendicularly to the epithecal surface.

In the smallest corallite observed, in which the calicular diameter is about 1 mm, neither septa, tabulae nor dissepiments are present; in this early stage of growth corallites consist essentially of a hollow tube. In corallites with diameters of slightly less than 2 mm, several very short ridge-like septa appear; simultaneously the cut edges of tabulae can be observed. In this growth stage (brephic) tabulae in the axial area appear as straight lines in transverse sections, while those in the peripheral portion of corallites appear as curved lines whose convex sides face inward.

At diameters of approximately 2.5 mm (early neanic), major septa are longer and more numerous (10 to 12) and minor septa are locally developed. The cardinal septum is easily distinguished in this stage of growth because of its greater length, while the counter septum seems to be somewhat shorter than lateral septa in the counter quadrants. Pinnate arrangement of septa is pronounced.

In corallites of still larger diameters, approximating 3.5 mm, septa thicken peripherally and are wedge-shaped. Major septa are up to 1 mm in length in this stage and range from 16 to 18 in number. Minor septa are now uniformly developed and alternate regularly with major septa; they are about one-half as long as the major septa and tend to be contratingent, especially in the cardinal quadrants. Pinnate septal arrangement is still distinct and the cardinal septum extends into the axial area where it is joined with the counter septum, now also elongated. Only slight distal swelling of the cardinal septum is present.

In the mature (ephebic) growth stage, corallites reach a maximum diameter of approximately 5 mm. Up to 20 major septa are present and are thickened to form a peripheral stereozone. Pinnate septal arrangement persists throughout this stage, particularly in the cardinal quadrants. The distal end of the cardinal septum is dilated to a maximum of about 0.25 mm in alar diameter. Septal microstructure is of the fibro-normal to diffuso-trabecular types.

Dissepiments are not clearly observable in transverse sections of any stage of growth, but can be distinctly seen in longitudinal sections of the mature stages. Dissepiments are elongate, up to 2.5 to 3 mm in their longest dimension, and

arranged in several tiers adjacent to the epitheca. Lonsdaleoid dissepiments appear to be absent in this form. Tabulae are irregularly spaced and steeply inclined downward toward the axis of corallites.

Remarks.—In size, septal number and apparent lack of lonsdaleoid dissepiments, the present species most closely resembles *Carinthiaphyllum carnicum* HERITSCH (1936, p. 137, pl. XVI, figs. 11–13, text-fig. V, fig. 41: note that fig. 40 is erroneously labeled " *Carinthiaphyllum carnicum* n. sp." but is, according to the specimen number recorded (Nr. 429) actually the holotype species, *C. kahleri.*

The Hokkaido specimens, however, differ from *C. carnicum* in several respects. HERITSCH's species has a prominent columella formed by the expansion of the axial end of the cardinal septum, while the cardinal septum in *C. yezoense* n. sp. is only slightly swelled distally and is slender throughout all stages of growth. Moreover, the pinnate arrangement of septa in the new species is retained throughout the ephebic stages; although a pinnate pattern is evident in the early growth stages of *C. carnicum*, septal arrangement is essentially radial in mature corallites.

Fossils associated with the Hokkaido corals include *Chaetetes* and *Fusulinella*, which indicate a Middle Carboniferous age. Thus *C. yezoense* n. sp. may represent the oldest known species assignable to this genus. When compared to other described species of *Carinthiaphyllum*, *C. yezoense* n. sp. is rather primitive in morphology. For example, the pinnate septal arrangement of this species is confined to the early ontogeny in *C. carnicum;* similarly, the slender cardinal septum of *C. yezoense* n. sp. compares to the condition observable in the neanic stage in some corallites of the type species, *C. kahleri* (e.g., HERITSCH, 1936, text fig. IV, fig. 39, spec. 429/7c/1). The absence of lonsdaleoid dissepiments in *C. yezoense* may also be significant in this respect.

Chaetetes sp. "A"

pl. 41, figs. 3 and 4.

Material.—The following description is based on newly acquired material from three localities in SW Hokkaido, Japan.

From locality No. 1, a fragment of limestone containing *Carinthiaphyllum yezoense* n. sp. and chaetetid corals. Two thin sections of the latter were prepared, one tangental (Reg. No. 18798) and one longitudinal (Reg. No. 18799). These specimens were provided by T. YOSHIDA, Geological Survey of Tokyo, and were originally labeled by him as Daisengen 66139b and 66139c respectively. Section 66139c (UHR Reg. No. 18799) is, however, almost completely recrystal-

lized and of little value for detailed study.

From locality No. 3, a limestone slab (Reg. No. 18813) in which a water-worn fragment of a chaetetid colony is embedded. This specimen was cut into four blocks which were then polished on three or four mutually perpendicular surfaces. Three thin sections were prepared, including a transverse section (Reg. No. 18812e), a longitudinal section (Reg. No. 18812g) and a tangental section (Reg. No. 18812f).

From locality No. 4, a transverse thin section (UHR. No. 18797), also provided by T. YOSHIDA, was prepared from a third specimen containing chaetetid corals.

Description.—The limestone slab from locality (1) is a calcarenite in which the chaetetid coral is associated with crinoid columnals, bryozoan skeletal material, fragments of brachiopod shells and a few fusulinid tests. The limestone consists of intraclasts of various shapes, but mostly angular or subangular, and locally coated by oolitic rims. The external form of the chaetetid corallum appears originally to have been elliptical in cross section; longitudinally, the corallum is subconical, with a broad base. The upper surface of the corallum is slightly convex. The complete corallum may have been approximately 80 mm in diameter and 40 mm in height.

Thin section 18813e cuts the corallum transversely near its upper surface. Because of the gentle convexity of this surface, corallites intersected by this section are cut obliquely in the peripheral parts of the section; well oriented transversely cut corallites are restricted to the central area in the section. These are irregularly polygonal and most corallites are slightly elongated, including elongate hexagonal, hexagonal, elongate pentagonal, pentagonal, elongate tetragonal, tetragonal and subround forms. Measurements of typical corallites are shown below:

	Long diameter (mm)	Short diameter (mm)
elongate hexagonal	0.85	0.55
elongate pentagonal	0.80	0.55
elongate pentagonal	1.00	0.50
elongate pentagonal	0.70	0.55
elongate tetragonal	0.60	0.50
elongate tetragonal	0.65	0.55
tetragonal	0.65	0.60

Measured in the direction of corallite elongation, 7 or 8 corallites occur in a distance of 5 mm, while as many as 10 or 11 corallites occur within this distance measured normal to the direction of corallite elongation. Corallite walls are characteristically quite thick: for example, in an elongate hexagonal corallite with maximum and minimum diameters of 0.60 and 0.46 mm respectively, the wall averages about 0.2 mm in thickness; in an elongate tetragonal corallite (diameters

approximately the same) the wall thickness ranges from 0.24 to 0.30 mm; in an elongate hexagonal corallite with diameters of 0.64 and 0.50 mm, the wall is uniformaly 0.24 mm in thickness.

Corallite walls are composed of a central transluscent layer that consists of distally diverging fine calcite fibers and darker layers on either side. Although locally almost opaque, the latter can be observed to consist of the ends of the diverging fibers that make up the central zone (i.e., there is no change in the orientation of the fine structure of the walls in their lateral parts). The central layer ranges from about 0.60 to 0.10 mm in width and is rather constant in a given corallite; the darker layers range from 0.03 to 0.05 mm in width in most corallites but locally may be almost absent. It is assumed that the darker color of these layers is due to the incorporation of organic material in the aragonite (?calcite) crystals during the spherulitic crystalization of vertical skeletal elements. Because these daker zones diverge distally at points of corallite increase (appearence of new offsets), adjacent corallites share a three-layered wall in transverse sections.

Thin section 18812g is a longitudinal section, in part well oriented, in which numerous slightly flexuous corallites are intersected. Measured normal to the growth axis of the colony, as many as 14 to 15 corallites occur within a distance of 5 mm. The average diameter of these corallites (about 0.33 mm) suggests that this section represents the younger (" immature ") portion of the corallum. Intermural increase occurs at intervals of from 5 to 6 mm in the lower part of this section, increasing to intervals of about 2 mm in the central part and to about 1 mm in the upper part. New corallites (offsets) widen rapidly to diameters approximating that of the parent corallite within a few millimeters of the point of increase. Locally, from 2 to 4 new corallites may simultaneously arise from a single antecedent, but single offsets are most common. In one portion of this section, at least 32 corallites arise from an original 4 corallites within a vertical distance of 20 mm.

Tabulae are thin (0.04 to 0.06 mm), complete, and subhorizontal. In general, tabulae are uniformly spaced along the corallites, with an average of 15 tabulae occuring through a vertical distance of 5 mm. The average distance between tabulae is thus approximately 0.35 mm, but locally this distance may be as much as 0.71 mm or as little as 0.16 mm. The fine structure of tabulae consists of a dark median line, commonly poorly defined, that is flanked proximally and distally by transluscent layers composed of short calcite fibers that are oriented perpendicularly to the plane of the tabulum.

Thin section 18812f is a tangental section in which the corallites are disposed subparallel to each other. An average of 11 corallites occur within a distance of 5 mm, measured normal to the growth direction. Tabulae are thin (0.03 to 0.04 mm) and although in general uniformly distributed along most corallites at intervals of 0.20 to 0.24 mm, this spacing varies from 0.08 to 0.40 mm.

Thin section 18797 is a slightly oblique transverse section in which corallites

are irregularly polygonal, elongated or curved. Measurements of typical corallites are given below:

	Long diameter (mm)	Short diameter (mm)
elongate hexagonal	0.74	0.40
elongate hexagonal	0.74	0.44
elongate hexagonal	0.64	0.44
tetragonal or subround	0.48	0.46
elongate tetragonal	0.44	0.34

Corallite walls in this section commonly range in thickness from 0.06 to 0.08 mm, but may vary within a single corallite from 0.04 to 1.0 mm.

Remarks.—Although it is not possible to say with certainty that the chaetetid coral specimens described above are conspecific, it is probably best to regard them as belonging to a single species at this time. The description given above nevertheless is arranged so as to permit separate comparison of any new material that may be found in southwestern Hokkaido with each of the three specimens. Material is inadequate for a formal species designation, however.

Collectively, these specimens appear to represent *Chaetetes* coralla that are elliptical in cross section and on the order of 80 mm in diameter and 40 mm in height. Individual corallites are irregularly polygonal and have a tendency for elongation in transverse sections; the most common forms are elongate hexagonal, pentagonal and tetragonal, although subround corallites also occur. Corallites increase in average diameter from about 0.33 mm in the lower portion of the coralla to 0.60 or 0.70 mm in the upper part. Corallite walls are compartively thick, and rarely are less than 0.24 mm across. Walls consist of distally diverging calcite fibers which are transluscent in the central part of the wall and darker laterally. Longitudinaly, corallites may be straight, but most are slightly flexuous. Reproduction is by intramural increase, with offsets appearing at intervals of 5 or 6 mm in the lower portions of coralla to intervals of 2.0 to 2.5 mm in the upper parts. Tabulae are thin (commonly about 0.04 mm in width), complete, and most commonly subhorizontal, although slightly convex or concave tabulae are also present. In general, tabulae are spaced with remarkable uniformity at intervals of about 0.24 mm, but extremes of 0.03 to more than 0.70 mm were recorded. There is a general trend for tabulae to be most densely distributed in the marginal parts of coralla. Average corallite diameters are also somewhat greater in these regions.

Chaetetes is a rather common genus in the Paleozoic of Japan, especially in limestones now referred to the *Fusulinella* zone such as the Akioshi and Omi limestone plateaus of western Honshu. Chaetetid corals from those areas were described by OZAWA (1925) and HAYASAKA (1924); however, because of the extremely poor preservation of their material, a meaningful comparison with the Hokkaido

specimens is not possible.

Chaetetes nagaiwaensis MINATO (1955, p. 190, pl. 19, fig. 1; pl. 38, fig. 2), from the *Profusulinella* zone in the Kitakami Mountains of northeastern Honshu, differs from the present form in having corallites that are more regular in both form and size, more closely spaced tabulae, and thinner corallite walls. *Chaetetes praemosquensis* VASS. (1964, p. 61, pl. 1, fig. 1) from upper Paleozoic strata of the Donez basin also can be distinguished from the Hokkaido specimens on the basis of these characters.

Many species of *Chaetetes* have been described from the Middle Carboniferous of China. Among these, *Chaetetes raritabularis*, *C. flexilis*, *C. luntanensis* (LEE et CHU 1930) and *C. thomsoni* Reed (1927) have as a common character very widely spaced tabulae and differ from the Hokkaido chaetetid corals primarily in this respect. *C. radians* FISCHER (1828) from the Moscovian of Russia and *C. Subradians* MANSUY (1912) from eastern Yunann, China, resemble the present specimens somewhat in having relatively large corallites with thick walls but these two species also differ with respect to their widely spaced tabulae.

Chaetetes penchiensis CHU (1928, p. 233, pl. 1 fig. 1a-c), from the Moscovian of North China, is generally similar to the present form but has thinner corallite walls and corallites are elongated in varying directions. *C. tangshanensis*, also described by CHU (1928) from this region, is morphologically closer to the Hokkaido specimens than any species thus far discussed but nevertheless differs slightly in having thinner corallite walls and smaller corallite diameters.

Thus, while the possibility that the Hokkaido specimens of *Chaetetes* are conspecific with any described species from the mainland of Asia is not precluded, the generally poor preservation of material, obliquity of thin sections, inadequate illustrations and descriptions of species as well as lack of access to original type specimens makes it impossible to arrive at any firm conclusions pertaining to the identity of the Hokkaido specimens at this time.

It is, however, possible to observe that a general trend appears to be present among chaetetid corals that may be of significance in phylogenetic studies of this group. Older species, such as *Chaetetes nagaiwaensis* and *C. praemosquensis*, are in general characterized by relatively small, thin-walled corallites which are quite regular in size and form and are further typified by densely distributed tabulae. Stratigraphically higher (i.e., younger) species of *Chaetetes*, such as examples from the *Fusulinella* zone of Japan and China consist of larger thick-walled corallites, which nevertheless are rather variable in size and in form, and in which tabulae tend to be more distantly spaced. Although exceptions doubtless can be found to this general trend, the Hokkaido specimens of *Chaetetes* seem to represent the younger, or more advanced, type. Their association with fusulinidae tentatively identified as *Fusulinella* thus tends to be consistent with this general trend.

Remarks on associated fusulinidae (Pl. 41, figs. 1–2)

Two types of fusulinid tests occur in the newly obtained material from southwestern Hokkaido. One form is comparatively small; however, the outer volutions of these tests are not preserved and the maximum original dimensions of these specimens thus are unknown. These tests have a rather long axis of coiling and low, broad chomata. The microstructure of the test wall is somewhat recrystallized, but a narrow diaphanotheca is definitely present.

Fusulinid tests of this type were found in thin sections of limestone slabs from all localities except locality no. 2 (see locality descriptions, above). Unfortunately, all specimens observed are fragmental and in no case are the outer volutions preserved. These small forms are have referred to as *?Fusulinella* sp. *A* (Pl. 41, fig. 2).

The second type, here provisionally called *Fusulinella* sp. *B* (Pl. 41, fig. 1) have comparatively large tests and occur in thin sections of material from localities 1 and 2. The following information is based on a thin section (Geol. Surv. Tokyo Reg. no. 66278) from locality 2, in which the test is well preserved but obliquely cut: Shell comparatively large, with radius vectors of approximately 0.35, 0.60, 1.00 and 1.35 mm from the fourth to the seventh volutions, respectively. Precise measurements are impossible and these are estimated from a tangental section. The height of chambers is rather uniform except in the polar regions where volutions increase slightly in height. The total number of volutions probably is in excess of seven, but only seven are preserved. This specimen is 2.7 mm wide and more than 3.2 mm long; the form ratio of a well oriented intact specimen would probably fall between 1.5 and 1.6.

The proloculus is intersected tangentially and is thick-walled. The diameter of the proloculus could not be determined. Early volutions are difficult to observe, but the first few are tightly coiled and have a spherical axial profile. Outer volutions increase uniformly in height and the general outer configuration of the test is rhomboidal or biconvex.

The spirotheca consists of a tectum, diaphanotheca, and inner and outer tectoria. The diaphanotheca appears in the second volution, where the inner and outer tectoria are also well developed, and these zones are present throughout subsequent whorls. The thickness of the equitorial spirotheca from the third to the seventh volution is approximately 20, 20, 22, 25 and 27 microns respectively.

Septa are planar throughout the test; the septal count in the sixth and seventh volutions is 24 and 30 respectively. The tunnel is narrow in the inner four volutions and widens only slightly in the outer volutions. Chomata are well developed in all volutions and have vertical sides adjacent to the tunnel. The chomata of this form are particularly high and prominent. Axial filling is very slight or absent.

Detailed comparison of these imperfect and poorly preserved fusulinids to

described species is obviously not warranted; however, the overall morphology and form is similar to highly specialized species of *Fusulinella* such as *F. iowensis* THOMPSON or to primitive species of *Fusulina*, such as *F. akiyoshiensis* TORIYAMA and *F. girtyi* DUNBER and CONDRA. In *Fusulinella iowensis*, however, the early volutions are coiled at angles as high as 90° to the axis of coiling of the outer volutions. Although the early stages of the specimens from Hokkaido are not well oriented, they appear to have a simple axis of coiling throughout all stages of growth. Although similar to *Fusulina akiyoshiensis* and *F. girtyi* as regards outer form and type of coiling, the plane septa of the Hokkaido specimens are in sharp contrast to these species.

In summary, the size, external form and internal characters of these specimens permit a tentative assignment to *Fusulinella;* they most closely resemble described species from the upper *Fusulinella* zone and lower part of the *Fusulina* zone. Thus their association with *Carinthiaphyllum yezoense* n. sp. is interesting inasmuch as it tends to confirm the observation that this new species of *Carinthiaphyllum* is rather primitive in its morphology. Prior to this note, the known range of previously described species of *Carinthiaphyllum* was from the upper Carboniferous *Triticites* zohe to the lower Permian *Pseudoschwagerina* zone.

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PLATE 39 AND EXPLANATION

Explanation of Plate 39

Carinthiaphyllum yezoense MINATO and ROWETT n. sp

Fig. 1 UHR. no. 18793 × 5.0
Fig. 2 UHR. no. 18792 × 5.0
Fig. 3 UHR. no. 18796d × 3.0
Fig. 4 UHR. no. 18791 × 5.0
Fig. 5 UHR. no. 18791 × 5.0

Plate 39

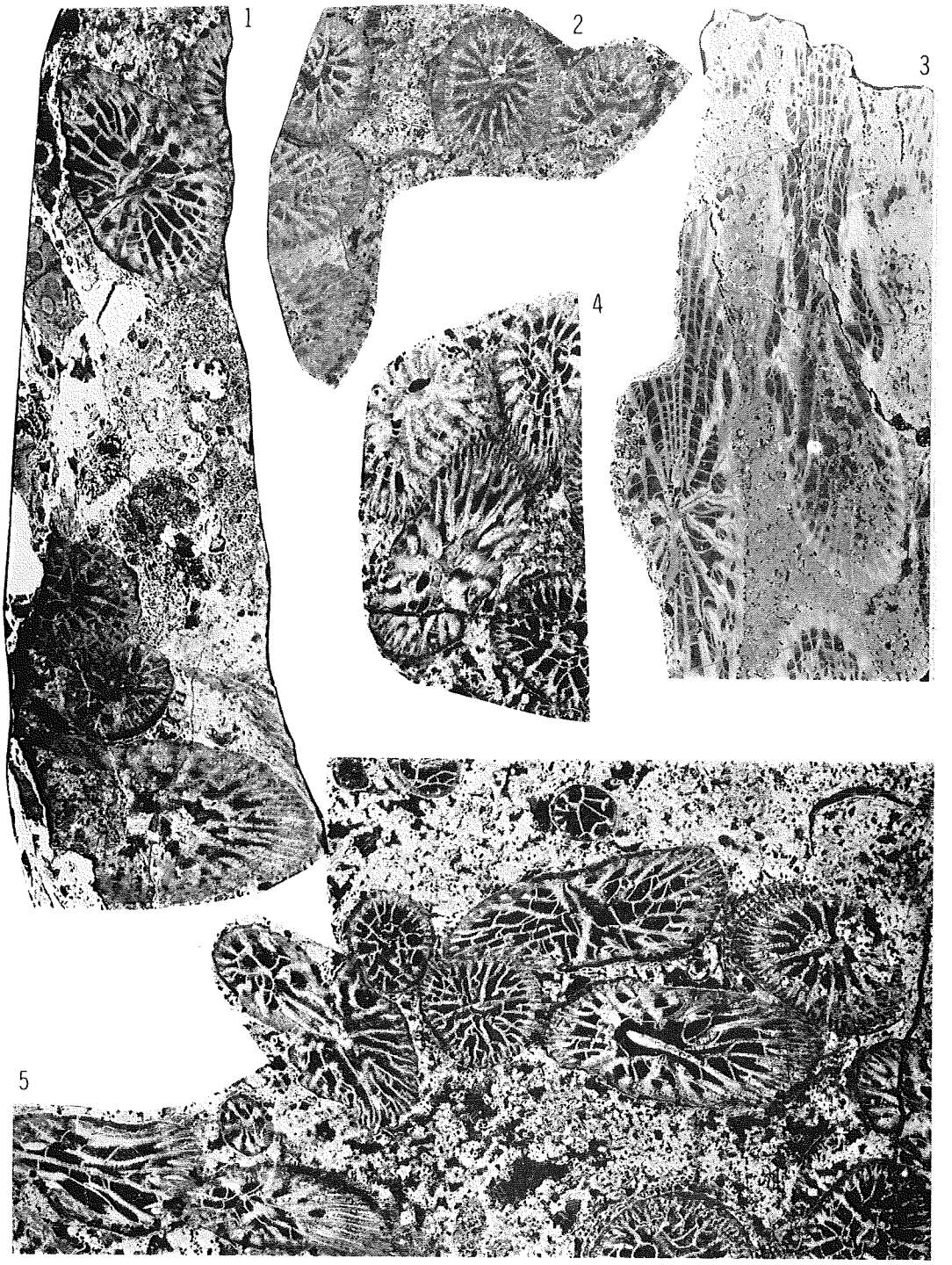


PLATE 40 AND EXPLANATION

Explanation of Plate 40

Carinthiaphyllum yezoense MINATO and ROWETT n. sp.

Fig. 1 UHR. no. 18792 × 5.0

Fig. 2 UHR. no. 18794 × 5.0

Fig. 3 UHR, no. 18793 × 5.0

Figs. 4a–4k × 5.0 showing ontogenic development in several different corallites, UHR no 18793

Figs. 5–6. UHR. no. 18791 × 25.0, showing microstructure of corallite

Plate 40

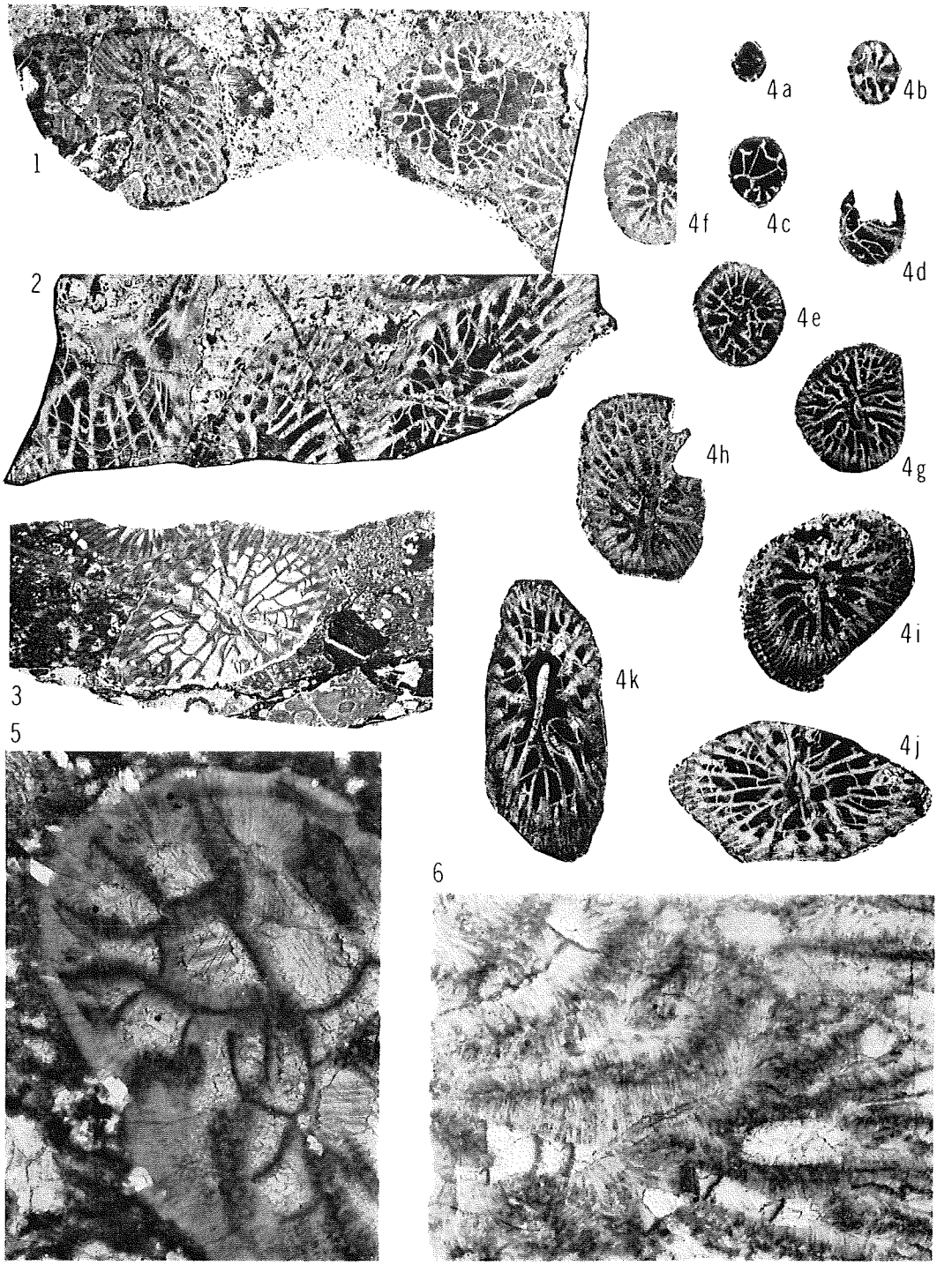


PLATE 41 AND EXPLANATION

Explanation of Plate 41

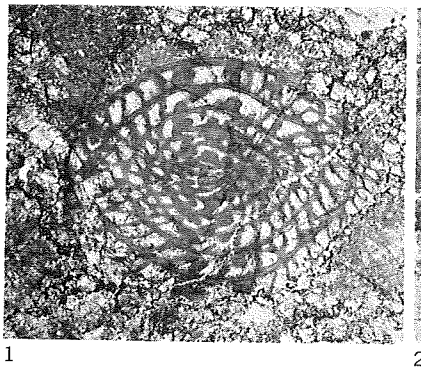
Fig. 1 *Fusulinella* sp. B
Reg. no. 66278, Geol. Surv. Tokyo × 11 5

Fig. 2 ? *Fusulinella* sp. A
UHR. no. 18799 × 10. 0

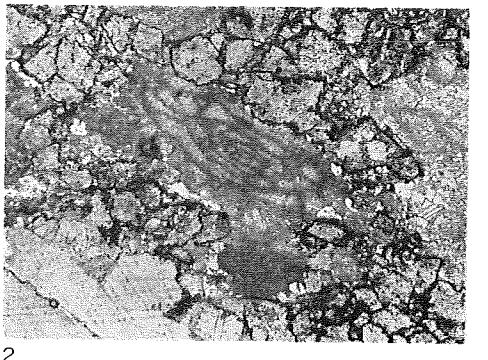
Fig. 3 *Chaetetes* sp. A
UHR. no. 18812e × 3. 2

Fig. 4 *Chaetetes* sp. A
UHR. no. 18812g × 2. 8

Plate 41



1



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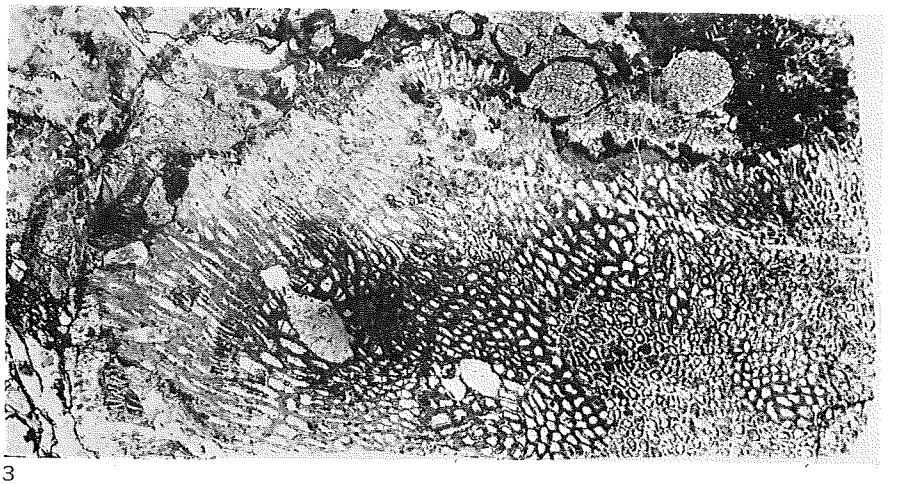
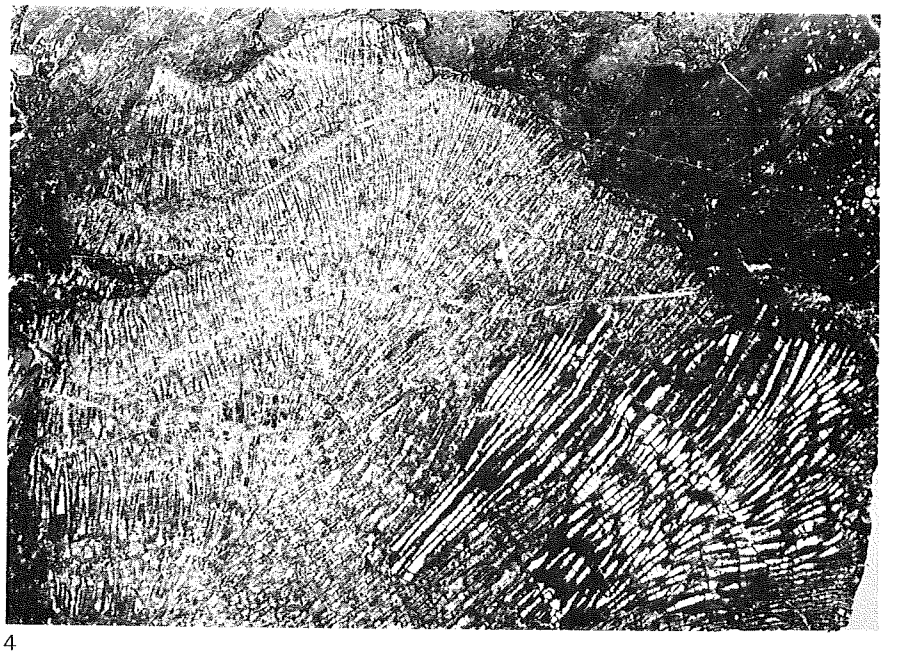


3



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