

THE CARNIAN REEF COMPLEX ON THE POKLJUKA (NW YUGOSLAVIA)

KARNIJSKI GREBENSKI KOMPLEKS NA POKLJUKI

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ABSTRACT

UDC 551.761.3 (234.3)

56 (116.13) (234.3)

The Carnian reef complex on the Pokljuka (NW Yugoslavia)

Continuous reef sedimentation throughout Carnian was established. On the basis of position and fossil assemblage the reef complex was subdivided into Cordevolian, Julian and Tuvanian. Studied were 23 species of reef fossils which comprise corals, chaetetids, stromatoporoids, solenoporids and microproblematica. Among them appear two new genera and three species of corals and one of chaetetids. In the paleoecological respect the reef complex represents shallow marine deposition on the Julian carbonate platform. Laterally it passes into deeper marine deposits of intraplatform channels which are connected to the Slovenian basin.

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IZVLEČEK

56 (116.13) (234.3)

Karnijski grebenski kompleks na Pokljuki

Ugotovljena je neprekinjena grebenska sedimentacija skozi ves karnij. Na podlagi lege in fosilne združbe je grebenski kompleks razčlenjen na cordevol, jul in tuval. Obdelanih je 23 vrst grebenskih fosilov, ki obsegajo korale, hetetide, stromatopore, solenopore in mikroproblematica. Med njimi so novi dva rodova in tri vrste koral ter ena hetetida. V paleoekološkem pogledu predstavlja grebenski kompleks plitvomoško sedimentacijo na Julijski karbonatni platformi. Lateralno prehaja v globljemorske sedimente intraplatformnih kanalov, ki so povezani s Slovenskim bazenom.

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INTRODUCTION

In the western part of the Pokljuka Mountain in the Lemovce area Carnian coral-chaetetid complex of about 5 km² of surface was discovered, lying between the alpine pasturage of Praprotnica, Rudno polje and the Sport Hotel. The reef limestone occurs in this area in uninterrupted continuous sedimentation.

The reef limestone was discovered first by us not earlier than in 1978 during investigation for the Basic geological map of sheets Tolmin and Videm (Udine). The characteristic reef fossils from this limestone were mentioned preliminary in 1982 (BUSER & al.). Interesting "pockets" of halobian lumachelles in the upper reef limestone were described a year later (KOLAR-JURKOVŠEK & al. 1983). The position of the reef complex among surrounding rocks is visible on the Basic geological map (BUSER 1986a) and its description appears in the guidebook to the mentioned map (BUSER 1986b).

In the present treatise the fossils are studied in detail from the reef complex which were collected in ten localities along the forest road between the Srenjski pašnik and the Sport Hotel. On the location map, they are marked by numbers 14413, 14415, 14416, 14418, 14419, 14741, 14742, 14744 and 14745 (Fig.1).

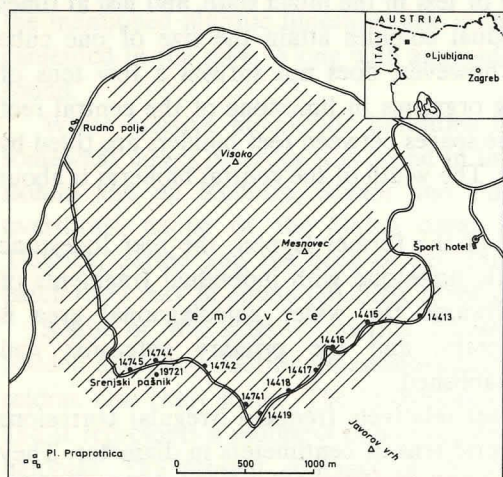


Fig. 1. Location map of Carnian Reef complex on Pokljuka. Reef fossil localities are marked with numbers from 14413 to 14745.

Sl. 1. Lokacijska karta karnijskega grebenskega kompleksa na Pokljuki. Nahajališča z grebenskimi fosili so označena s številkami od 14413 do 14745.

Determined were 23 species of reefbuilding fossils which belong to corals, chaetetids, stromatoporoids algae-solenopora and microproblematica. More in detail corals and chaetetids are described; among them 8 species were first found in Slovenia. Two genera and three species of corals and one species of chaetetids are new.

The Carnian complex could have been subdivided on the basis of fossils and its position to Cordevolian, Julian and Tuvalian ages.

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GEOLOGICAL BUILDUP OF THE TERRITORY

Stanko Buser

Lithological composition of the reef complex

The central part of the reef complex, the reef proper, consists of light grey biolithitic massive limestone. It is composed of coral-chaetetid and other in situ living reef organisms which occur more or less in the intact state, and just at times broken and in part redeposited. Individual colonies attain the size of one cube meter and more. Their average size, however, does not surpass a few tens of centimeters. The content of reefbuilding organisms in limestone of the central reef body is at least 50 percent and more. The spaces between reef builders are filled by their debris and by biosparitic limestone. The width of the central bioherm is about 2 km.

Towards the north, in the direction of the former lagoon, the reef limestone passes into biocalcarenic and biosparitic limestone with individual fragments of various reef organisms. Farther northwards the wider paleolagoonal area is unfortunately covered by glacial morain, and the primary extension and paleogeographic conditions cannot be established.

At the southern rim of the central reef relatively frequent irregular corrosions or paleokarstic hollows occur, up to several tens of centimeters in diameter. They are filled by brownish to reddish marly micritic limestone.

Southwards, i.e. in the direction of the former deep and open sea, the reef limestone passes laterally into a several to 30 meters wide belt of massive light grey biocalcarenic limestone which contains numerous remains of echinids and crinoids, as well as fragments of corals. In places in this limestone also smaller

fossil remains occur, in form of small patch reefs. Even farther southwards follows an about 20 meters wide belt of fore-reef limestone breccia. Fragments in breccia attain 3 cm, and they consist of biolithitic and calcarenitic limestone. Larger spaces between the fragments are filled by calcitic radial cement of the A generation and in centers the druse cement of the B generation. On the weathered surface of the limestone breccia the radial cement is especially conspicuous.

Towards the south the reef breccia passes laterally into white massive biomicritic limestone. In this limestone frequent several millimeters to ten centimeters thick sheets occur which consist of true lumachelle of thinvalved lamellibranchs of *Halobia* group. This limestone belongs already to the deeper marine sediment which formed in a quiet depositional environment. *Halobia* layers positively represent a primary nonredeposited sediment in which the halobian pelecypod valves remained on the place of their death.

With the find of these halobians, the idea on periodical "inundation" of the reef limestone as stated already before (KOLAR-JURKOVŠEK & al. 1983) can be confirmed with even more certainty. During temporary oscillations of the sea level the reef could be submerged deeper, the sea level rose, and the reef sedimentation was replaced by deeper marine sedimentation of micritic limestone with lumachelles of halobian shells. During repeated uplift and sinking of the sea level, above the halobian horizon again deposition of reef limestone started. Therefore the deeper marine limestone interfingers with the reef limestone. In certain places in the mentioned micritic limestone also numerous ammonites occur which are firmly cemented in the rock. Along with ammonites in this limestone also conodonts were found.

White massive biomicritic limestone has not much extension on Pokljuka. In somewhat larger outcrops it is found in immediate neighborhood at Uskovnica, in Bohinj and on Rudnica, Studor and Vogar. Of even larger extent it is in the overthrust nappe of the Slatna cover between Viševnik, The Triglav lakes, Tičarica, Slatna and the peak of Mt. Triglav. In this limestone rare small coral patch reefs may be found (BUSER 1986b).

South of the massive micritic limestone with halobias grey, white to rosy bedded and platy micritic limestones extend, containing irregular chert nodules and seldom also chert sheets. The limestone contains more or less abundant conodonts, and it represents a sediment of an even deeper sea than the massive limestone with halobias. The present contact of the two types of limestone is unfortunately tectonic, so that their primary position could only be guessed.

Facies types of Pokljuka reef complex are schematically shown on Fig. 2.

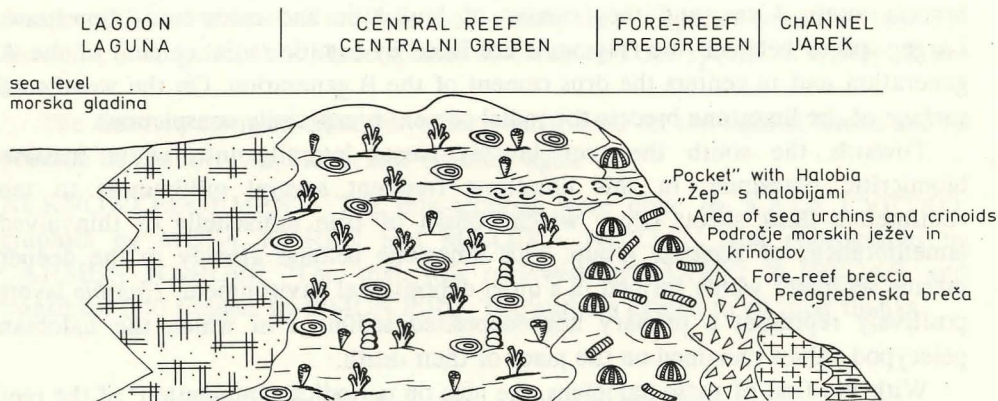


Fig. 2. Schematic facies zonation of Carnian reef complex on Pokljuka:

- Lagoon: Dolomites
- Central reef: Limestone with reef fossils (corals, stromatoporoids, chaetetids, algae, and others)
- Fore-reef: Limestone with sea urchins and crinoids, and fore-reef breccia. In some places "pockets" with Halobias, which interfinger with central reef.
- Intraplatform channel: Micritic limestone with cherts and platy massive limestone with conodonts.

Sl. 2. Shematski facialni prikaz conacije v karnijskem grebenskem kompleksu na Pokljuki:

- Laguna: Dolomit
- Centralni greben: Apnenec z grebenskimi fosili (korale, stromatoporoidi, hetetide, alge in drugo)
- Predgreben: Apnenec z morskimi ježki in krinoidi in predgrebenska breča. Mestoma "žepi" s halobijami, ki se zajedajo v centralni greben.
- Intraplatformni kanal: Mikritni apnenec z roženci in ploščasti apnenec s konodonti.

Position and age of the reef complex

It was established during field investigations that as a rule on Pokljuka from the east westward successively older strata are exposed. Along numerous faults, however, due to uplifts and sinking of blocks, often beds of the same age are repeated.

In the eastern part of Pokljuka Lower Carnian, respectively Cordevolian conodonts were found in light bedded micritic limestone with chert nodules (KRIVIC 1979). These limestones pass quite far southwards, on Marovšca east of Zgornje Gorjuše, into reef limestone. They present a piece of evidence that the start of reefs could be placed already in Cordevolian.

The age of the considered reef limestone in the western part of Pokljuka can be directly established also by conodonts and halobias which were found within the reef limestone. Indirectly the age of the reef limestone can be dated with conodonts which were found in the massive and platy limestone with cherts to which the reef limestone laterally passes in the south. Along the forest road on the Srenjski pašnik south of Rudno polje within the reef limestone the already mentioned 4 m thick "pocket" with lumachells of Tuvalian species *Halobia* cf. *paraceltica* Kittl and *Halobia mediterranea* Gemmellaro was found. In the cement of lumachells further conodonts of the same age, *Neogondolella polygnathiformis* Budurov, *Epigondolella nodosa* (Hayashi), *Gondolella navicula* (Huckriede) and *Gondolella oertly* Kozur (KOLAR-JURKOVŠEK & al. 1983) were found. On the ground of the second mentioned *Halobia* and conodonts also the reef limestone in this area is attributed to Upper Carnian respectively Tuvalian. In the area of the Praprotnica, also south of Rudno polje, in the massive limestone which northwards passes into the reef limestone, characteristic Lower Norian conodonts were found (KOLAR-JURKOVŠEK & al. 1983). This it may be concluded that also in this area reef limestone is of Lower Norian age. On the geological map of sheets Tolmin and Videm (Udine) the limestone of entire Pokljuka is ranged to Norian-Rhaetian (BUSER 1986a). As a result of additional detailed investigations it has been now established that the deposition of reef limestone on Pokljuka started in the lower part of Carnian already, and it lasted throughout Carnian at least into the Lower Norian.

PALEONTOLOGICAL PART

Dragica Turnšek

Problems of systematic

A survey of literature on Triassic corals reveals a highly disagreeing systematics. Modern researchers have attempted to put up the system on the basis of microstructure which is causing considerable difficulties due to the degree of preservation. Individual species or genera were studied in detail on the basis of microstructure especially by CUIF who, however, did not elaborate the entire system of

higher systematic categories. The system of all Mesozoic corals (also the Triassic ones) was proposed, on the contrary, by BEAUVAIS, who did not perform the exact revision of species. Many new genera were established by MELNIKOVA, but they often contradict the contemporaneous revisions of CUIF. An extensive revision of Triassic corals from the Northern Calcareous Alps on the basis of microstructure is being elaborated by RONIEWICZ, but, unfortunately, her treatise has not been published yet. At my disposal there has been only the manuscript copy of its abstract with main suborders and families.

Corals from Pokljuka and Bohinj are unfortunately too poorly preserved, the microstructure recrystallized, to permit any independent revision or independent system. On the ground of older systems (ALLOITEAU 1952, VAUGHAN & WELLS 1943) and more recent revisions (CUIF 1975, 1977; MELNIKOVA 1975; BEAUVAIS 1980; RONIEWICZ, manuscript) I tried to range our coral genera at least to suborders, without naming the families, for the present.

Stromatoporoids and chaetetids which belong, according to recent finds of spicules, at least partly to sponges (Wood & REITNER 1986), appear here only as groups outside higher systematic categories.

Carnian reef fossils from Pokljuka are arranged into the following system:

A n t h o z o a

Suborder: Pachythecalina Eliašova 1976

Genus: *Protoheterastraea* Wells 1937

Genus: *Volzeia* Cuif 1966

Suborder: Archaeocoeniina Alloiteau 1952

Genus: *Koilocoenia* Duncan 1884

Suborder: ?Distichophyllina Beauvais 1980

Genus: *Coryphyllia* Cuif 1974

Genus: *Margarophyllia* Volz 1896

Genus: *Margarosmilia* Volz 1896

Genus: *Pokljukosmilia* nov.gen.

Suborder: Fungiina Verrill 1865

Genus: *Araiophyllum* Cuif 1975

Genus: *Craspedophyllia* Volz 1896

Genus: *Myriophyllum* Cuif 1975

Genus: *Rhopalodendron* nov.gen.

Genus: *Stuoresia* Cuif 1976

Genus: *Tropidendron* Cuif 1975

S t r o m a t o p o r o i d e a

Genus: *Stromatomorpha* Frech 1890

Chaetetida

Genus: *Aculaechaetetes* Boiko 1979

Genus: *Atrochaetetes* Cuif & Fischer 1974

Genus: *Blastochaetetes* Dietrich 1919

Algae

Genus: *Marinella* Perner 1939

Genus: *Solenopora* Dybowski 1879

Microproblematica

Genus: *Ladinella* Ott 1968

Genus: *Plexoramea* Mello 1977

The description of fossil species

Palaeontological description of corals, chaetetids and stromatoporoids is given in detail only for new genera and species. With species found earlier in Slovenia, only the new locality and age are added (their previous distribution in Slovenia is listed in Fig.3). With species which are known elsewhere but at this occasion first found in our country, synonymy is given, as well as comparison with other specimens and localities in the world.

With algae and microproblematica only localities and specimens are listed for the reason of documentation and completeness of the fossil assemblage.

At description international abbreviations are used: d = diameter of corallites, c-c = distance between the centres of corallites, s = number or density of septa

Anthozoa

Suborder: Pachythealina Eliašova 1976

Genus: *Protoheterastraea* Wells 1937

Protoheterastraea minor n.sp.

Pl. 1, Fig. 1-5

Name: Corallites are small.

Holotypus: Specimen: P-840

Locus typicus: Pokljuka 14745

Stratum typicum: Tuvanian

Material: 4 specimens, 7 thin sections

Diagnosis: *Protoheterastraea* with thick wall, hexameral slightly bilateral septa, d = 2-2.5(3)mm, c-c = 2.5-7mm, s = 20-24.

Description: Phaceloid colony has long parallel corallites. In cross section they are round. Wall is thick epitheca. Septa are developed in hexameral system, slightly irregularly bilateral, in 2-3 cycles, the first one being thicker and outstanding, the others shorter and thinner. Lateral thorns are rare. Endotheca is of short and longer dissepiments. Microstructure is of single trabeculae with median line.

Dimensions:	holotype	P-899	P-900	P-750
d =	2-2.5(3)mm	2 -2.5mm	2.5-3mm	2-3mm
c-c =	3-7 mm	2.5-6 mm	4 -7mm	3-4mm
s =	20-24	ca 24	ca 24	?

Comparison: New species differs from *P.leonhardi*, *P.hudajuznensis* and *P.fritzchi* in smaller dimensions and smaller number of septa. *P.magna* is even smaller (compare TURNŠEK & al. 1982: 71-72).

Localities: Pokljuka 14745 (P-840) (holotype), Kamniško sedlo (P-899), Blegoš (P-900), and Hudajužna (P-750), the two last being very recrystallized. Tuvalian.

Genus: *Volzeia* Cuif 1966
Volzeia badiotica (Volz 1896)
 Pl. 2, Fig. 1-3

New locality: Pokljuka 14415 (P-808). Cordevolian.

Suborder: Archaeocoeniina Alloiteau 1952
 Genus: *Koilocoenia* Duncan 1884
Koilocoenia sp.
 Pl.2, Fig.4-5

Fragment of plocoid colony with corallite diameter of 3 mm belongs to *Koilocoenia*. A more exact determination is not possible due to recrystallization.

Locality: Pokljuka-14741 (P-825). Julian.

Suborder: ? Distichophylliina Beauvais 1980
 Genus: *Coryphyllia* Cuif 1974
Coryphyllia regularis Cuif 1974
 Pl. 3, Fig. 1

New locality: Pokljuka-14745 (P-857). Tuvalian.

Genus: *Margarophyllia* Volz 1896

Margarophyllia capitata (Münster 1841)

Pl. 3, Fig. 2

New locality: Pokljuka 14413 (P-805), 14418 (P-812, P-814), Cordevolian.

Margarosmilia confluens (Münster 1841)

Pl. 3, Fig. 3

New locality: Pokljuka-14741 (P-828). Julian.

Margarosmilia richthofeni Volz 1896

Pl. 4, Fig. 3

New locality: Pokljuka-14742 (P-841). Julian.

Margarosmilia septanectens (Loretz 1875)

Pl. 4, Fig. 1-2

New locality: Pokljuka-14741 (P-820). Julian.

Genus: *Pokljukosmilia* nov. gen.

Name: After the Pokljuka Mountain where it was found.

Type species: *Pokljukosmilia tuvalica* n.sp.

Diagnosis: Phaceloid colony with lateral budding. Septa radial, all cycles of the same thickness, with rare dentate ornamentations. No wall, no columella, vesicular dissepiments. Microstructure of very small non divergent trabeculae centred in median line.

Comparison: In structure of septa the new genus approaches *Coryphyllia*, but differs in the colonial growth. From *Margarosmilia* it differs in different median line, from *Retiophyllia* in lacking of wall, from *Paradistichophyllum* and *Parathecasmilia* in equal septa.

Systematics: It belongs to the family Distichophylliidae which was attributed to the new suborder Distichophylliina by L.BEAUVAIS (1980). For the moment I follow this attribution.

Pokljukosmilia tuvalica n.sp.

Pl.5, Fig.1-5, Pl.6, Fig.1-3

Name: After the Tuvalian age.

Holotypus: Specimen P-854.

Locus typicus: Pokljuka-14745.

S t r a t u m t y p i c u m: Tuvalian.

M a t e r i a l: Two colonies, 5 thin sections.

D i a g n o s i s: *Pokljukosmilia* with $d = 5-6\text{mm}$, $c-c = 7-10\text{mm}$, $s = 48-60$.

D e s c r i p t i o n: Phaceloid colony has parallel corallites, roundish in cross section. In the phase of budding they are sometimes bicentric or elongated but become soon free. Septa are radial, in 4-5 cycles, all of equal thickness, they differ only in length. Laterally they bear very rare but rough teeth. Endotheca is of vesicular dissepiments. No wall, no columella. Microstructure is described at genus.

L o c a l i t y: Pokljuka-14745 (P-854), and P-852. Tuvalian.

Suborder: Fungiina Verrill 1865

Genus: *Araiophyllum* Cuif 1975

Araiophyllum cf. *A. triassicum* Cuif 1975

Pl. 7, Fig. 1-2

1975 *Araiophyllum triassicum* n.sp. CUIF: 110-115, Pl.16, Fig. 1-7.

D e s c r i p t i o n: was given by CUIF (1975). Our specimens are phaceloid colonies with roundish corallites. Septa are very winding and porous, with numerous lateral offsets, synapticalae and mennianae.

D i m e n s i o n s: $d = 2.5-3\text{mm}$, $c-c = 4-5\text{mm}$, $s = \text{ca } 60$.

C o m p a r i s o n: Our specimens differ in smaller corallites from those of CUIF ($d = 4-5\text{mm}$), therefore I mark them with cf.

D i s t r i b u t i o n: Carnian of Alakir Cay in Turkey.

L o c a l i t y: Pokljuka-14415 (P-807), and -14418 (P-815). Cordevolian.

Genus: *Craspedophyllia* Volz 1896

Craspedophyllia alpina (Loretz 1875)

Pl. 7, Fig. 3

1875 *Axosmilia alpina*. LORETZ: n.v.

1896 *Craspedophyllia alpina* Loretz. VOLZ: 64-65, Taf.17, Fig. 23-31.

1966 *Craspedophyllia alpina* (Loretz). KOLOSVARY: 185.

1973 *Craspedophyllia alpina* Loretz. MONTANARO GALLITELLI & al. Taf.31.

1980 *Craspedophyllia alpina* (Loretz). CUIF: 367.

D e s c r i p t i o n: Solitary coral with dentate radially arranged septa in 5 cycles. Numerous tabulate dissepiments, strong round columella. Microstructure in our specimen is not preserved.

D i m e n s i o n s: $d = 9-13\text{mm}$, columella $d = 1-2\text{mm}$, $s = \text{ca } 70$.

D i s t r i b u t i o n: Upper part of Cassian beds in Dolomites, Italy.

L o c a l i t y: Pokljuka-14745 (P-858). Tuvalian.

Genus: *Myriophyllum* Cuif 1975

Myriophyllum badioticum (Volz 1896)

Pl. 7, Fig. 4

N e w l o c a l i t y: Pokljuka - 14419 (P-817), and - 14741 (P-833). Upper Cordevolian - Julian.

Genus: *Rhopalodendron* nov.gen.

N a m e: Similar to *Rhopalophyllia* and *Tropidendron*.

T y p e s p e c i e s: *Rhopalodendron juliensis* n.sp.

D i a g n o s i s: Phaceloid with extracalicular budding. Septa thin of equal thickness, axially anastomosing. Large rare lateral teeth, rare tabulate dissepiments, thin epitheca, small styliiform columella. Microstructure of many trabeculae.

C o m p a r i s o n: New genus has septal structure similar to *Rhopalophyllia* Cuif 1975, and partly *Omphalophyllia* Laube 1865. It approaches *Tropidendron* Cuif 1975 in phaceloid growth of colony.

Rhopalodendron juliensis n.sp.

Pl. 8, Fig. 1-6

N a m e: After the Julian platform where it was found.

H o l o t y p u s: Specimen P-845.

L o c u s t y p i c u s: Pokljuka-14744.

S t r a t u m t y p i c u m: Tuvalian.

M a t e r i a l: Three colonies, 6 thin sections.

D i a g n o s i s: *Rhopalodendron* with $d = 2.5-3.5(4) \text{ mm}$, $c-c = 4-5 \text{ mm}$, $s = 40-50$.

D e s c r i p t i o n: Phaceloid colony has many corallites which budd laterally and quickly become free. Septa are developed in 3-4-5 cycles of equal thickness. Sometimes axial ends join with older septa forming "pourtales" (WELLS 1956: F341, Fig.239). Septa are very thin, laterally ornamented with ?mennianae or thorns. Columella is very small, styliiform, not preserved in all corallites. Wall is very uncomplete septotheca or epitheca. Tabulate dissepiments are rare, of the same thickness as septa. Microstructure of many small centres of calcification.

C o m p a r i s o n: Very similar to our new species are *Omphalophyllia bitneri* Volz 1896, and *O. exigua* Volz 1896, which differ in dimensions.

L o c a l i t i e s: Pokljuka-14744 (P-845) = holotype. Kamnik Alps - road to the Krvavec (P-901) and (P-902). Upper Carnian.

Genus: *Stuoresia* Cuif 1976

Stuoresia bronni (Klipstein 1843)

Pl. 7, Fig. 5

1843 *Meandrina bronni*. KLIPSTEIN; n.v.

1896 *Isastraea bronni* (Klipstein). VOLZ: 53, Taf. 5, Fig. 8-12.

1973 "*Isastraea*" *bronni* Klipstein. MONTANARO-GALLITELLI & al. Tav. 1.

1976 *Stuoresia bronni* (Klipstein). CUIF: 103-105, 108, Pl. 7, Fig. 1-9.

?1976 *Stuoresia cerioidea* nov.sp. CUIF: Pl. 14, Fig. 7.

D e s c r i p t i o n: Modern description and revision were made by CUIF (1976) on the basis of microstructure. Our specimen is cerioid-meandroid with irregular mono to polycentric corallites. Septa are developed in more cycles, laterally dentate, with ? mennianae. No columella, septotheca strong. Endotheca of rare dissepiments and/or synapticulae.

D i m e n s i o n s: d = 4-5(6) mm, s = ca 80 and costae.

C o m p a r i s o n: CUIF (1976) mentioned new species *S. cerioidea* without description. Comparing figures it probably belongs to *S. bronni*.

D i s t r i b u t i o n: "Cassian" beds in Dolomites, Italy.

L o c a l i t y: Pokljuka-14418 (P-813). Cordevolian.

Genus: *Tropidendron* Cuif 1975

Tropidendron rhopalifer Cuif 1975

Pl. 7, Fig. 6-7

N e w l o c a l i t y: Pokljuka-14416 (P-809). Cordevolian.

S t r o m a t o p o r o i d e a

Genus: *Stromatomorpha* Frech 1890

Stromatomorpha sp.

Pl. 10, Fig. 1-2

Bulbous coenosteum is built of orthogonally arranged vertical and transverse elements, the vertical being predominate. In transverse section structure is irregularly

vermiculate and tubular. Density of vertical elements is 3/1mm.

L o c a l i t y: Pokljuka-14741 (P-823). Julian.

C h a e t e t i d a

Genus: *Aculaechaetetes* Boiko 1979

Aculaechaetetes sp.

Pl.10, Fig.3

Massive bulbous colony is built of irregularly branched tubules united with double walls. In cross section of the colony tubules are round, but sometimes they appear irregular or even meandric if sections follow their meandroid growth. Density of tubules 3/2mm.

L o c a l i t i e s: Pokljuka-14741 (P-829). Julian. Similar are also specimens from Št.Još (P-903), and from Mežakla (P-904). Carnian.

Genus: *Atrochaetetes* Cuif & Fischer 1974

Atrochaetetes cylindrica n.sp.

Pl. 9, Fig. 1-7

N a m e: After cylindrical form of colony.

H o l o t y p u s: Specimen P-816.

L o c u s t y p i c u s: Pokljuka-14418.

S t r a t u m t y p i c u m: Julian.

M a t e r i a l: 6 specimens, with 12 thin sections.

D i a g n o s i s: *Atrochaetetes* with long cylindrical colonies built of small tubules density of which is 20-25/1 square mm.

D e s c r i p t i o n: Colony is ramose, cylindrical, branching. It is built of long parallel tubules, which grow upwards and outwards. Tubules in transverse section are roundish to polygonal, with wall inbetween of the same thickness. In some levels skeletal thicknesses appear which are named by CUIF and FISCHER (1974) "touffes de fibres". These thicknesses are not real tabulae, but they are some kind of fibres which fill tubules in some levels.

D i m e n s i o n s: d of tubules = 0.10-0.12 mm, c-c = 0.15 mm.

C o m p a r i s o n: From *A.tamnifer*, *A.medius* and *A.alakirensis* (CUIF & FISCHER 1974: 7-10) new species differs in smaller tubules, and they all have massive form of colony. Ramose cylindrical form of colony has species *A.cycliformis* (BOIKO 1879: 79-80), which differs as well in larger tubules (c-c = 0.24-0.40 mm).

Distribution: Species of this genus are known from Upper Carnian of Turkey (CUIF & FISCHER 1974), from Norian of Pamir (BOIKO 1979), from Tuvalian of Perbla (TURNŠEK & al. 1987) and from Carnian of Mežakla (RAMOVŠ & TURNŠEK 1984).

Localities: Pokljuka-14413 (P-804), -14415 (P-806), -14741 (P-824, P-831, P-832), -14419 (P-817). Julian-Tuvalian. Species was found in four horizons of Pokljuka section.

Genus: *Blastochaetetes* Dietrich 1919

Blastochaetetes orientalis Cuif & Fischer 1974

Pl. 10, Fig. 4-5

1974 *Blastochaetetes orientalis* n.sp. CUIF & FISCHER: 12-13, Pl.4, Fig.2-3.

Our specimens are bulbous massive colonies with diameter of about 5 cm. They are built of tubules which in cross section show irregular forms and openings. Slight concentric growth of colony. Density of tubules 25-35/l square mm fits with original dimension of this species.

Distribution: Upper Carnian beds of Alakir Cay, Turkey.

Locality: Pokljuka-14741 (P-836), -14742 (P-837), and -14745 (P-856). Julian-Tuvalian.

Other fossils

Sponges will be systematically described separately.

Algae:

:*Marinella* sp. (Pl. 10, Fig. 6)

Locality: Pokljuka-14741, Julian.

:*Solenopora* sp. (Pl. 10, Fig. 7)

Locality: Pokljuka-14741, -14745. Julian-Tuvalian.

Microproblematica:

:*Ladinella porata* Ott 1967 (Pl. 10, Fig. 9)

Locality: Pokljuka -14415, -14417, -14741, -14742, -14744, -14745, Carnian (Cordevolian - Julian - Tuvalian).

:*Plexoramea cerebriformis* Mello 1977 (Pl. 10, Fig. 10)

Locality: Pokljuka-14741, -14742, -14744. Julian-Tuvalian.

Stratigraphic comparison of fossils

The corals and other reef fossils were collected on Pokljuka in the same profile. In it the carbonate reef sedimentation lasted continuously throughout the Carnian. The oldest Cordevolian fossils start in locality 14413 and continue conformingly across Julian into Tuvanian in locality 14745. (Compare chapter on The Position of reef complex on Pokljuka).

The coral and other reef species from Pokljuka section could have been divided in three horizons. The two lower horizons contain fossils typical for the "Cassian complex" as known in the Italian Dolomites (FRECH 1890), Austrian Alps (OTT 1967), Pamir (MELNIKOVA 1975), and elsewhere. In Slovenia, it was found at Hudajužna (TURNŠEK & al. 1982) and in northern Julian Alps (RAMOVŠ & TURNŠEK 1984). Everywhere this complex was ranged to Cordevolian-Julian.

On Pokljuka this complex could be subdivided on the basis of fossils in two horizons. To the first, lowermost part of the section five coral species are confined: *Margarophyllia capitata*, *Araiophyllum* cf. *A. triassicum*, *Volzeia badiotica*, *Tropidodendron rhopalifer* and *Stuoresia bronni*, as well as the ramose chaetetid *Atrochaetetes cylindrica*. These species appear in localities 14413, 14416, 14418, and 14419. Since they represent the lower part of the Cassian complex, I attributed them to Cordevolian. In this horizon on Pokljuka, however, sponges are lacking; they are elsewhere typical for the lowermost part of Cassian beds. Therefore it seems most probable that the section on Pokljuka does not start before the Upper Cordevolian.

In the central part of the Pokljuka section, in localities 14741, and 14742 four species of corals were collected: *Myriophyllum badioticum*, *Margarosmilia confluens*, *M. septanectens* and *M. richthofeni*. Also these species are characteristic "Cassian" ones. Since they occur on Pokljuka everywhere above the afore mentioned Cordevolian horizon, they were ranged to Julian. The stratigraphic subdivision of "Cassian" into Cordevolian and Julian is supported also by abundant appearance of massive chaetetids and algae in higher horizon. They are *Aculaechaetetes* sp., *Blastochaetetes orientalis*, *Stromatomorpha* sp., *Marinella* sp. and *Solenopora* sp. Here begins also *Plexoramea cerebriformis* (cf. FLÜGEL & al. 1988). The most typical species in the Julian stage is *Blastochaetetes orientalis* which was found in Turkey in Upper Carnian (CUIF & FISCHER 1974). Here also the sponge *Stylothalamia dehmi* (Pl.10, Fig.8) was found, which OTT (1967) attributed to "Raibl".

In the third, the uppermost part of the Pokljuka section appears an entirely different coral assemblage. In localities 14744 and 14745 species were found as *Craspedophyllia alpina*, *Rhopalodendron pokljukensis* n.g.n.sp., *Bledosmilia tuvalica*

n.g.n.sp., *Coryphyllia regularis* and *Protoheterastraea minor* n.sp.. Among five species there are three new species and two new genera. Such drastic change of fossil assemblage is an indication of a change in deposition or of age. Since these new forms occur above the already mentioned Julian horizon and laterally interfere with Tuvalian halobids, they were attributed to Tuvalian. The Tuvalian corals and other reef fossils are not yet well known in the world, therefore the appearance of new forms which do not have comparison is understandable.

Owing to all mentioned considerations, the section with reef fauna and flora from Pokljuka is an important contribution to the knowledge of the Carnian stage. The continuous reef sedimentation enabled the subdivision of the Cassian complex into the Cordevolian and the Julian horizons, and also the Tuvalian age of certain reef deposition was established. This stratigraphic subdivision of the reef fossil assemblage might serve in the future as a marker for a more detailed stratigraphic subdividing of Carnian.

Listing of all Carnian reef species from Pokljuka with their previous known localities in Slovenia are shown on Fig.3.

Fig. 3. List of reef fossil species with their regional and stratigraphic distribution on Pokljuka and with their previous known localities in Slovenia:

Hj = Hudajužna (TURNŠEK & al. 1982)

JA = Northern Julian Alps (RAMOVŠ & TURNŠEK 1984)

P = Perbla (TURNŠEK & al. 1987)

Sl. 3. Seznam grebenskih fosilnih vrst z njihovo regionalno in stratigrafsko razširjenostjo na Pokljuki ter njihova dosedanja nahajališča v Sloveniji

HJ = Hudajužna (TURNŠEK & al. 1982)

JA = Severne Julijske Alpe (RAMOVŠ & TURNŠEK 1984)

P = Perbla (TURNŠEK & al. 1987)

Corals	P o k l j u k a									Previous localities in Slovenia		
	Cordevolian					Julian		Tuvalian				
	14413	14415	14416	14418	14419	14741	14742	14744	14745	HJ	JA	P
<i>Margarophyllia capitata</i>	+			+						HJ	JA	P
<i>Araiophyllum triassicum</i>		+								-	-	-
<i>Volzeia badiotica</i>		+								HJ	JA	-
<i>Tropidendron rhopalifer</i>			+							-	JA	-
<i>Stuoresia bronni</i>				+						-	-	-
<i>Myriophyllum badioticum</i>						+				HJ	-	-
<i>Koilocoenia</i> sp.						+				-	-	-
<i>Margarosmilia confluens</i>						+				HJ	-	-
<i>Margarosmilia septanectens</i>						+				-	JA	-
<i>Margarosmilia richthofeni</i>							+			-	JA	-
<i>Rhopalodendron juliensis</i>								+		-	-	-
<i>Craspedophyllia alpina</i>									+	-	-	-
<i>Pokljukosmilia tuvalica</i>									+	-	-	-
<i>Coryphyllia regularis</i>									+	-	JA	-
<i>Protoheterastraea minor</i>									+	-	-	-
Chaetetids												
<i>Atrochaetetis cylindrica</i>	+	+		+	+	+				-	-	-
<i>Aculaechaetetis</i> sp.						+				-	-	-
<i>Blastochaetetis orientalis</i>						+	+		+	-	-	-
Stromatoporoids												
<i>Stromatomorpha</i> sp.						+				-	-	P
Algae												
<i>Marinella</i> sp.						+				HJ	-	-
<i>Solenopora</i> sp.						+			+	HJ	-	-
Microproblematica												
<i>Ladinella porata</i>		+				+	+	+	+	-	JA	-
<i>Plexoramea cerebriformis</i>						+	+	+		-	-	-

PALEOGEOGRAPHIC RELATIONS DURING THE GROWTH OF REEF COMPLEX

The reef complex of Pokljuka was formed on the Julian carbonate platform which was, in comparison with the southerly lying Dinaric platform, much more dissected during Carnian. On it existed within shallow areas deeper marine intra-platform channels.

In central parts of channels bedded micritic limestones with cherts deposited. In their peripheral parts, however, biomicritic limestones deposited, which contain sheets and nests of halobian lumachelles. The deeper marine channel was probably connected from Pokljuka southwards with the Slovenian basin.

The reef fossils lived in shallows of the platform and along rims of these shallows. They are well preserved. For the most part they are not broken. Individual corals occur in colonies up to one cube meter in primary growth, but the majority of fossils are smaller.

According to the shape of growth the reef fossils may be subdivided into solitary, ramose or branching and massive forms. In Cordevolian (in localities 14413 to 14419) the branching type is prevailing. The solitary and massive organisms are rare. Such associations are mentioned by researchers in all parts of reef complexes (STANTON & FLÜGEL 1987). Large branched colonies needed water of appropriate depth for their unrestrained growth in the height.

The shape of reef organisms on Pokljuka is changed in localities 14741 and 14742, where absolutely prevail the massive forms of chaetetids, solenoporids and stromatoporoids. Here also occurs the encrusting coral *Koilocoenia*. Ramose and solitary forms are subordinate. Such assemblage is representative of the reef flat. Massive and encrusting forms indicate shallowing of the reef. In the surroundings of these localities occur also paleokarstic cavities with fillings, which supports the hypothesis of shallowing, and even of uplift above the sea level.

In upper part of Pokljuka reef complex again the branched type of organisms, and deepening, took over. On the top of these reef structures, however, the pockets of halobian lumachelles are found. The latter indicate deeper sinking of the platform which was, at least on the periphery, covered by deeper marine sediments. The reef sedimentation continued in Norian only in certain places.

Changes in form of fossils through Carnian are shown on Fig. 4.

During Carnian the reef organisms grew in many shallows of the Julian Carbonate platform. They have been studied in detail from various parts of the northern Julian Alps (RAMOVŠ & TURNŠEK 1984). From this period in Slovenia are known also reefs which occurred in quite differing environments, i.e. in the southern part of the Slovenian basin. From these parts the reef "mud mounds" have

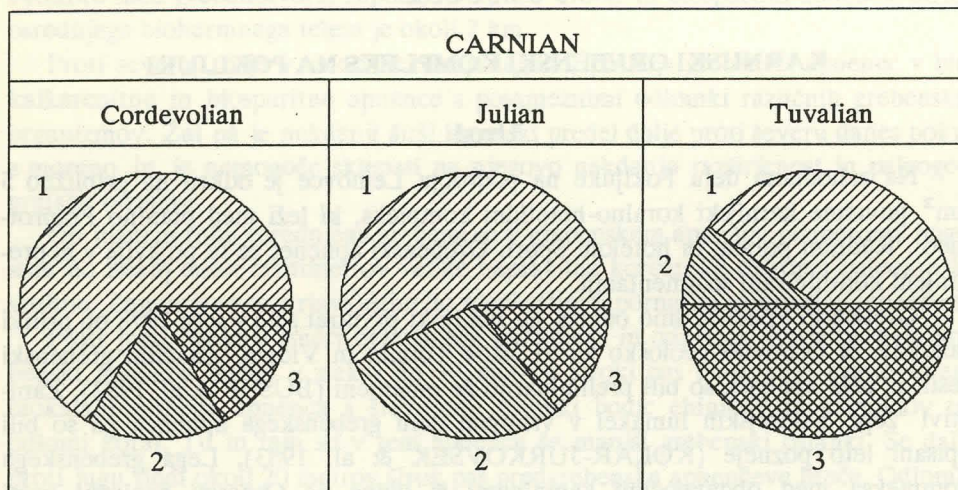


Fig. 4. Changes of fossil forms throughout the Carnian in the Pokljuka reef complex:

1. Ramose and branching forms of fossils
2. Solitary corals
3. Massive forms of fossils

Sl. 4. Spremembe fosilnih oblik skozi karnij v grebenskem kompleksu na Pokljuki:

1. Ramozne in vejnate oblike fosilov
2. Solitarne korale
3. Masivne oblike fosilov

been described in detail from Jesenica (ČAR & al. 1981), and from Hudajužna and Perbla (TURNŠEK & al. 1984. 1987).

True reefs of the platform type probably lived also on the northern periphery of the Dinaric carbonate platform. However, here the reef limestone was altered into dolomite, or destroyed, which obliterated the reef fossils (BUSER 1986b).

Carnian reef complex of Pokljuka and its fossil assemblage can partly be compared with "Wetterstein" development of the Hochstaufen-Rauschberg Massif in Northern Calcareous Alps and its passage into the Reifling Limestone (HENRICH 1983).

Povzetek

KARNIJSKI GREBENSKI KOMPLEKS NA POKLJUKI**Uvod**

Na zahodnem delu Pokljuke na področju Lemovce je odkrit na približno 5 km² površine karnijski koralno-hetetidni kompleks, ki leži med planino Praprot-nico, Rudnim poljem in hotelom Šport. Grebenski apnenec se tu pojavlja v neprekinjeni kontinuirani sedimentaciji.

Grebenski apnenec smo odkrili na Pokljuki prvokrat šele v letu 1978 ob priliki raziskav za Osnovno geološko karto listov Tolmin in Videm. Značilni grebenski fosili iz tega apnenca so bili preliminarно že omenjeni (BUSER & al. 1982). Zanimivi "žepi" halobijskih lumakel v vrhnjem delu grebenskega apnenca pa so bili opisani leto pozneje (KOLAR-JURKOVŠEK & al. 1983). Lega grebenskega kompleksa med obdajajočimi kamninami je vidna na Osnovni geološki karti (BUSER 1986a), njegov opis pa podan v tolmaču h karti (BUSER 1986b).

Iz grebenskega kompleksa so v razpravi podrobno obdelani fosili, ki so bili zbrani na desetih nahajališčih ob gozdni cesti med Srenjskim pašnikom in hotelom Šport. Na lokacijski karti so nahajališča označena s številkami: 14413, 14415, 14416, 14418, 14419, 14741, 14742, 14744 in 14745 (Sl.1).

Določenih je bilo 23 vrst grebenotvornih fosilov, ki pripadajo koralam, hetetidam, stromatoporoidom, solenoporam in mikroproblematikam. Podrobneje so opisane koralne in hetetide, med njimi je 8 vrst sedaj prvič najdenih v Sloveniji. Nova sta dva rodova in tri vrste koral in ena hetetida.

Karnijski grebenski kompleks smo na podlagi fosilov in lege lahko razčlenili na cordevolsko, julsko in tuvalsko starost.

ZAHVALA: Zbruske je izdelala KATA CVETKO, grafične priloge META KARER in MILOJKA HUZZAN, fotografije CARMEN NAROB. Tekst je strokovno pregledal MARIO PLENIČAR, v angleščino pa ga je prevedel SIMON PIRC. Vsem se avtorja iskreno zahvaljujeta.

Sestava grebenskega kompleksa

Osrednji del grebenskega kompleksa oziroma pravega grebena sestavlja svetlo sivi biolititni masivni apnenec. Sestavljajo ga koralno-hetetidni in drugi in situ živeči organizmi, ki so več ali manj celi, včasih pa tudi polomljeni in deloma presedimentirani. Posamezne kolonije dosežejo velikost več kot kubični meter. Običajno pa njihova velikost ne presega nekaj deset centimetrov. Vsebnost grebenotvornih organizmov v apnencu osrednjega grebenskega telesa je vsaj 50 % in več.

Prostore med grebenotvorci zapolnjuje njihov drobni in biosparitni apnenec. Širina osrednjega biohermnega telesa je okoli 2 km.

Proti severu, to je v smeri nekdanje lagune, prehaja grebenski apnenec v biokalkarenitne in biosparitne apnenice s posameznimi odlomki različnih grebenskih organizmov. Žal pa je nekdanji širši lagunski predel dalje proti severu danes pokrit z moreno in je nemogoče sklepati na njegovo nekdanjo razširjenost in paleogeografske razmere.

Ob južnem robu osrednjega grebena so v grebenskem apnencu razmeroma pogostne do nekaj deset centimetrov velike nepravilne korozijske oziroma paleokraške votline. Zapolnjene so z rjavkastim do rdečkastim lapornatim mikritnim apnencem.

Proti jugu, to je v smeri nekdanjega globokega in odprtega morja prehaja grebenski apnenec bočno v nekaj do 30 metrov široki pas masivnega svetlo sivega biokalkarenitnega apnenca s številnimi ostanki bodic ehinidov in krinoidov ter odlomi koral. Tu in tam so v tem apnencu še manjši grebenski ostanki. Še dalje proti jugu sledi okoli 20 metrov širok pas predgrebenske apnenčeve breče. Odlomki v breči so veliki do 3 cm in pripadajo biolititnemu ter kalkarenitnemu apnencu. Velike prostore med odlomki zapolnjuje žarkoviti kalcitni radialni cement A generacije in v sredini kapučasti kalcitni cement B generacije. Na prepereli površini apnenčeve breče še posebno značilno izstopa žarkovito radialni cement.

Lateralno proti jugu prehaja grebenska breča v beli masivni biomikritni apnenec. V tem apnencu so pogostne nekaj mm do 10 cm debele pole, ki jih sestavlja prava lumakela drobnolupinskih školjk iz skupine halobij. Ta apnenec pripada že globljemorskemu sedimentu, ki je nastajal v mirni sedimentacijski sredini. Pole s halobijami so zanesljivo primarne nepresedimentirane plasti, v katerih so halobijske lupine školjk ostale na mestu njihovega odmrtja.

Z najdbo teh halobijskih pol, ki so še posebno lepo vidne v novem vseku gozdne ceste, katera se odcepi od glavne ceste proti jugu vzhodno od Srenjskega pašnika, moremo sedaj še bolj zanesljivo potrditi misel o občasni "potopitvi" grebenskega apnenca, ki smo jo navedli že prej (KOLAR-JURKOVŠEK & al.1983). Ob občasnih nihanjih morske gladine je bil greben globlje potopljen oziroma se je morska gladina vode povišala in je grebensko sedimentacijo zamenjala globljemorska sedimentacija mikritnega apnenca z lumakelami halobijskih školjk. Pri ponovnem dvigu grebena oziroma upadu morske gladine pa je nad halobijskim horizontom zopet pričela sedimentacija grebenskega apnenca. Tako se globljemorski apnenec prstasto zajeda med grebenski apnenec. Na nekaterih krajih dobimo v omenjenem mikritnem apnencu tudi številne amonite, ki so trdno vezani v kamnini. Poleg amonitov so najdeni v tem apnencu tudi konodonti.

Beli masivni biomikritni apneneci na Pokljuki nimajo prav velikega obsega. Na večjem prostoru jih dobimo v neposredni soseščini na Uskovnici, v Bohinju pa na Rudnici, Studorju in Vogarju. Še večji obseg imajo v narivnem pokrovu Slatenske

plošče med Viševnikom, Triglavskimi jezери, Tičarico, Slatno in vrhom Triglava. Na redkih mestih dobimo v tem apnencu koralne patch grebene (BUSER 1986a).

Južno od omenjenega masivnega mikritnega apnenca s halobijami dobimo svetlo sive, bele do rožnate skladovite in ploščaste mikritne apnence, ki vsebujejo nepravilne gomolje, redko pa tudi pole roženca. Apnenec vsebuje bolj ali manj pogoste konodonte in predstavlja sediment še globljega morja kot masivni apnenec s halobijami. Današnji stik obeh tipov apnenca je žal povsod tektonski in tako lahko o njuni prvotni normalni legi oziroma prostorskem položaju le ugibamo. Prav gotovo je nastajal apnenec z roženci sočasno in neposredno ob masivnem apnencu, vendar v še globljem morskem okolju.

Razni facialni tipi grebenskega kompleksa na Pokljuki so shematično prikazani na sl. 2.

Lega in starost grebenskega kompleksa

Pri terenskih geoloških raziskavah smo ugotovili, da si na Pokljuki slede od vzhoda proti zahodu praviloma vedno mlajše plasti. Ob številnih prelomih se zaradi dvignjenih in spušenih grud večkrat ponavljajo plasti iste starosti.

Na vzhodnem delu Pokljuke je našla KRIVIC (1979) v svetlem skladovitem mikritnem apnencu z gomolji roženca spodnekarnijske oziroma cordevolske konodonte. Ti apnenci prehajajo precej daleč na jugu, to je na Marovšci vzhodno od Gorjuš, v grebenski apnenec in dokazujejo, da imamo tukaj začetek nastajanja grebenov že v cordevolu.

V zahodnem delu Pokljuke lahko starost obravnavanega grebenskega apnenca neposredno določimo še s konodonti in halobijami, ki so bile najdene med grebenskim apnencem. Posredno pa lahko določimo starost grebenskega apnenca s konodonti, ki so bili najdeni v masivnem in ploščastem apnencu na jugu. Ob gozdni cesti na Srenjskem pašniku južno od Rudnega polja je bil najden med grebenskim apnencem že omenjeni 4 m debeli "žep" z lumakelo halobij vrst *Halobia cf. paraceltica* Kittl in *Halobia mediterranea* Gemmellaro. V vezivu lumakele so bili najdeni še konodonti *Neogondolella polygnathiformis* Budurov, *Epigondolella nodosa* (Hayashi), *Gondolella navicula* (Huckriede) in *Gondolella oertlii* Kozur (KOLAR - JURKOVŠEK & al. 1983). Na podlagi drugo omenjene halobije in konodontov pripada tudi grebenski apnenec na tem področju zgornjemu karniju oziroma tuvalu. Na območju planine Praprotnice prav tako južno od Rudnega polja so bili najdeni v masivnem apnencu, ki proti severu prehaja v grebenski apnenec, značilni spodjenorijski konodonti (KOLAR-JURKOVŠEK & al. 1983). Tako moremo sklepati, da so tukaj tudi grebenski apnenci spodnenorijske starosti. Na geološki karti listov Tolmin in Videm so grebenski apnenci na celotni Pokljuki uvrščeni v norij in retij (BUSER 1986a). Po natančnih dodatnih raziskavah pa smo ugotovili, da je pričelo

nastajanje grebenskega apnenca na Pokljuki že v nižjem delu karnija in trajalo ves karnij ter segalo še v spodnji norij.

Sistematika in opis grebenskih fosilov

Literatura o triasnih koralah kaže zelo neenotno in nedokončano sistematiko. Za korale s Pokljuke uporabljam kombinacijo dosedanjih nepopolnih sistemov (ALLOITEAU 1952, WELLS 1956, CUIF 1975, 1977, MELNIKOVA 1975, BEAUVAIS 1980, RONIEWICZ rokapis). Uvrščam jih v podredove: Pachytheclliina, Archaeocoeniina, ?Distichophyllina in Fungiina. Družin zaenkrat ne nava-jam, ker so korale s Pokljuke preslabo ohranjene za samostojno revizijo ali sistem.

Stromatoporoidi in hetetide, ki po novejših najdbah spikul vsaj deloma spadajo v spongije (WOOD & REITNER 1986), so tukaj navedeni samo kot skupine zunaj višjih sistematskih kategorij.

Paleontološki opis fosilov je podan v angleškem besedilu. Podrobneje so opisane samo nove vrste. Pri že znanih je dodano le novo nahajališče in dokumentacijski podatki. Opis vrst si sledi po skupinah, pri koralah še po podredovih in potem po abecednem redu rodov:

Korale

<i>Protoheterastraea minor</i> n.sp.	(Tab.1, sl.1-5)
<i>Volzeia badiotica</i> (Volz 1896)	(Tab.2, sl.1-3)
<i>Koilocoenia</i> sp.	(Tab.2, sl.4-5)
<i>Coryphyllia regularis</i> Cuif 1974	(Tab.3, sl.1)
<i>Margarophyllia capitata</i> (Münster 1841)	(Tab.3, sl.2)
<i>Margarosmilia confluens</i> (Münster 1841)	(Tab.3, sl.3)
<i>Margarosmilia richthofeni</i> Volz 1896	(Tab.4, sl.3)
<i>Margarosmilia septanectens</i> (Loretz 1875)	(Tab.4, sl.1-2)
<i>Pokljukosmilia tuvalica</i> n.gen.n.sp.	(Tab.5,sl.1-5,Tab.6,sl.1-3)
<i>Araiophyllum</i> cf. <i>A. triassicum</i> Cuif 1975	(Tab.7, sl.1-2)
<i>Craspedophyllia alpina</i> (Loretz 1875)	(Tab.7, sl.3)
<i>Myriophyllum badioticum</i> (Volz 1896)	(Tab.7, sl.4)
<i>Rhopalodendron juliensis</i> n.gen.n.sp.	(Tab.8, sl.1-6)
<i>Stuoresia bronni</i> (Klipstein 1843)	(Tab.7, sl.5)
<i>Tropidendron rhopalifer</i> Cuif 1975	(Tab.7,sl.6-7)

Stromatoporoidea

<i>Stromatomorpha</i> sp.	(Tab.10, sl.1-2)
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Chaetetida

<i>Aculaechaetetes</i> sp.	(Tab.10, sl.3)
<i>Atrochaetetes cylindrica</i> n.sp.	(Tab.9, sl.1-7)
<i>Blastochaetetes orientalis</i> Cuif & Fischer 1974	(Tab.10, sl.4-5)

Drugi fosili

<i>Marinella</i> sp.	(Tab.10, sl.6)
<i>Solenopora</i> sp.	(Tab.10, sl.7)
<i>Ladinella porata</i> Ott 1968	(Tab.10, sl.9)
<i>Plexoramea cerebriformis</i> Mello 1964	(Tab.10, sl.10)

Stratigrafska primerjava grebenskih fosilov

Korale in drugi grebenski fosili so bili zbrani na Pokljuki v istem profilu. Že v poglavju o legi grebenskega kompleksa smo zapisali, da si v tem profilu karbonatna grebenska sedimentacija sledi neprekinjeno skozi ves karnij. Najstarejši grebenski fosili so cordevolski in se začno pri nahajališču 14413, najmlajši pa tuvalski pri nahajališču 14745.

Koralne in druge grebenske fosile iz tega profila smo lahko razdelila na tri horizonte. Dva spodnja vsebujeta fosile, ki so značilni za "kasijanski" kompleks. Znan je v Dolomitih (FRECH 1890), v severnih Apneniških Alpah (OTT 1967, HENRICH 1983), na Pamirju (MELNIKOVA 1975) in drugje. V Sloveniji je bil najden v Hudajužni (TURNŠEK & al. 1982) ter v severnih Julijskih Alpah (RAMOVŠ & TURNŠEK 1984). Povsod je ta kompleks uvrščen v cordevol-jul. Na Pokljuki smo ta kompleks lahko razdelili na dva horizonta. Na prvi, najspodnjejši del profila je omejenih pet vrst koral: *Margarophyllia capitata*, *Araiophyllum triassicum*, *Volzeia badiotica*, *Tropidendron rhopalifer* in *Stuoresia bronni* ter ramosna hetetida *Atrochaetetes cylindrica* n.sp. Te vrste se pojavljajo v nahajališčih 14413, 14415, 14416, 14418 in 14419. Ker predstavljajo spodnji del kasijanskega kompleksa, sem jih uvrstila v cordevol. Vendar na Pokljuki manjkajo v tem horizontu spongije, ki so sicer značilne za spodnji del kasijanskih skladov. Zato je najverjetneje, da se profil na Pokljuki začne šele v zgornjem cordevolu.

V drugem, to je srednjem delu profila na Pokljuki, to je v nahajališčih 14741 in 14742 smo dobili 4 vrste koral: *Myriophyllum badioticum*, *Margarosmilia confluens*, *M. septanectens* in *M. richthofeni*. Tudi te vrste so tipične "kasijanske". Ker se na Pokljuki pojavljajo vedno nad prej omenjenim cordevolskim horizontom, jih uvrščamo v jul. Od cordevola se loči jul tudi po množičnem pojavu masivnih hetetid in alg. To so *Aculaechaetetes* sp., *Blastochaetetes orientalis*, *Stromatomorpha* sp., *Marinella* sp in *Solenopora* sp. Tu začne tudi *Plexoramea cerebriformis* (gl. FLÜGEL & al. 1988). Najbolj značilna od te združbe je *Blastochaetetes orientalis*,

ki je v Turčiji omenjena v "karniju", kar je pomenilo sklade nad "kasijanom" (FISCHER & CUIF 1974), torej jul. Tu smo našli tudi spongijo *Stylothalamia dehmi* (Tab. 10, sl. 8), ki jo je OTT (1967) uvrstil v "rabelj".

V tretjem, zgornjem delu profila na Pokljuki se pojavi povsem drugačna koralna združba. V nahajališčih 14744 in 14745 smo dobili vrste *Craspedophyllia alpina*, *Rhopalodendron juliensis* n.g.n.sp., *Pokljukosmilia tuvalica* n.g.n.sp., *Coryphyllia regularis* in *Protoheterastraea* n.sp., torej med petimi vrstami kar dva nova rodova in tri nove vrste. Taka velika sprememba fosilne združbe nakazuje spremembo v sedimentaciji in starosti. Ker te nove oblike leže nad prej omenjenim julskim horizontom in tik pod vrhom karnija, dokazanega s halobijami in konodonti, smo jih uvrstili v tuval. Tuvalske korale in drugi grebenski fosili so v svetu še zelo slabo raziskani, zato je razumljiv pojav novih oblik, ki še nimajo primerjave.

Zaradi vseh omenjenih ugotovitev je profil z grebenko favno in floro na Pokljuki nov prispevek k poznavanju karnijske stopnje. Zaradi neprekinjene grebenske sedimentacije omogoča delitev "kasijanskega" kompleksa na cordevolski in julski horizont, ugotovljena pa je tudi tuvalska stopnja. Stratigrafsko razčlenjena grebenska fosilna združba s Pokljuke bo v bodoče morda lahko služila kot reper za natančnejše razčlenjevanje karnija.

Razpredelnica vseh karnijskih grebenskih fosilnih vrst s Pokljuke je prikazana na sl. 4, ki prikazuje tudi njihova nahajališča drugje v Sloveniji.

Paleogeografske razmere ob nastajanju grebenskih kompleksov

Grebenski kompleks na Pokljuki je nastal na Julijski karbonatni platformi. Ta je bila v primerjavi z južneje ležečo Dinarsko platformo v karniju mnogo bolj razčlenjena. Na njej so med plitvinami obstajali globljemorski intraplatformski kanali.

V osrednjem delu kanalov so nastajali skladoviti mikritni apnenci z roženci. V obrobem delu pa so se sedimentirali biomikritni apnenci, ki vsebujejo pole in gnezda halobijskih lumakel. Verjetno je imel globljemorski kanal z območja Pokljuke proti jugu zvezo s Slovenskim bazenom.

Grebenski fosili so uspevali na plitvinah platforme in ob robovih teh plitvin. Dobro so ohranjeni, večinoma nerazlomljeni. Posamezne korale se pojavljajo v primarni rasti v kolonijah velikih do 1 m³ ali manjše.

Po obliki rasti se grebenski fosili lahko delijo na solitarne, vejnate in masivne oblike. V nahajališčih cordevola prevladuje vejnat tip. Solitarni in masivni organizmi so redki. Velike vejnate kolonije so rabile primerno globino vode, da so lahko nemoteno rasle v višino. Najpogostejše so ob robovih plitvin oziroma na predgrebenski ali lagunski strani grebena.

Oblika grebenskih organizmov se je na Pokljuki spremenila v julskem horizontu, ko povsem prevladajo masivne oblike hetetid, solenopor in stromatoporoidov.

Tu je najdena tudi ena od dveh masivnih koral rodu *Koilocoenia*. Vejnate in solitarne oblike so podrejene. Taka združba predstavlja centralni greben. Masivne in skorjaste oblike nakazujejo poplavitvev grebena. V okolici teh nahajališč dobimo tudi paleokraške votline z zapolnitvami, ki potrjujejo poplavitvev ali celo dvig nad vodno gladino.

V tuvalu ponovno prevlada vejnati tip organizmov, torej poglobitev. Na vrhu teh grebenskih struktur pa najdemo žepe halobijskih lumakel. Te nakazujejo še večjo pogreznitev platforme, tako da so jo vsaj na obrobju preplavili globljemorski sedimenti. Grebenska sedimentacija se je na nekaterih mestih Pokljuke nadaljevala v norij.

V času karnija so grebenski organizmi rasli na mnogih plitvinah Julijske karbonatne platforme. Podrobno so obdelani iz raznih krajev severnih Julijskih Alp (RAMOVŠ & TURNŠEK 1984). Iz tega obdobja pa so v Sloveniji znani grebeni tudi iz precej drugačnih razmer, to je iz južnega dela Slovenskega bazena. Od tu so grebenski "mud mounds" podrobno opisani iz Jesenice (ČAR & al. 1981), ter iz Hudajužne in Perble (TURNŠEK & AL. 1984, 1987).

Pravi grebeni platformskega tipa so verjetno uspevali tudi na severnem obrobju Dinarske karbonatne platforme. Vendar je bil tukaj grebenski apnenec razrušen ali spremenjen v dolomit in s tem so bili uničeni tudi grebenski fosili (BUSER 1986b).

Karnijski grebenski kompleks na Pokljuki in njegova fosilna združba se paleogeografsko vsaj deloma lahko primerjata z "wettersteinskim" razvojem masiva Hochstaufen-Rauschberg v Severnih apneniških Alpah in njegovim preходом v "Reiflinški" apnenec (HENRICH 1983).

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Explanation to Plates

All photographs except those of surfaces are negatives. Thin sections are enlarged directly onto the photographic paper.

PLATE 1

Fig. 1-5. *Protoheterastraea minor* n.sp.

Locality: Pokljuka 14745, Tuvalian

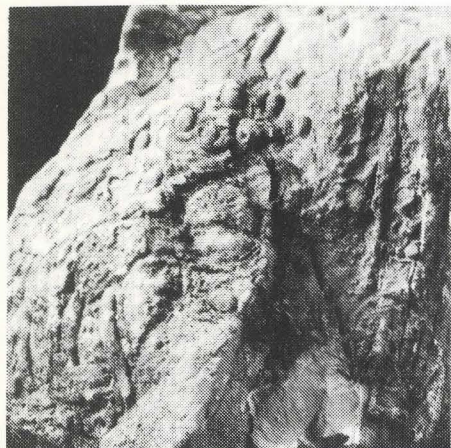
1. Surface of the phaceloid colony. Specimen P-849, holotype, x 1.
2. Longitudinal section of the holotype. Thin section P-849b, x 4.
3. Transverse section of the holotype. Thin section P-849a, x 4.
4. Detail from Fig. 3, x 8.
5. Detail from Fig. 3, x 15.

TABLA 1

Sl. 1-5. *Protoheterastraea minor* n.sp.

Nahajališče: Pokljuka 14745, tuval.

1. Površina faceloidne kolonije. Vzorec P-849, holotip, x 1.
2. Podolžni presek holotipa. Zbrusek P-849b, x 4.
3. Prečni presek holotipa. Zbrusek P-849a, x 4.
4. Detajl s sl. 3, x 8.
5. Detajl s sl. 3, x 15.



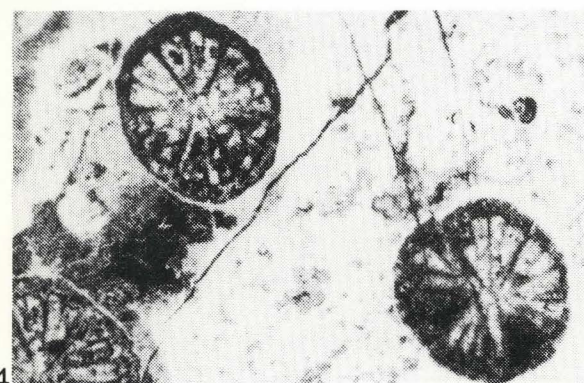
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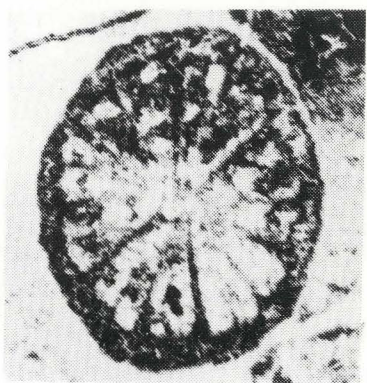
2



3



4



5

PLATE 2

Fig. 1-3. *Volzeia badiotica* (Volz 1896)

Locality: Pokljuka 14415, Cordevolian.

1. Surface of phaceloid colony. Specimen P-808, x 1.
2. Transverse section of the same colony. Thin section P-808a, x 4.
3. Detail from Fig. 2, x 8.

Fig. 4-5. *Koilocoenia* sp

Locality: Pokljuka 14741, Julian.

4. Transverse section of plocoid colony. Thin section P-825a, x 4.
5. Longitudinal section of the same colony. Thin section P-825b, x 4.

TABLA 2

Sl. 1-3. *Volzeia badiotica* (Volz 1896)

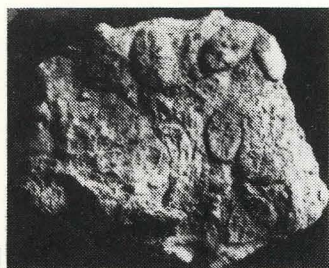
Nahajališče: Pokljuka 14415, cordevol.

1. Površina faceloidne kolonije. Vzorec P-808, x 1.
2. Prečni presek iste kolonije. Zbrusek P-808a, x 4.
3. Detajl s sl. 2, x 8.

Sl. 4-5. *Koilocoenia* sp.

Nahajališče: Pokljuka 14741, jul.

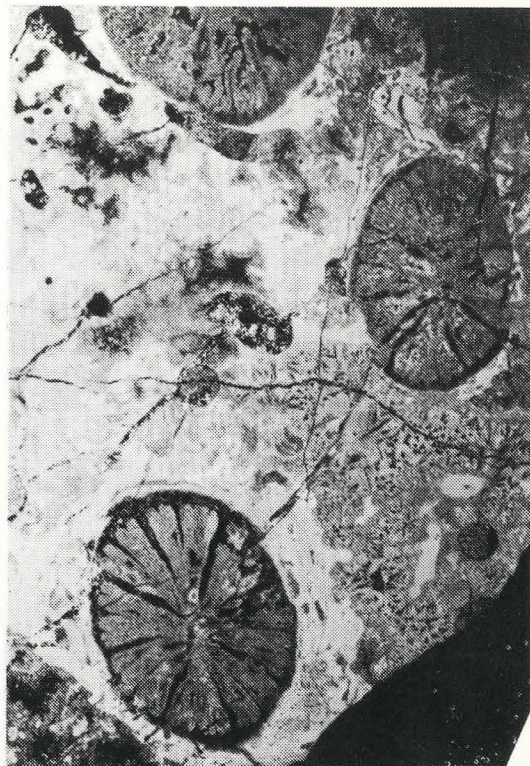
4. Prečni presek plokoidne kolonije. Zbrusek P-825a, x 4.
5. Podolžni presek iste kolonije. Zbrusek P-825b, x 4.



1



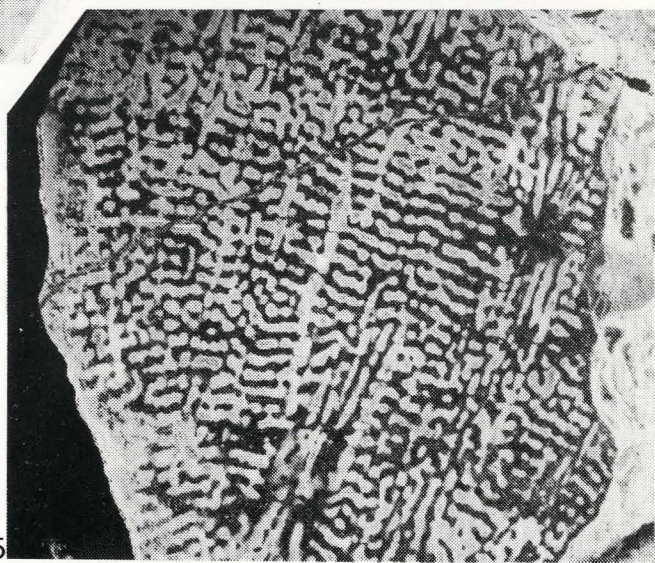
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2



4



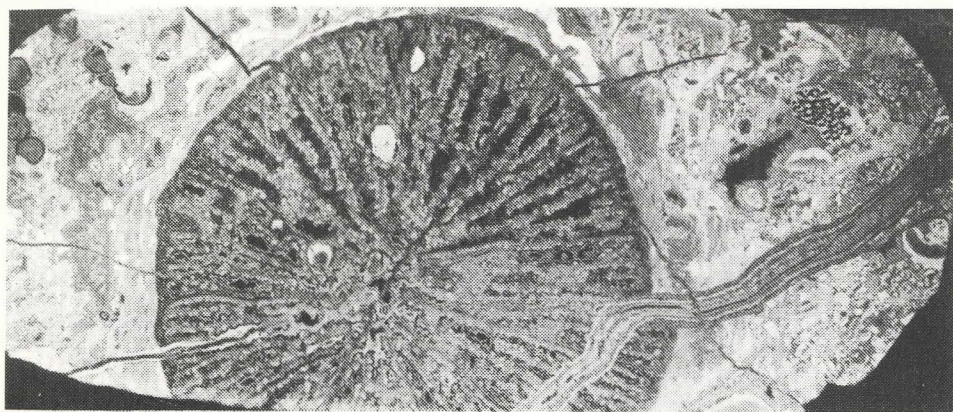
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PLATE 3

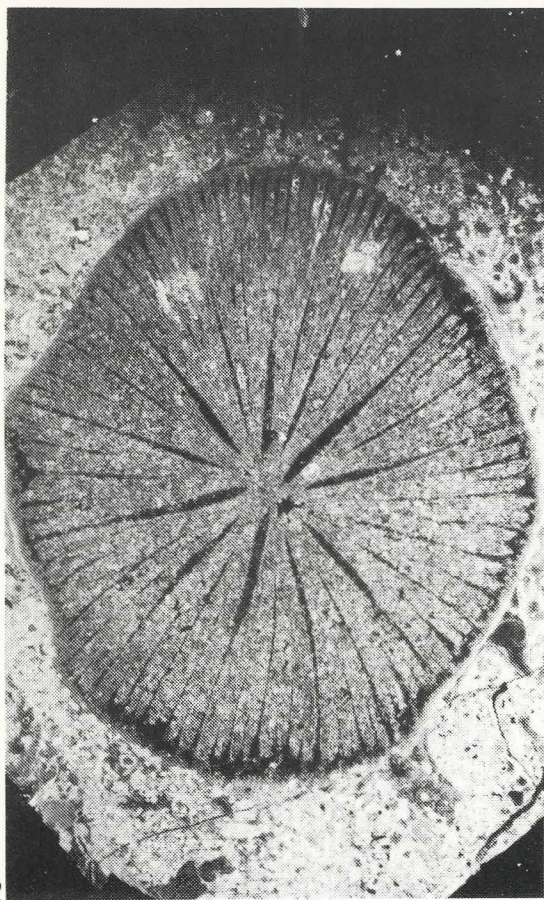
- Fig. 1. *Coryphyllia regularis* Cuif 1974
 Locality: Pokljuka 14745, Tuvalian.
 Transverse section of corallum. Thin section P-857a, x 4.
- Fig. 2. *Margarophyllia capitata* (Münster 1841)
 Locality: Pokljuka 14418, Cordevolian.
 Transverse section of corallum. Thin section P-812a, x 4.
- Fig. 3. *Margarosmilia confluens* (Münster 1841)
 Locality: Pokljuka 14741, Julian.
 Transverse section of two corallites of phaceloid colony. Thin section P-828a, x 4.

TABLA 3

- Sl. 1. *Coryphyllia regularis* Cuif 1974
 Nahajališče: Pokljuka 14745, tuval.
 Prečni presek koraluma. Zbrusek P-857a, x 4.
- Sl. 2. *Margarophyllia capitata* (Münster 1841)
 Nahajališče: Pokljuka 14418, cordevol.
 Prečni presek koraluma. Zbrusek P-812a, x 4.
- Sl. 3. *Margarosmilia confluens* (Münster 1841)
 Nahajališče: Pokljuka 14741, jul.
 Prečni presek dveh koralitov v faceloidni koloniji. Zbrusek P-828a, x 4.



1



2



3

PLATE 4

Fig. 1-2. *Margarosmilia septanectens* (Loretz 1875)

Locality: Pokljuka 14741, Julian.

1. The surface of the phaceloid colony. Specimen P-820, x 1.

2. Transverse section of the same colony. Thin section P-820a, x 4.

Fig. 3. *Margarosmilia richthofeni* Volz 1896

Locality: Pokljuka 14742, Julian.

Transverse section of irregularly branching corallites. Thin section P-841a, x 4.

TABLA 4

Sl. 1-2. *Margarosmilia septanectens* (Loretz 1875)

Nahajališče: Pokljuka 14741, jul.

1. Površina faceloidne kolonije. Vzorec P-820, x 1.

2. Prečni presek iste kolonije. Zbrusek P-820a, x 4.

Sl. 3. *Margarosmilia richthofeni* Volz 1896

Nahajališče: Pokljuka 14742, jul.

Prečni presek nepravilno razvejanih koralitov.

Zbrusek P-841a, x 4.

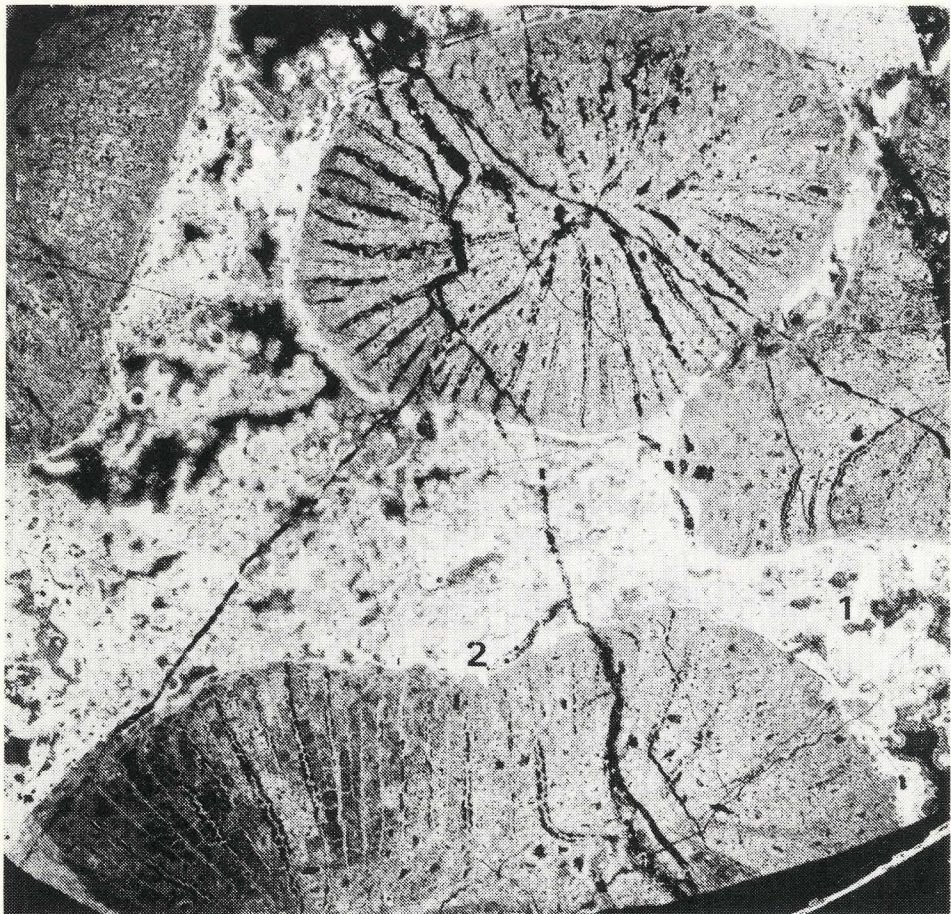
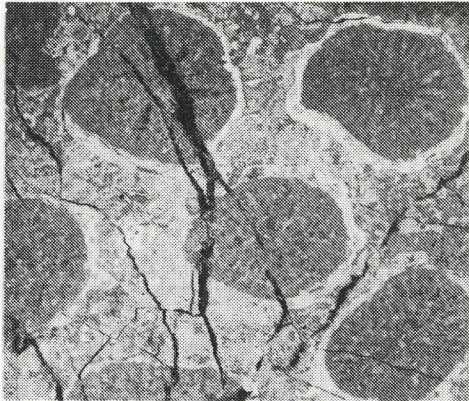
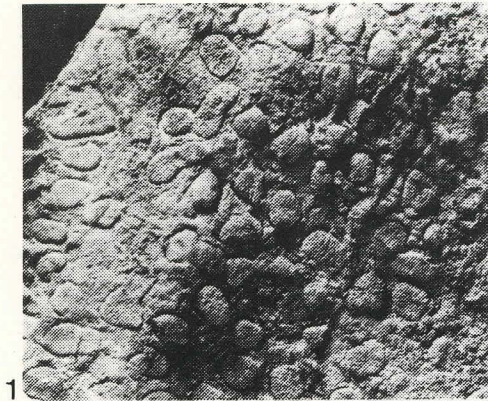


PLATE 5

Fig. 1-5. *Pokljukosmilia tuvalica* n. gen. n. sp.

Locality: Pokljuka 14745, Tuvalian.

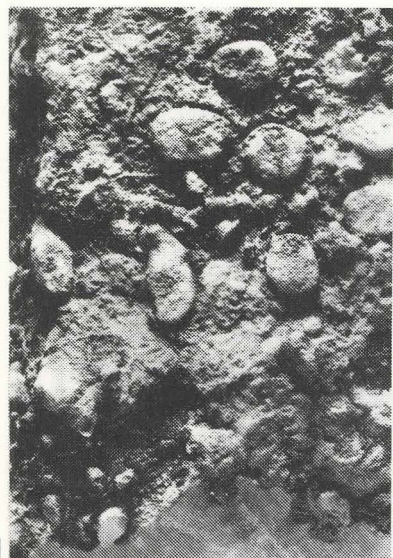
1. Surface of the phaceloid colony. Specimen P-854, holotype, x 1.
2. Transverse section of the same colony. Thin section P-854a, x 4.
3. Surface of another colony. Specimen P-852, x 1.
4. Transverse section of the colony from Fig. 3. Thin section P-852a, x 4.
5. Longitudinal section of the same colony. Thin section P-852b, x 4.

TABLA 5

Sl. 1-5. *Pokljukosmilia tuvalica* n. gen. n. sp.

Nahajališče: Pokljuka 14745, tuval.

1. Površina faceloidne kolonije. Vzorec P-854, holotip. x 1.
2. Prečni presek iste kolonije. Zbrusek P-854a, x 4.
3. Površina druge kolonije. Vzorec P-852, x 1.
4. Prečni presek kolonije s sl. 3. Zbrusek P-852a, x 4.
5. Podolžni presek iste kolonije. Zbrusek P-852b, x 4.



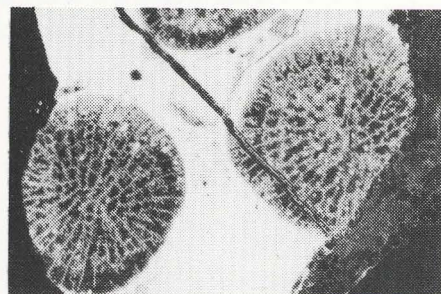
1



2



3



4



5

PLATE 6

Fig. 1-3. *Pokljukosmilia tuvalica* n.gen.n.sp.

Locality: Pokljuka 14745, Tuvalian.

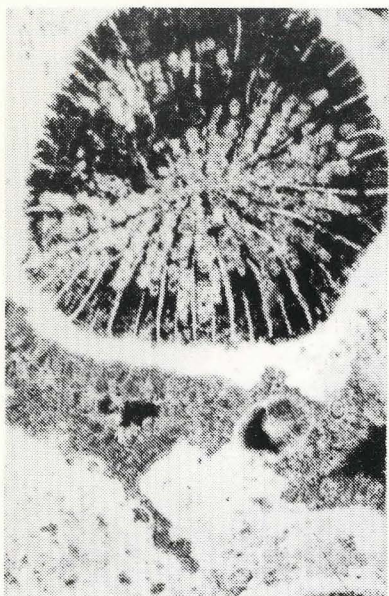
1. Transverse section of one holotype corallite Thin section P-854a, x 8.
2. Transverse section of another colony. Thin section P-852a, x 8.
3. Transverse section of one holotype corallite. Thin section P-854a, x 15.

TABLA 6

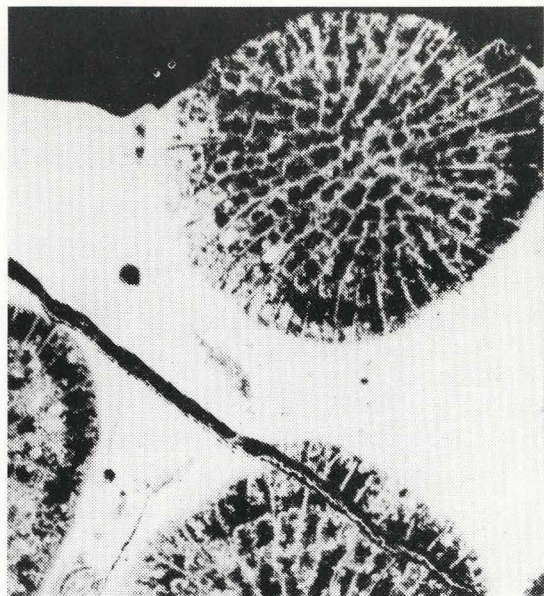
Sl. 1-3. *Pokljukosmilia tuvalica* n.gen.n.sp.

Nahajališče: Pokljuka 14745, tuval.

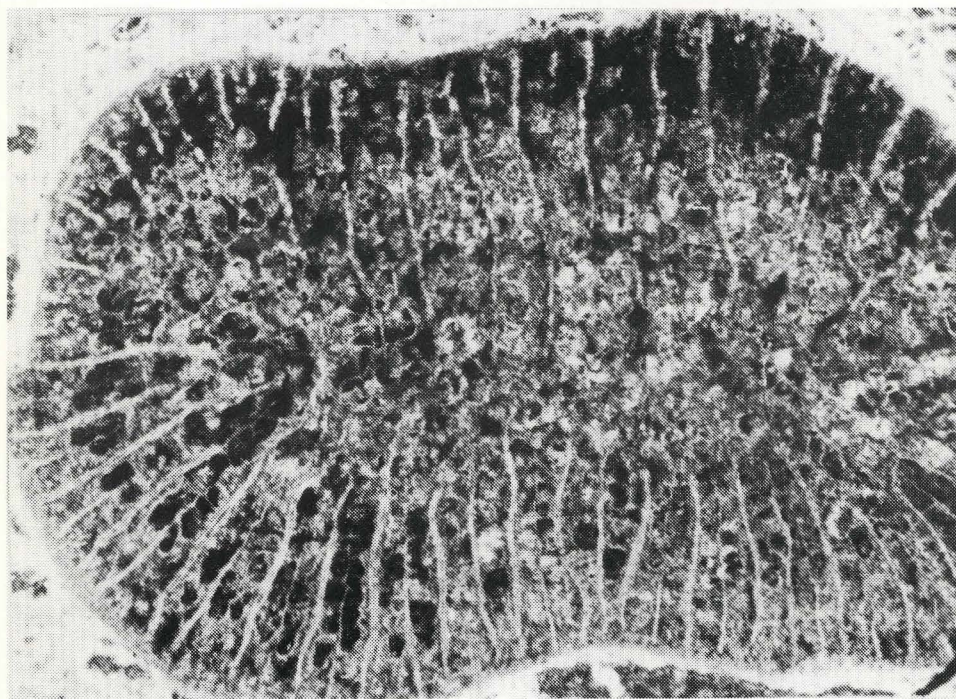
1. Prečni presek enega koralita iz holotipa. Zbrusek P-854a, x 8.
2. Prečni presek koralitov iz druge kolonije. Zbrusek P-852a, x 8.
3. Prečni presek enega koralita iz holotipa. Zbrusek P-854a, x 15.



1



2



3

PLATE 7

- Fig. 1-2. *Araiophyllum* cf. *A. triassicum* Cuif 1975
 Locality: Pokljuka 14415, Cordevolian.
 1. Surface of the colony from above. Specimen P-807, x 1.
 2. Transverse section of the same colony. Thin section P-807b, x 4.
- Fig. 3. *Craspedophyllia alpina* (Loretz 1875)
 Locality: Pokljuka 14745, Tuvanian.
 Transverse section of corallum. Thin section P-858a, x 4.
- Fig. 4. *Myriophyllum badioticum* (Volz 1896)
 Locality: Pokljuka 14741, Julian.
 Transverse section of corallum. Thin section P-833a, x 4.
- Fig. 5. *Stuoresia bronni* (Klipstein 1843)
 Locality: Pokljuka 14418, Cordevolian.
 Transverse section of meandroid colony.
 Thin section P-813a, x 4.
- Fig. 6-7. *Tropidendron rhopalifer* Cuif 1975
 Locality: Pokljuka 14416, Cordevolian.
 6. Surface of the phaceloid colony. Specimen P-809, x 1.
 7. Transverse section of the same colony. Thin section P-809a, x 4.

TABLA 7

- Sl. 1-2. *Araiophyllum* cf. *A. triassicum* Cuif 1975
 Nahajališče: Pokljuka 14415, cordevol.
 1. Površina kolonije od zgoraj. Vzorec P-807, x 1.
 2. Prečni presek iste kolonije. Zbrusek P-807a, x 4.
- Sl. 3. *Craspedophyllia alpina* (Loretz 1875)
 Nahajališče: Pokljuka 14745, tuval.
 Prečni presek koraluma. Zbrusek P-858a, x 4.
- Sl. 4. *Myriophyllum badioticum* (Volz 1896)
 Nahajališče: Pokljuka 14741, jul.
 Prečni presek koraluma. Zbrusek P-833a, x 4.
- Sl. 5. *Stuoresia bronni* (Klipstein 1843)
 Nahajališče: Pokljuka 14418, cordevol.
 Prečni presek meandroidne kolonije. Zbrusek P-813a, x4.
- Sl. 6-7. *Tropidendron rhopalifer* Cuif 1975
 Nahajališče: Pokljuka 14416, cordevol.
 1. Površina faceloidne kolonije od zgoraj. Vzorec P-809, x 1.
 2. Prečni presek iste kolonije. Zbrusek P-809a, x 4.

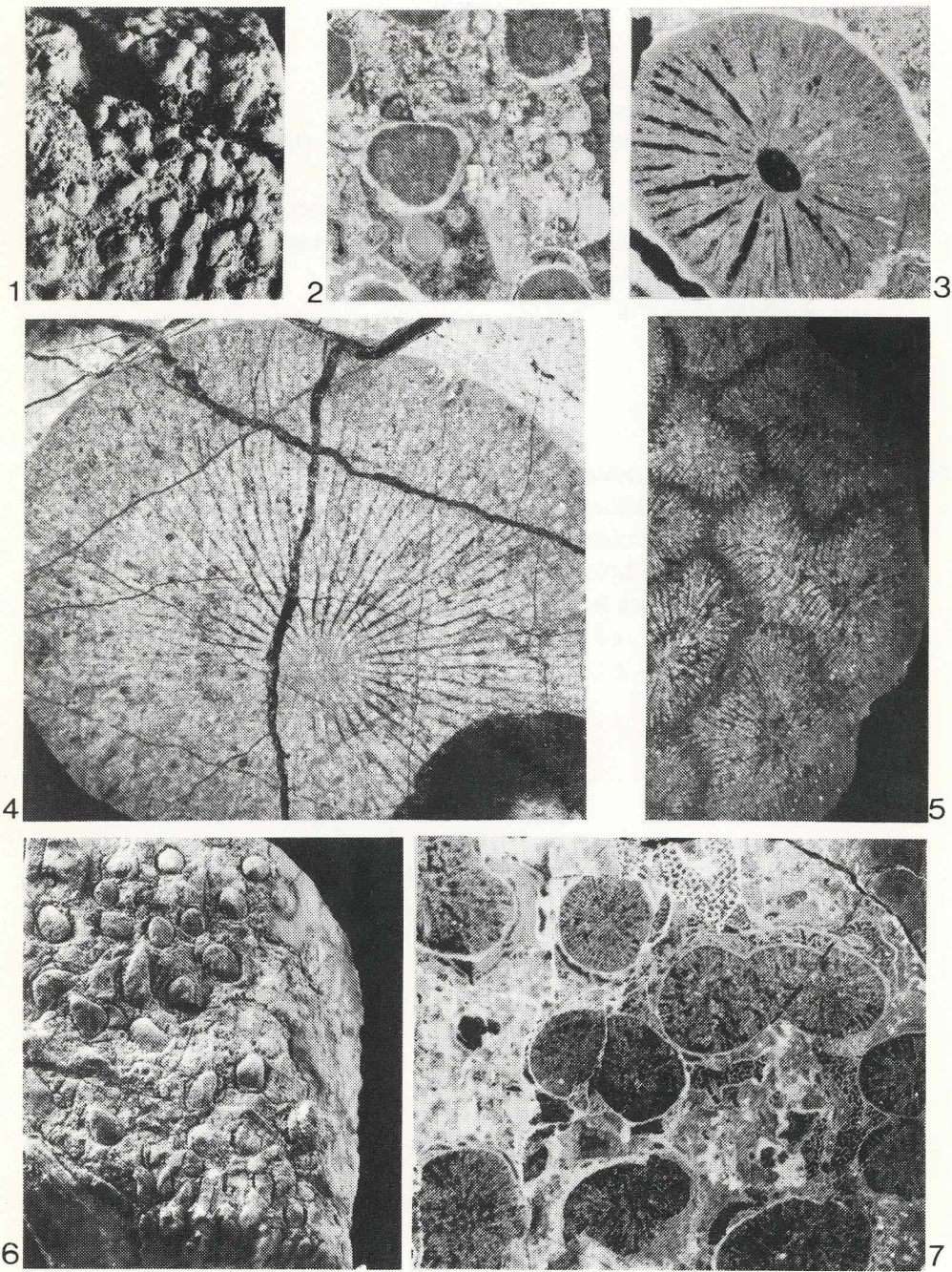


PLATE 8

Fig. 1-6. *Rhopalodendron juliensis* n. gen. n. sp.

Locality: Pokljuka 14744, Tuvalian.

1. Surface of the phaceloid colony from above. Specimen P-845, holotype, x 1.

2. Transverse section of the holotype. Thin section P-845a, x 4.

3. Longitudinal section of the holotype. Thin section P-845b, x 4.

4. Detail from Fig. 2, x 8.

5. Detail from Fig. 4, x 15.

TABLA 8

Sl. 1-6. *Rhopalodendron juliensis* n. gen. n. sp.

Nahajališče: Pokljuka 14744, tuval.

1. Površina faceloidne kolonije od zgoraj. Vzorec P-845, holotip, x 1.

2. Prečni presek holotipa. Zbrusek P-845a, x 4.

3. Podolžni presek holotipa. Zbrusek P-845b, x 4.

4. Detajl s sl. 2, x 8.

5. Detajl s sl. 4, x 15.

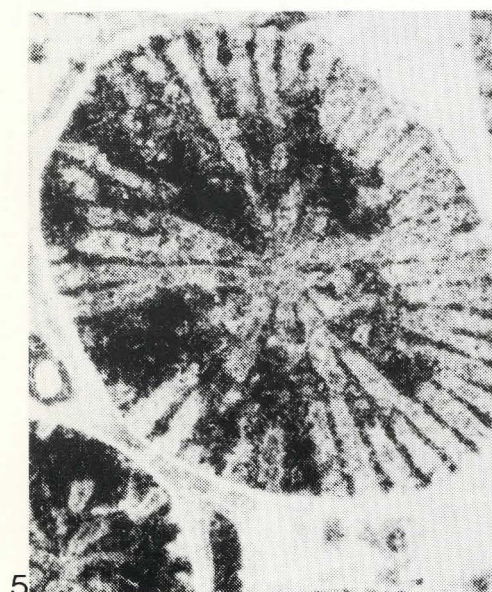
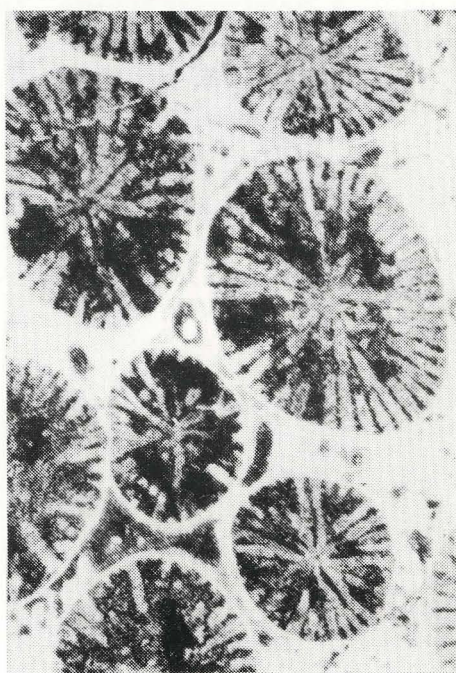
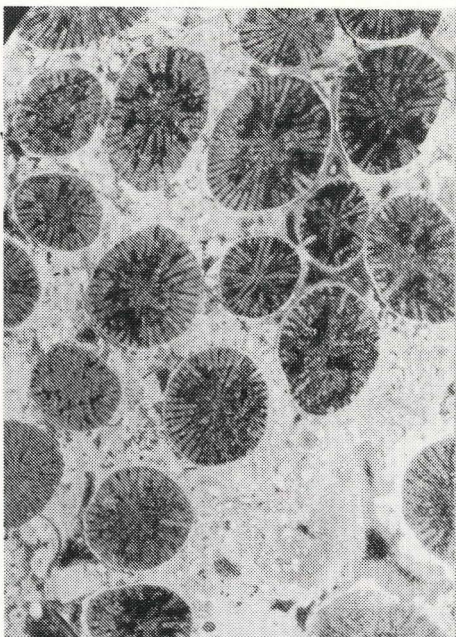
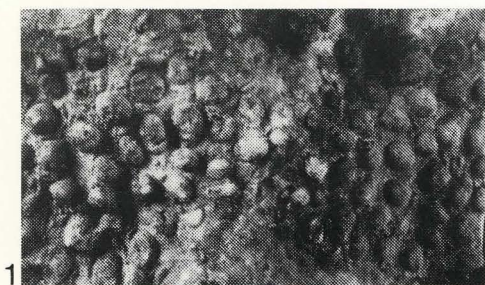


PLATE 9

Fig. 1-7. *Atrochaetetes cylindrica* n.sp.

Locality: Pokljuka 14415, 14418, Cordevolian.

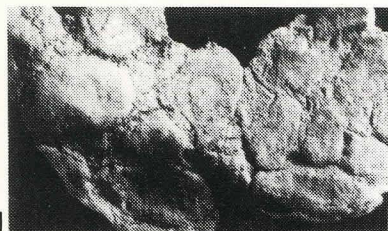
1. Surface of the branching colony from above. Specimen P-816, holotype, x 1.
2. Longitudinal section of the holotype. Thin section P-816d, x 4.
3. Transverse section of the holotype. Thin section P-816a, x 4.
4. Detail from Fig. 3, x 15.
5. Detail from Fig. 2, x 15.
6. Surface of another specimen from above. P-806, x 1

TABLA 9

Sl. 1-7. *Atrochaetetes cylindrica* n.sp.

Nahajališče: Pokljuka 14415, 14418, cordevol.

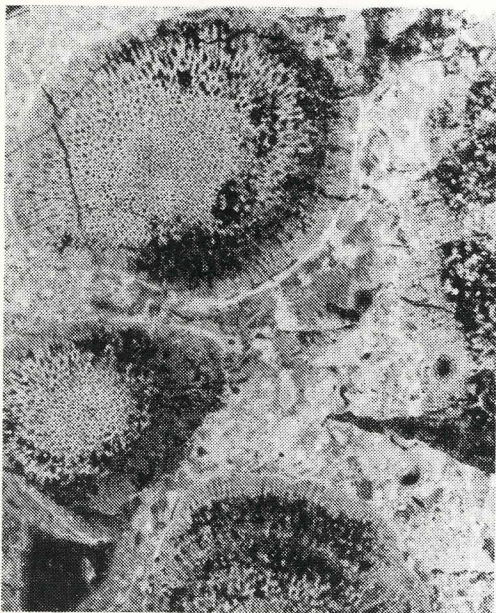
1. Površina vejnate kolonije od zgoraj. Vzorec P-816, holotip, x 1.
2. Podolžni presek holotipa. Zbrusek P-816d, x 4.
3. Prečni presek holotipa. Zbrusek P-816a, x 4.
4. Detajl s sl. 3, x 15.
5. Detajl s sl. 2, x 15.
6. Površina drugega vzorca od zgoraj. P-806, x 1.



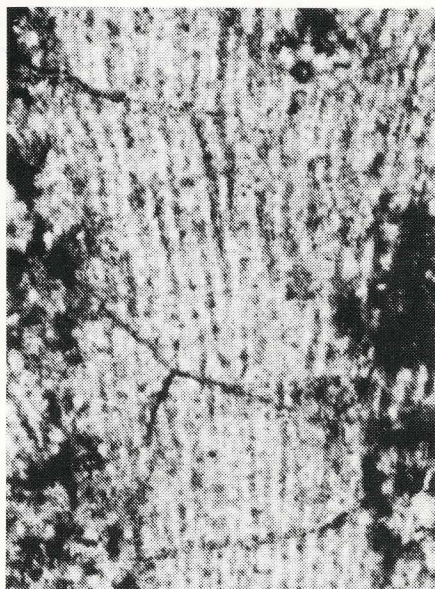
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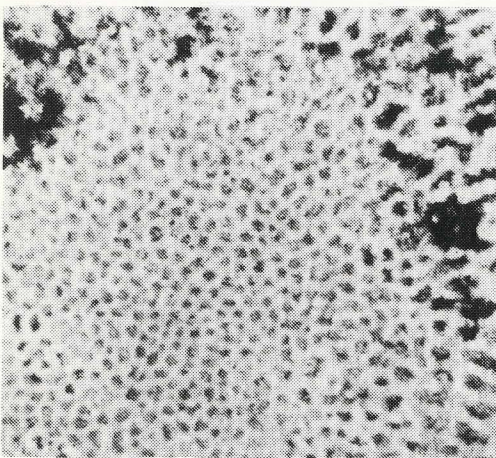
2



3



5



4



6

PLATE 10

Fig. 1-2. *Stromatomorpha* sp.

Locality: Pokljuka 14741, Julian.

1. Transverse thin section of coenosteum. P-823a, x 4.

2. Longitudinal thin section. P-823b, x 4.

Fig. 3. *Aculaechaetetes* sp.

Locality: Pokljuka 14741, Julian. Transverse thin section of colony. P-829a, x 4.

Fig. 4-5. *Blastochaetetes orientalis* Cuif & Fischer 1974

Locality: Pokljuka 14742, Julian.

4. Transverse section of massive colony showing tubular structure. Thin section P-837a, x 4.

5. Detail from Fig. 4, x 8.

Fig. 6. *Marinella* sp.

Locality: Pokljuka 14741, Julian. Transverse and partly longitudinal section of colony. Thin section P-822a, x 4.

Fig. 7. *Solenopora* sp.

Locality: Pokljuka 14741, Julian. Longitudinal and transverse sections of smaller colonies. Thin section P-832, x 4.

Fig. 8. *Stylothalamia dehmi* Ott 1967

Locality: Pokljuka 14741, Julian. Thin section P-821, x 4.

Fig. 9. *Ladinella porata* Ott 1967

Locality: Pokljuka 14741, Julian. Thin section P-828a, x 8.

Fig. 10. *Plexoramea cerebriformis* Mello 1977

Locality: Pokljuka 14741, Julian. Thin section P-834, x 8.

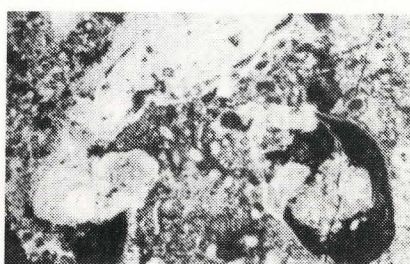
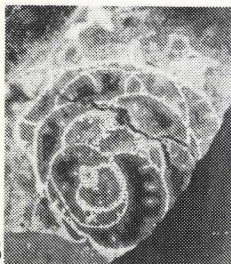
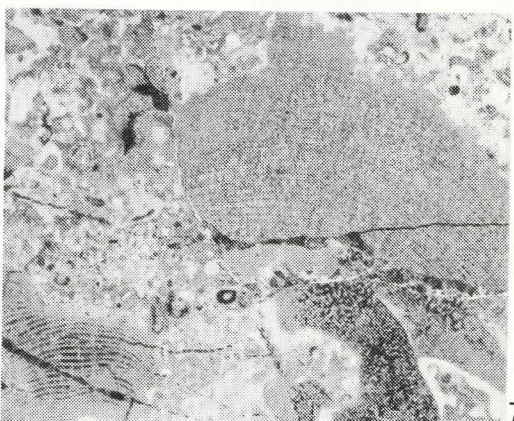
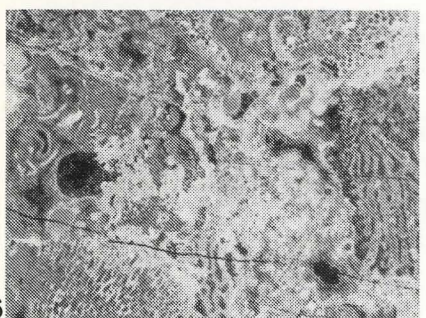
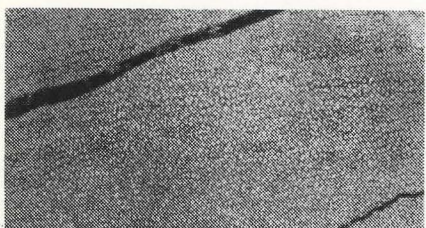
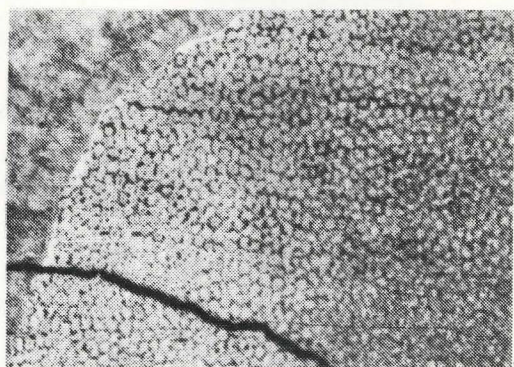
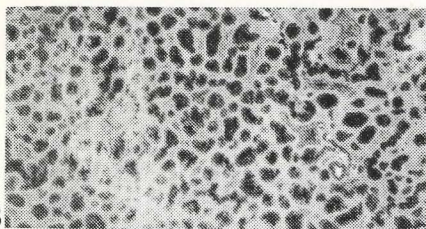
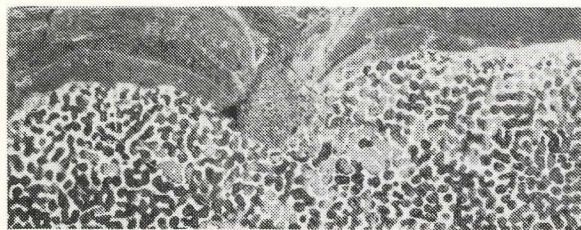


TABLA 10

- Sl. 1-2. *Stromatomorpha* sp.
Nahajališče: Pokljuka 14741, jul.
1. Prečni presek cenosteja. Zbrusek P-823a, x 4.
2. Podolžni presek cenosteja. Zbrusek P-823b, x 4.
- Sl. 3. *Aculaechaetetes* sp.
Nahajališče: Pokljuka 14741, jul. Prečni presek kolonije. Zbrusek P-829a, x 4.
- Sl. 4-5. *Blastochaetetes orientalis* Cuif & Fischer 1974
Nahajališče: Pokljuka 14742, jul.
4. Prečni presek masivne kolonije. Zbrusek P-837a, x 4
5. Detajl s sl. 4, x 8.
- Sl. 6. *Marinella* sp.
Nahajališče: Pokljuka 14741, jul. Prečni in deloma podolžni presek kolonije. Zbrusek P-822a, x 4.
- Sl. 7. *Solenopora* sp.
Nahajališče: Pokljuka 14741, jul. Podolžni in prečni preseki več manjših kolonij. Zbrusek P-832, x 4.
- Sl. 8. *Stylothalamia dehmi* Ott 1967
Nahajališče: Pokljuka 14741, jul. Zbrusek P-821, x 4.
- Sl. 9. *Ladinella porata* Ott 1967
Nahajališče: Pokljuka 14741, jul. Zbrusek P-828a, x 8.
- Sl. 10. *Plexoramea cerebriformis* Mello 1977
Nahajališče: Pokljuka 14741, jul. Zbrusek P-834, x 8.