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DRAGICA TURNŠEK

MALMIAN CORALS FROM ZLOBIN, SOUTHWEST CROATIA

MALMSKI KORALJI ZLOBINA U JUGOZAPADNOJ HRVATSKOJ

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DRAGICA TURNŠEK

MALMIAN CORALS FROM ZLOBIN, SOUTHWEST CROATIA

With 1 text-figure, 1 table and 12 plates

Received at the meeting of the Natural Science Department of the Yugoslav Academy of Sciences and Arts on 15th October 1975.

Nineteen species of corals have been determined and described from the Zlobin collection; one of them, *Diplaraea croatica*, being new. They belong to 15 genera, and can mainly be compared with the Upper Oxfordian and Kimmeridgian corals of West Europe.

The author discusses on the question of the age of the Tithonian in the coral facies.

INTRODUCTION

The fossil coral material from Zlobin near Kraljevica in southwest Croatia (Fig. 1) has been kept for several years now in the palaeontological collection of the Department for Geology and Palaeontology, Faculty of Science, University of Zagreb. The material was collected at the Zlobin railway station by the late Professor M. Salopek. The present authorities of the mentioned Department were so kind as to make these corals available to me for investigation, with permission to publish the results obtained. My sincere thanks go to all of them for the trust they have shown in me.

The Zlobin coral collection consists of 57 specimens, from which about a ninety thin sections have been made. Large ramose colonies predominate, whereas massive colonies and solitary corals are fewer in number. I have determined 19 species, one of which is a new one. For most specimens, the microstructure of the skeletal elements is recrystallized. However, the macrostructural elements were so well preserved that it was possible to determine nearly all the specimens.

The collection is kept at the Department for Geology and Palaeontology, Faculty of Science, University of Zagreb.

I am grateful to Prof. Dr. Vanda Kochansky-Dévidé for all her kind advice regarding the publication. I would also like to thank Milojka Huzjan for the technical lay-out of this paper and for the preparation of the fossil materials, as well as Carmen Narobe for providing the photographs.

All the species are shown in the plates. Photographs have been taken of thin sections and of the surfaces of fossils. The thin sections have been enlarged directly onto the paper; the photographs of the thin sections are thus negatives. The surfaces of fossils have been photographed by means of a film. In order to make the comparison of species easier all photographs have been enlarged 4 times. Only some surfaces have been left unenlarged. In addition, the structural elements of the new species have been enlarged also 8 times.

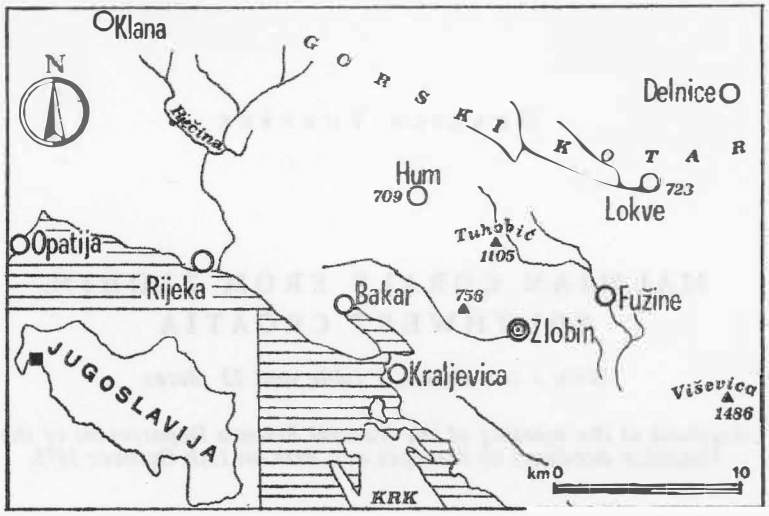

Fig. 1. Position of coral locality at Zlobin
Sl. 1. Položaj koraljnog nalazišta u Zlobinu

SYSTEMATIC PALAEONTOLOGY

I have included the coral species determined from Zlobin in the system I used and explained in the description of Jurassic corals of Slovenia (Turnšek 1972). The genus *Aplosmilia*, which I have not found in Slovenia, I have attributed, in accordance with the system of Vaughan & Wells (1943, 221), to the suborder Caryophyllina, family Rhipidogyridae Koby, 1904. The similarity of *Aplosmilia* with the genus *Acanthogyra* was pointed out also by Alloiteau (1957, 359).

When dealing with the seven species which are the same as those in Slovenia I do not repeat the synonymy but only make reference to my work of 1972.

Suborder: Stylinina Alloiteau, 1952
Family: Stylinidae d'Orbigny, 1851
Genus: *Stylina* Lamarck, 1816
Stylina thiessingi (Koby, 1881)

Pl. I, figs. 1–3

1881 *Cryptocoenia Thiessingi.* Koby, 86–87, pl. 29, figs. 2–2a.
1964 *Stylina thiessingi.* Beauvais, 132–133, pl. 9, fig. 4, pl. 10, fig. 3.
1970 *Cryptocoenia thiessingi.* Babaev, 86.

Description: The colony is massive, plocoid. The corallites are round, being joined by a costate intercorallite skeleton. The septa are hexameral, confluent or subconfluent. The columella is styliform, the wall parathecal, and the microstructure recrystallized.

Dimensions:	Zlobin	Koby	Beauvais
diameter of corallites	1–1.5 mm	1.5 mm	1–2 mm
distance of centres	2–3 mm	2.5–3 mm	2–4 mm
number of septa	24+S4	12+12c	24s+24c
colony	70×40 mm	80×70 mm	

Distribution: The Upper Oxfordian of Switzerland, and the Lower Kimmeridgian of the U. S. S. R.

Material in the Zlobin collection: Specimen Zl. 26.

Genus: *Heliocoenia* Étallon, 1859

Heliocoenia (Decaheliocoenia) variabilis Étalon, 1859

Pl. I, figs. 4–5

1965 *Heliocoenia variabilis.* Geyer, 231
1970 *Heliocoenia variabilis.* Babaev, 87
1972 *Heliocoenia (Decaheliocoenia) variabilis.* Turnšek, 168–169, 230, pl. 8, fig. 3, pl. 9, figs. 1–6.

Description: This species has been exactly described by the author when examining the Upper Jurassic corals of Slovenia. (Turnšek 1972). The specimens from Zlobin, too, show a decameral system of septa, a lamelar columella, and a parathecal wall. The microstructure is not preserved.

Distribution: The Oxfordian of Poland, France, and Switzerland, the Oxfordian and Lower Kimmeridgian of Slovenia, Montenegro, and the U. S. S. R., andt he Kimmeridgian of Portugal and Spain.

Material in the Zlobin collection: Specimens Zl. 54, Zl. 55.

Genus: *Stylosmilia* Milne-Edwards & Haime, 1851

Stylosmilia corallina Koby, 1881

Pl. II, figs. 1–5

1972 *Stylosmilia corallina.* Turnšek, 169–170, 230–231, pl. 10, figs. 1–2.

Description: This species, too, was described by the author in 1972. Six large colonies from the Zlobin collection belong to it. The largest one is 15 cm high and 25 cm wide. The corallites are parallel, and all of the same size; they bud laterally. The septa are developed in three cycles. The columella is styliform, and a little prolongated. The diameter of the corallites is 2,5–3 mm, the septa are 24 in number. Interesting are some colonies where the corallites are overgrown by chaetetids.

Distribution: The Oxfordian of Switzerland, France and Poland, and the Oxfordian and Lower Kimmeridgian of Slovenia.

Material in the Zlobin collection: Specimens Zl. 9, Zl. 10, Zl. 16, Zl. 25, Zl. 40.

Stylosmilia suevica Becker, 1875

Pl. III, figs. 1–2

1875 *Stylosmilia Suevica.* Becker in: Becker & Milaschewitsch (1875–76), 139–140, pl. 4, fig. 1.
1912 *Stylosmilia* cfr. *suevica.* Speyer, 202.
1966 *Stylosmilia suevica.* Roniewicz, 192, pl. 4, fig. 4.

Description: The colony is phaceloid. The corallites are parallel; they bud laterally on several sides. On the weathered surface the calices are even. The septal structure is sometimes irregular. The septa are developed in three full cycles. The fourth cycle is incomplete, it appears as costae. The columella is styliform, a little lamelar. The microstructure is not preserved.

Dimensions:	Zlobin	Becker	Roniewicz
diameter of corallites	2–4 mm	3.5–4 mm	3.5–3.8 mm
number of septa	24 + S4	24	48 (24 + 24)
colony	100–200 mm		

Comparison: The corallites of this species are more densely spaced than in *S. corallina*. They bud in several directions, not only on the two opposite sides of the mother calice.

Distribution: The Upper Oxfordian of Poland, and the Kimmeridgian of Germany and the Caucasus.

Material in the Zlobin collection: the larger-sized colonies Zl. 5, Zl. 17, Zl. 18, and the smaller fragments Zl. 35, Zl. 51.

Genus: *Goniocora* Milne-Edwards & Haime, 1851

Goniocora socialis (Roemer, 1839)

Pl. III, figs. 3–5

1851 *Goniocora socialis*. Milne-Edwards & Haime, 92–93, pl. 15, figs. 2, 2a–b.

Description: The colony is dendroid-phaceloid. The corallites are small; they bud at an angle of about 50°. The columella is styliform, the wall is septothecal.

Dimensions:	Zlobin	Milne
diameter of corallites	1.5–2.5 mm	1–5 mm
number of septa	24	24
colony	150 × 200 mm	–

Comparison: The specimens from Zlobin fit in with the descriptions of the English specimens. The columella is even more well preserved.

Distribution: The Upper Oxfordian of England.

Material in the Zlobin collection: two large colonies Zl. 1, Zl. 15, and some fragments of colonies Zl. 14, Zl. 39, Zl. 41.

Genus: *Aplophyllia* d'Orbigny, 1849

Aplophyllia sexradiata Roniewicz, 1966

Pl. III, figs. 6–7

1972 *Aplophyllia sexradiata*. Turnšek, 172, 232, pl. 11, fig. 4.

Description: The specimen from Zlobin is quite similar to that from Slovenia (Turnšek 1972). The colony is dendroid-plocoid, the corallites being irregularly parallel, and the septa hexameral, without columella. The diameter of the corallites of the Zlobin specimen is

2.5–4.0 mm; there are 12 septa of the first two cycles; the number of the septa of the third cycle varies. The size of the colony is 50 × 20 mm.

Distribution: The Upper Oxfordian of Poland, the Upper Oxfordian and the Lower Kimmeridgian of Slovenia.

Material in the Zlobin collection: one specimen only Zl. 33.

Suborder: Faviina Vaughan & Wells, 1943

Family: Montlivaltiidae Dietrich, 1926

Genus: *Montlivaltia* Lamouroux, 1821

Montlivaltia compressa Fromentel, 1861

Pl. IV, figs. 1–2

1861 *Montlivaltia compressa.* Fromentel, 118.
1876 *Montivaultia compressa.* Milaschewitsch in: Becker & Milaschewitsch (1875–76), 198, pl. 45, figs. 1b–c.
1926 *Montlivaultia compressa.* Speyer, 245–246, pl. 4, fig. 4.
1954 *Montlivaltia compressa.* Geyer, 175.

Description: A solitary coral with a turbinate corallum of very large dimensions. This species is one of the largest of this genus. The septa are developed in five to six cycles, the fossula is prolongated, the endotheca is typical montlivaltiid. The microstructure consists of simple, periodically thickened, trabeculae.

Dimensions:	Zlobin	Milaschewitsch
diameter of the corallum	80 mm	78 mm
number of septa	ca 200	240–280

Comparison: In the specimen from Zlobin I have enumerated somewhat less septa than Milaschewitsch did. I think he counted the septa on the basis of the cycles. On his fig. 1b, too, not more than 200 septa can be counted.

Distribution: The Upper Oxfordian of France and Switzerland, and the Upper Oxfordian and Kimmeridgian of Germany.

Material in the Zlobin collection: the single corallum Zl. 21.

Montlivaltia champlittensis Fromentel, 1861

Pl. IV, fig. 3

1972 *Montlivaltia champlittensis.* Turnšek, 173–174, 233–234, pl. 12, fig. 1.

Description: The specimen from Zlobin corresponds wholly with the specimens of this species from Slovenia, with the only difference that it is a little smaller. The diameter of the corallum is 23 mm, and there are 96 septa. The axial part of the corallum is more recrystallized.

Distribution: The Upper Oxfordian of France, the Upper Oxfordian and Lower Kimmeridgian of Slovenia, and the Kimmeridgian of Germany.

Material in the Zlobin collection: the whole corallum Zl. 23, and the part of a corallum Zl. 44.

Genus: *Thecosmilia* Milne-Edwards & Haime, 1848

Thecosmilia magna Thurmann & Étallon, 1864

Pl. IV, fig. 4

1884 *Thecosmilia magna (Lithodendron).* Koby, 166–167, pl. 44, figs. 1–3.
1954 *Thecosmilia magna.* Geyer, 181–182.

Description: The colony is phaceloid with round corallites. The septa are developed in four cycles, the first two being of the same thickness and length, the next ones being shorter and thinner. The fossula is round. The endotheca consists of long dissepiments.

Dimensions:	Zlobin	Koby	Geyer
diameter of corallites	12 mm	12–18 mm	12–20 mm
number of septa	ca 70	ca 60–70	–
density of septa	7–9/5 mm	18/10 mm	7–8/5 mm

Distribution: The Upper Oxfordian of France, the Kimmeridgian of Germany.

Material in the Zlobin collection: specimen Zl. 30; this is a colony with three corallites, 60 mm high.

Theocosmilia suevica (Quenstedt, 1858)

Pl. IV, fig. 5

1972 *Thecosmilia suevica.* Turnšek, 177, 235–236, pl. 15, figs. 1–2.

Description: A description and comparison of this species was given by the present author on the basis of her investigations of the Upper Jurassic corals of Slovenia (Turnšek 1972). The specimens from Zlobin are of the same structure and dimensions as the Slovene ones.

Distribution: The Oxfordian and Kimmeridgian of Portugal, France, Switzerland, Germany and Slovenia, and the Tithonian of Czechoslovakia.

Material in the Zlobin collection: Two large fragments of colonies Zl. 12, Zl. 22.

Family: Placosmiliidae Alloiteau, 1952

Genus: *Placophyllia* d'Orbigny, 1848

Placophyllia rugosa Becker, 1875

Pl. V, figs. 1–3

1972 *Placophyllia rugosa.* Turnšek, 184, 241, pl. 24, figs. 1–2.

Description: This species, too, was exactly described by the present author in 1972, when she examined the Jurassic corals from Slovenia. The specimen from Zlobin is of the same structure and dimensions, with only the minor difference that it has more regular and equal corallites, and that the costate ribs are stronger. These differences bring it close to the species *Placophyllia dianthus* Becker but the latter has short and thick corallites (compare Geyer 1954, 193).

Distribution: The Oxfordian and the Kimmeridgian of Germany, Poland and Slovenia, and the Tithonian of Czechoslovakia.

Material in the Zlobin collection: just one colony Zl. 36.

Family: Axosmiliidae Geyer, 1955

Genus: *Axosmilia* Milne-Edwards & Haime, 1848

Axosmilia corallina (Étalon, 1859)

Pl. V, figs. 4–5

1880 *Pleurosmilia corallina.* Koby, 37–38, pl. 4, figs. 1–1a.
1955a *Axosmilia corallina.* Geyer, 326–327.

Description: This solitary tubinate coral has slightly oval calice; its length is not known. The septal structure is similar to that of *Montlivaltia,* but with a strong lamelar columella. The septa are developed in five to six cycles. The wall is parathecal, poorly preserved. The endotheca consists of long and tabulate dissepiments. The microstructure is not preserved.

Dimensions:	Zlobin	Koby	Geyer
diameter of corallum	35 × 45 mm	25 × 30 mm	30 × 50 mm
number of septa	ca 100 + S6	ca 120	ca 120

Comparison: *A. corallina* is very similar to *A. marcou;* the latter is distinguished from the former by having less septa (50–60) and a smaller corallum. On the other hand, *A. crassa* is larger than *A. corallina.*

Distribution: The Upper Oxfordian of Switzerland, and the Kimmeridgian of Portugal.

Material in the Zlobin collection: specimen Zl. 43.

Suborder: Fungiina Duncan, 1884

Family: Microsolenidae Koby, 1890

Genus: *Dermoseris* Koby, 1886

Dermoseris nodosa Koby, 1886

Pl. VI, figs. 1–4

1886 *Dermoseris nodosa.* Koby, 341–342, pl. 89, fig. 4.

Description: This phaceloid colony consists of long parallel corallites which bud at an acute angle. The calices are round, oval or irregular in shape. The septa are thin, even, radially arranged, developed in five to six cycles. The columella is spongy. The endotheca consists of sparcely spaced short dissepiments and numerous synapticulae. The wall is synapticulothecal. The microstructure is poorly preserved; in some places segmented divergent trabeculae can be seen.

Dimensions:	Zlobin	Koby
diameter of corallites	15–25 mm	10–30 mm
number of septa	140–180	120–180
density of septa	15–16/5 mm	16/5 mm
colony	70 × 150 mm	–

Comparison: *D. nodosa* differs from *D. schardti* in that it has less septa, from *D. loeve* and *D. delgadoi* in that it has larger corallites.

Distribution: The Upper Oxfordian of Switzerland.

Material in the Zlobin collection: two large colonies (Zl. 4, Zl. 49), and two smaller fragments (Zl. 42, Zl. 50).

Family: Haplaraeidae Vaughan & Wells, 1943

Genus: *Diplaraea* Milaschevitsch, 1876

Diplaraea croatica n. sp.

Pl. VII, figs. 1–3, pl. VIII, figs. 1–2

Derivatio nominis: The species is named after Hrvatska, lat. Croatia.
Holotypus: Nr. 931 – Zl. 11; Pl. VII, VIII.
Locus typicus: Zlobin, SW Croatia.
Stratum typicum: The Upper Jurassic.
Material: a large colony with five corallites, Zl. 11.
Diagnosis: *Diplaraea* with a diameter of corallites 20–35 mm, number of septa ca 180 (4/2 mm), and a papillose-parietal columella.

Description: The colony is phaceloid with large corallites standing apart but generally parallel. The septa are radially arranged, developed in 5 to 6 cycles, even. In the axial part they are thickened and perforated. Their axial prolongations look like paliform lobes and form a papillose-parietal columella. The endotheca consists of tabulate dissepiments. In the peripheral corallite few synapticulae occur. The microstructure is not preserved.

Dimensions:

diameter of corallites	20–35 mm
number of septa	ca 180
density of septa at wall	4/2 mm

Comparison: The new species differs from all the known species of the genus in that it has larger corallites, more septa, and a more developed parietal columella. It shows similar structure to that of *Epistreptophyllum bonjouri* (Étalon), which is solitary.

Distribution: so far at the type locality only.

Family: Dermosmiliidae Koby, 1889

Genus: *Dermosmilia* Koby, 1889

Dermosmilia labeata Krković, 1965

Pl. IX, figs. 1–3

1965 *Dermosmilia labeata.* Krković, 170, 179–180, pl. 6, fig. 4, pl. 7, figs. 1–2.

Description: This plocoid colony has long parallel corallites. The septa are numerous, being perforated in axial part. Their trabecular prolongations form a spongy columella. The endotheca consists of long uneven dissepiments.

Dimensions:	Zlobin	Krković	*D. crassa*
diameter of corallites	25–35 mm	25–30 mm	15–30 mm
number of septa	ca 160	ca 160	90–120

Description: Krković distinguished her new species form *D. crassa* in that it has more septa and larger corallites. For *D. crassa,* Koby mentioned that it had very few dissepiments. Our specimens, as well as the specimens of Krković (the holotype of *D. labeata*), have on the contrary numerous dissepiments, and so they, too, separate the species *D. labeata* from *D. crassa.*

Distribution: The Oxfordian-Kimmeridgian of Montenegro (Crna Gora).

Material in the Zlobin collection: three colonies (50–200 mm) Zl. 34, Zl. 47, Zl. 53.

Dermosmilia etalloni Koby, 1884

Pl. X, figs. 1–2

1884 *Dermosmilia etalloni.* Koby, 200, pl. 52, fig. 3.
1964 *Dermosmilia etalloni.* Beauvais, 241.

Description: This phaceloid colony has dense, long corallites which bud at an acute angle. In cross section the corallites are round or oval. The septa are perforated and thin; they are developed in 4 to 5 cycles. The endotheca consists of few dissepiments and many synapticulae. The columella is spongy. The microstructure is poorly preserved; here and there large simple sclerodermites can be seen.

Dimensions:	Zlobin	Koby
diameter of corallites	7–11 mm	8–10 (18) mm
number of septa	60–80	70–90

Comparison: This species differs from other species of this genus by its small and long corallites.

Distribution: The Upper Oxfordian of Switzerland and France.

Material in the Zlobin collection: the single specimen (Zl. 3) is a colony of size 150–200 mm.

Genus: *Calamophylliopsis* Alloiteau, 1952

Calamophylliopsis flabellum (Michelin, 1843)

Pl. XI, figs. 1–5

1972 *Calamophylliopsis flabellum.* Turnšek, 202–203, 254, pl. 34, figs. 1–2.

Description: The four colonies (the largest one 200 mm wide) are of the same structure as those from Slovenia (Turnšek 1972). The corallites are 5–7 mm in diameter, and have 48–70 septa.

Distribution: The Upper Oxfordian of France and Switzerland, the Upper Oxfordian and Lower Kimmeridgian of Slovenia and U. S. S. R.

Material in the Zlobin collection: Specimens Zl. 32, Zl. 37, Zl. 38, Zl. 45.

Family: Thamnasteriidae Vaughan & Wells, 1943

Genus: *Kobyastraea* Roniewicz, 1970

Kobyastraea lomontiana (Étallon, 1864)

Pl. X, fig. 3

1887 *Thamnastrea lomontiana.* Koby, 366–368, pl. 98, figs. 3–5.
1970 *Thamnasteria lomontiana.* Babaev, 88.
1970 *Kobystraea lomontiana.* Roniewicz, 140–142, pl. 1, figs. 1–2, pl. 2, fig. 1, pl. 3, fig. 4.

Description: This massive thamnasterioid colony has well defined corallites with polygonal contours. The septa are developed in 3–4

cycles. They are of equal thickness, and reach the centres of the corallites. They have lateral dents. Their axial trabecular lobes and prolongations form an irregular columellar structure. The endotheca consists of thin tabulate dissepiments and few synapticulae. The wall is synapticulothecal, the microstructure is not preserved.

Dimensions:	Zlobin	Koby	Roniewicz
diameter of corallites	4–7 mm	4.5–5 mm	4.5–7 mm
distance of centres	4.5–7 mm	4.5–5 mm	4.5–7 mm
number of septa	30	18–24	20–27 (30)

Comparison: Tabulate dissepiments (not vesicular), trabecular axial lobes and lateral ornamentation of the septa distinguish *Kobyastraea* from *Thamnasteria*. Our specimen has something more septa than Koby's specimens; but Roniewicz, too, mentioned 30 septa, so colony from Zlobin falls within the variation range of the species *K. lomontiana*.

Distribution: The Upper Oxfordian of Switzerland and the U. S. S. R.

Material in the Zlobin collection: the single specimen Zl. 56.

Suborder: Caryophyllina Vaughan et Wells, 1943

Family: Rhipidogyridae Koby, 1904

Genus: *Aplosmilia* d'Orbigny, 1849

Aplosmilia coalescens Eliášová, 1973

Pl. XII, figs. 1–3

1973 *Aplosmilia coalescens*. Eliášová, 282, pl. 8, fig. 2, pl. 9, fig. 1.

Description: This species has been exactly described by Eliášová. The colony is dendroid-plocoid, the corallites being mainly monocentric, round or oval in cross-section. They are long and parallel. The septa of the first two cycles are joined to the columella.

Dimensions:	Zlobin	Eliášová
diameter of corallites	5–13 mm	5–11 mm
density of septa	11/3 mm	11/3 mm

Comparison: The corallites of the Zlobin specimen are something more roundish than those of Štramberk, but all the structure and dimensions correspond wholly to the holotype.

Distribution: The Tithonian of Czechoslovakia.

Material in the Zlobin collection: one large colony Zl. 2.

STRATIGRAPHICAL COMPARISON – THE QUESTION OF THE »TITHONIAN« IN CORAL FACIES

Eighteen coral species found at Zlobin have so far been known from various places in Europe. The greatest number of the same species appear in Switzerland (10) and in France (8), whereas somewhat fewer of them occur in Poland (5), Germany (6) and Slovenia (7). Individual ones

Table 1. The existing regional and stratigraphical distribution of the described species in Europe
Tabela 1. Dosadašnja regionalna i stratigrafska rasprostranjenost opisanih vrsta u Evropi

Species	1 ČSSR	2 Polska	3 Deutschland	4 England	5 Suisse	6 France	7 España	8 Portugal	Jugoslavija 9 Slovenija	Crna Gora	MALM OXFORDIAN	MALM KIMMERIDGIAN	TITHONIAN PORTLANDIAN
Stylina thiessingi (KOBY)					●						▬		
Heliocoenia (Decaheliocoenia) variabilis ÉTALLON		●			●	●	●	●	●	●	▬	▬	
Stylosmilia corallina KOBY		●			●	●			●		▬	▬	
Stylosmilia suevica BECKER		●	●								▬	▬	
Goniocora socialis (ROEMER)				●							▬		
Aplophyllia sexradiata RONIEWICZ		●							●		▬	▬	
Montlivaltia champlittensis FROMENTEL			●			●			●		▬	▬	
Montlivaltia compressa FROMENTEL			●		●	●					▬	▬	
Thecosmilia magna THURMANN et ÉTALLON			●			●					▬	▬	
Thecosmilia suevica (QUENSTEDT)	●		●		●	●		●	●		▬	▬	▬
Placophyllia rugosa BECKER	●	●	●						●		▬	▬	▬
Axosmilia corallina (ÉTALLON)					●			●			▬	▬	
Dermoseris nodosa KOBY					●						▬		
Diplaraea croatica n. sp.													
Dermosmilia labeata KRKOVIĆ										●	▬	▬	
Dermosmilia etalloni KOBY					●	●					▬		
Calamophylliopsis flabellum (MICHELIN)					●	●			●		▬	▬	
Kobyastraea lomontiana (ÉTALLON)					●						▬		
Aplosmilia coalescens ELIÁŠOVÁ	●												▬
											2 - 9		1

are known from Czechoslovakia (3), Crna Gora (Montenegro) (2), England (1), Portugal (3) and Spain (1). Five of the same species have been noted in Gruzia, the Crimea and the Caucasus in the U. S. S. R.

The coral localities in Switzerland, France, Poland and England date from the Upper Oxfordian. The finds in Slovenia, extend from the Oxfordian into the Lower Kimmeridgian, in Montenegro and Portugal into the whole Kimmeridgian. The corals in Spain and Germany date from the Kimmeridgian; in Czechoslovakia the finds have been attributed to the Tithonian; the latter includes, according to the decision of the International Colloquium in Luxemburg (H ö l d e r 1962), the Upper Kimmeridgian and the Portlandian.

From the above comparison it can be seen that coral fauna from almost all European localities are present at Zlobin. Nearly 90% of the Zlobin collection shows relatedness with the French, Swiss, Polish and other localities which are placed in the older part of the Upper Jurassic, i. e. in the Oxfordian and the Kimmeridgian. Only three of the Zlobin species can be compared with the Tithonian age, but even then two of these are known from the older Upper Jurassic stratigraphic horizons as well. The table 1 shows the existing stratigraphical distribution of the Zlobin coral species in Europe. The finds in the Asian part of the U. S. S. R., which are not taken into account here, come as well from the Oxfordian--Kimmeridgian horizons. Thus we can see that the coral species place the Zlobin locality with certainty in the Oxfordian and the Kimmeridgian.

Croatian geologists, however, have, on the very basis of a comparison with the Štramberk locality in Czechoslovakia, which is the type locality for the Tithonian, placed the Zlobin reef locality in the Upper Malm. According to the labelling of the Zlobin collection, the latter is of Upper Tithonian age, whereas on the Crikvenica sheet of the basic geological map of 1970 (scale 1:100.000), this reef limestone is marked as being Upper Malmian ($J_3^{2-\varepsilon}$), as an equivalent to the strata containing the alga *Clypeina jurassica*, that is, the Upper Kimmeridgian and the Portlandian, or the Tithonian.

The question thus arises as to where the coral locality at Zlobin should be placed. On the one hand there is the view-point in favour of the Oxfordian-Kimmeridgian age, and, on the other, the view-point in favour of the Tithonian age. A common solution to both of these viewpoints would be the Upper Kimmeridgian, i. e. the lower part of the Tithonian.

However, the typically Tithonian locality at Štramberk poses a problem in itself. It is the only locality which, with respect to its age, differs from all the other rich, Upper Jurassic coral localities in Europe. It was already O g i l v i e (1896–97) who, when working on the corals from Štramberk, found that the majority of the species at Štramberk were the same as those found in western Europe, where they are placed in the Oxfordian and the Kimmeridgian. O g i l v i e made the following comparison: out of the total of 128 species which she had determined from Štramberk, 43 are new. Of the remaining 85 species, 4 were known at that time from the Tithonian, 6 from the French Portlandian, 9 from the Upper Jurassic (without a more exact definition), 27 from the Kimmeridgian, 10 from the Kimmeridgian and the Oxfordian, and as many as 29 species from the Oxfordian only. In addition to this, O g i l v i e's numerous new species were later on found in the older strata of the Upper Jurassic, as well. It can therefore be seen that over three-quarters of the coral fauna of Štramberk are in other European localities of older date. The coral fauna thus makes the age of the Tithonian at Štramberk questionable. G e y e r (1955b), who re-examined the Štramberk corals, placed them, on the basis of earlier relevant literature, in the Tithonian,

which is tectonically and transgressively separated from other stratigraphical units. In recent investigations of the Tithonian in the Western Carpathians (Houška, Scheibner & Stráník 1963, see table 2) the Štramberk reef limestone has been placed in the Middle and Upper Tithonian, but there are no overlying or underlying strata. Eliášová (1973), who is now investigating the corals of Štramberk, notes as well that the species found have a wide stratigraphical distribution (from the Oxfordian to the Tithonian).

I cannot see, therefore, why the coral locality at Štramberk should not be compared, with respect to its age, to the other rich localities in Western Europe, containing the same coral fauna. I think that it can be maintained (compare Turnšek 1972, 66–74, 115–117), with almost complete certainty, that the »Tithonian« in the coral development is older than has been thought so far. The coral fauna from Zlobin proves it. I myself would place its start as far back as in the Oxfordian. The period of abundant growth of reefs lasted up to the end of the Kimmeridgian, whereas in the Portlandian it was much reduced. If we retain the name »Tithonian« as reffering to the period of the Upper Kimmeridgian and Portlandian, then the rich coral reefs reach only into the lower part of the Tithonian.

Until the question of the age of Tithonian is finally solved, the Zlobin locality can be called Upper Jurassic without a more exact stratigraphic definition.

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DRAGICA TURNŠEK

MALMSKI KORALJI ZLOBINA U JUGOZAPADNOJ HRVATSKOJ

UVOD

U paleontološkoj zbirci Geološko-paleontološkog zavoda Prirodoslovno-matematičkog fakulteta Sveučilišta u Zagrebu već se poduže vrijeme nalazi sakupljen fosilni koraljni materijal iz Zlobina kod Kraljevice u jugozapadnoj Hrvatskoj. Sabrao ga je, zajedno sa studentima, sada već pokojni profesor M. Salopek na samoj željezničkoj stanici Zlobin. Sadašnja uprava Geološko-paleontološkog zavoda dala mi je koralje u obradu s dopuštenjem da rezultate objavim. Najljepše zahvaljujem na tom povjerenju.

Koraljna zlobinska zbirka obuhvaća 57 primjeraka, od kojih smo izradili 90 mikroskopskih izbrusaka. Uglavnom su to velike granate kolonije, manje ima masivnih kolonija i koralja-samaca. Odredila sam 19 vrsta, od kojih je jedna nova. Mikrostruktura skeletnih elemenata je u većine primjeraka prekristalizirana, ali su makrostrukturni elementi tako dobro sačuvani da se moglo odrediti gotovo sve primjerke.

Zbirka je pohranjena u Geološko-paleontološkom zavodu Prirodoslovno-matematičkog fakulteta u Zagrebu.

Zahvaljujem prof. dr Vandi Kochansky-Devidé za savjete u vezi sa štampanjem. Zahvaljujem i tehničkoj suradnici Milojki Huzjan za tehničku opremu rasprave i za prepariranje fosilnog materijala, kao i fotografkinji Carmen Narobe za izradu fotografija.

SISTEMATSKI OPIS VRSTA

Koraljne vrste, koje sam odredila iz Zlobina, uvrstila sam u sistem, koji sam upotrebljavala i obrazložila kod opisa jurskih koralja Slovenije (Turnšek 1972). Rod *Aplosmilia*, koji u Sloveniji nisam našla, uvrštavam po Vaughanovom & Wellsovom (1943, 221) sistemu u porodicu Rhipidogyridae Koby 1904, podred Caryophyllina. Sličnost tog roda s rodom *Acanthogyra* utvrđuje i Alloiteau (1957, 359).

Kod sedam vrsta, koje su iste kao u Sloveniji, ne ponavljam sinonimije, nego se pozivam na svoj rad iz g. 1972.

Opisi vrsta izneseni su u engleskom tekstu. U sažetku dajem samo opis nove vrste.

Sve su vrste prikazane na tablama. Fotografirali smo izbruske i površine fosila. Izbrusci su povećani direktno na papir, zato su fotografije negativi. Zbog lakše usporedbe slike sviju vrsta povećane su 4 puta, samo su neke površine dane u prirodnoj veličini. Kod nove vrste prikakazana su i povećanja strukturnih elemenata od 8 puta.

Diplaraea croatica n. sp.

Tab. VII, VIII

Derivatio nominis: nazvana prema Hrvatskoj (lat. Croatia), croaticus = hrvatski.

Materijal, ujedno holotypus: velika kolonija s pet koralita. Inv. br. 931, Zl. 11. Tab. VII i VIII.

Locus typicus: Zlobin između Liča i Kraljevice, istočno-jugoistočno od Rijeke.

Stratum typicum: malm.

Diagnosis: *Diplaraea* s promjerom koralita 20–35 mm, oko 180 sepata (4/2 mm) i jakom parijetalnom kolumelom.

Opis: Kolonija je faceloidna s velikim, prilično razmaknutim, uglavnom paralelnim koralitima. Septi su ravni, poredani u 5 do 6 ciklusa. U aksijalnom su dijelu odebljali i perforirani. Njihovi aksijalni nastavci, mjestimično paliformni, izgrađuju parijetalnu kolumelu. Endoteku sastavljaju tabulatni disepimenti i periferne sinaptikule. Mikrostruktura se nije sačuvala.

Usporedba: Nova se vrsta razlikuje od svih poznatih vrsta roda većim koralitima i većim brojem sepata, kao i izrazitijom kolumelom. Prema strukturi nalikuje vrsti *Epistreptophyllum bonjouri* (É t a l l o n), ali ta je solitarna.

Rasprostranjenost: Zasad samo locus typicus.

STRATIGRAFSKA USPOREDBA – PITANJE TITONA

Osamnaest koraljnih vrsta, nađenih u Zlobinu, bilo je do sada poznato iz raznih predjela Evrope. Najviše istih vrsta pojavljuje se u Švicarskoj (10) i Francuskoj (8), nešto manje u Poljskoj (5), Njemačkoj (6) i u Sloveniji (7). Pojedine vrste poznajemo još iz Čehoslovačke (3), Crne Gore (2), Engleske (1), Portugala (1) i iz Španjolske (1). Pet istih vrsta spominje se i iz raznih krajeva SSSR.

Koraljna nalazišta Švicarske, Francuske, Poljske i Engleske su gornjooksfordske starosti. Nalazi iz Slovenije sežu od oksforda još i u donji kimeridž, a iz Portugala i Crne Gore u cijeli kimeridž. Koralji u Španjolskoj i Njemačkoj su kimeričke starosti; u Čehoslovačkoj ih uvrštavaju, međutim, u titon, koji prema zaključku međunarodnog kolokvija o juri u Luksemburgu (H ö l d e r 1962) obuhvaća gornji kimeridž i portland.

Iz te usporedbe vidimo da imamo u Zlobinu koraljnu faunu gotovo svih evropskih nalazišta. Skoro 90% zlobinske zbirke pokazuje sličnost s nalazištima koja su stavljena u stariji dio gorje jure, tj. u oksford i kimeridž. Samo tri vrste možemo usporediti s titonskom starošću, i još od tih su dvije poznate i iz starijih gornjojurskih horizonata. Točna dosadašnja stratigrafska rasprostranjenost prikazana je u tabeli 1. Nalazi u azijskom dijelu SSSR tu nisu uzeti u obzir, ali i ti potječu iz oksfordskih i kimeričkih horizonata.

Prema tome, vidimo da koraljne vrste uvrštavaju zlobinsko nalazište u oksford i kimeridž. Hrvatski geolozi su, međutim, usporedbom s nalazištem u Štramberku u Čehoslovačkoj, koje je locus typicus za titon, i

zlobinsko grebensko nalazište uvrstili u gornji malm. Na ceduljicama zlobinske zbirke nalazimo podatak da je fauna gornjotitonska. Na osnovnoj geološkoj karti, list Crikvenica, 1 : 100.000 iz g. 1972, taj je grebenski vapnenac označen kao gornjomalmski (J_3^{2-3}), kao ekvivalent naslaga s algom *Clypeina jurassica*, dakle gornji kimeridž i portland ili titon.

Postavlja se pitanje, kamo uvrstiti koraljno nalazište u Zlobinu. Na jednoj strani je mišljenje o oksfordsko-kimeričkoj starosti, na drugoj o titonskoj. Zajedničko rješenje oba mišljenja bilo bi gornji kimeridž, tj. donji dio titona.

I tipično nalazište titona u Štramberku predstavlja problem za sebe. Prema starosti, naime, odudara od svih drugih bogatih koraljnih gornjojurskih nalazišta u Evropi. Već je Ogilvie (1896–97) utvrdila prilikom obrade koralja iz Štramberka da je većina vrsta u Štramberku ista kao u zapadnoj Evropi, gdje su stavljene u oksford i kimeridž. Ogilvie je načinila ovu usporedbu: od ukupno 128 vrsta, koliko ih je odredila iz Štramberka, 43 su nove. Od ostalih 85 vrsta bile su 4 do tada poznate iz titona, 6 iz francuskog portlanda, 9 iz gornje jure bez točnije odredbe, 27 iz kimeridža, 10 iz kimeridža i oksforda i čak 29 samo iz oksforda. Geyer (1955b) je doduše revidirao Ogilvijinu zbirku, a ipak vidimo, da su više nego tri četvrtine koraljne faune iz Štramberka na drugim evropskim nalazištima starije. Koraljna fauna postavlja, dakle, starost titona u Štramberku u pitanje. Geyer (1955b), koji je štramberške koralje ponovno istražio, stavio ih je na osnovi starije literature u titon, koji je tektonski i transgresivno odvojen od drugih stratigrafskih članova. Kod novijih istraživanja titona u zapadnim Karpatima (Houška, Scheibner & Stráník 1963, tabela 2), stavili su štramberški grebenski vapnenac u srednji i gornji titon, premda su ti vapnenci bez veze s podinom i krovinom. I Eliášová (1973), koja danas istražuje koralje iz Štramberka, utvrđuje da nađene vrste imaju veliku stratigrafsku raširenost (od oksforda do titona).

Ne znam zašto, dakle, ne bismo mogli koraljno nalazište u Štramberku paralelizirati s drugim bogatim nalazištima jednake faune iz zapadne Evrope. Po mom je mišljenju štramberški titon u koraljnom razvoju stariji nego što se dosad mislilo (usporedi i Turnšek, 1972, 66–74, 115–118). Ja bih stavila njegov početak već u oksford. Bogati rast grebena trajao je do kraja kimeridža, a u portlandu je jako reduciran. To potvrđuju i koralji iz Zlobina. Ako pak naziv titon zadržimo za razdoblje gornjeg kimeridža i portlanda, tada bogati koraljni grebeni sežu samo u njegov donji dio.

Dok nije pitanje titona konačno riješeno, možemo zlobinsko nalazište nazvati gornjojurskim, bez točnije stratigrafske odredbe.

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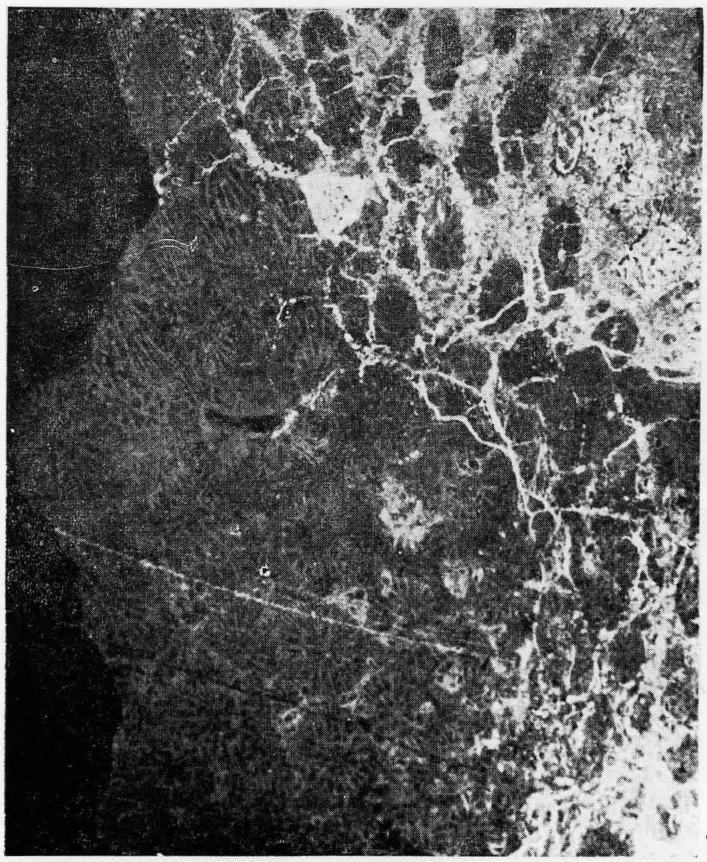
PLATE – TABLA I

1–3. *Stylina thiessingi* (K o b y)

1. Transverse and slightly oblique section of the corallites (poprečni i malo kosi presjek koralita); Thin section (mikroskopski preparat); Zl. 26 c, × 4.
2. Transverse section of the corallites (poprečni presjek koralita); Thin section (preparat); Zl. 26 d, × 4.
3. The surface of the colony with the calical view (površina kolonije odozgo); Zl. 26, × 1.

4–5. *Heliocoenia (Decaheliocoenia) variabilis* É t a l l o n

4. The surface of the colony, calical view (površina kolonije odozgo); Zl. 54, × 1.
5. The surface from the fig. 4 (dio površine sa sl. 4); × 4.



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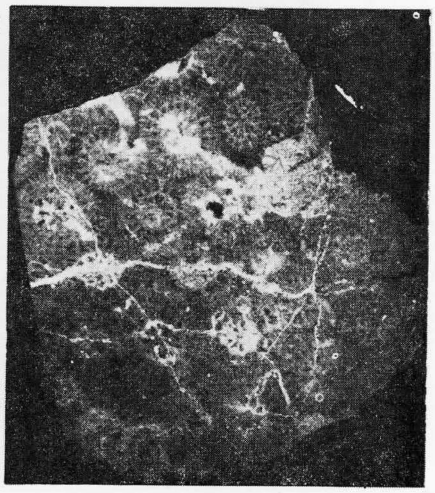

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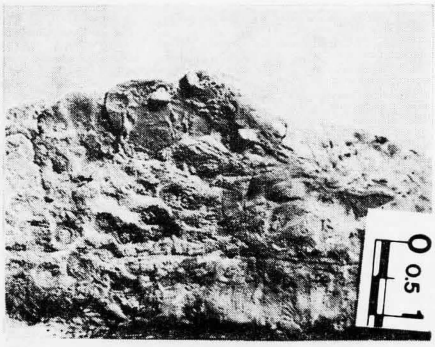


4

3

5

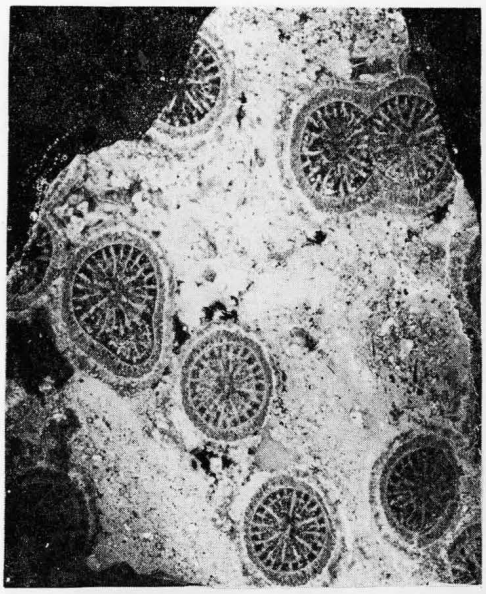
PLATE – TABLA II

1–5. *Stylosmilia corallina* K o b y

1. The surface of the colony, calical and partly side view (površina kolonije odozgo i dijelom sa strane); Zl. 9, × 1.
2. Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 9 a, × 4.
3. Longitudinal section of the corallites (uzdužni presjek koralita); Thin section (mikroskopski preparat); Zl. 25 a, × 4.
4. Transverse section of the corallites owergrown by chaetetids (poprečni presjek koralita obraslih hetetidima); Thin section (mikroskopski preparat); Zl. 25 b, × 4.
5. Longitudinal section of the corallites (uzdužni presjek koralita); Thin section (mikroskopski preparat); Zl. 9 b, × 4.

1

2



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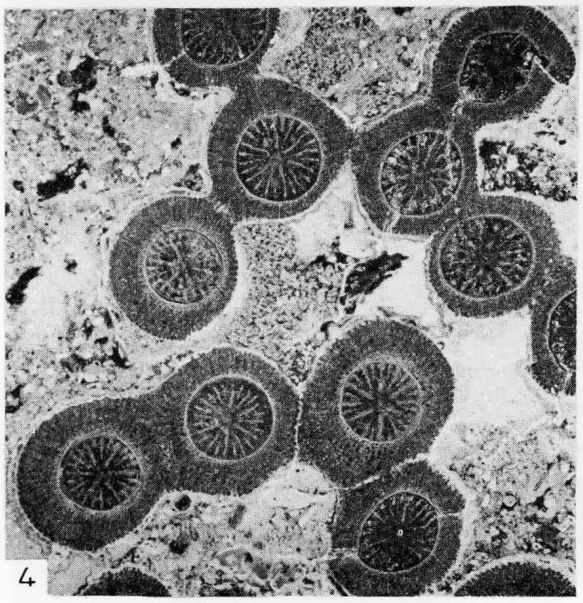

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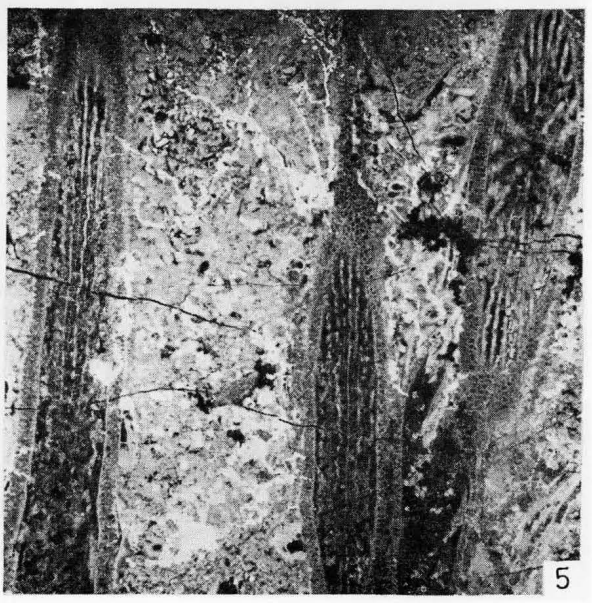

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PLATE – TABLA III

1–2. *Stylosmilia suevica* Beker

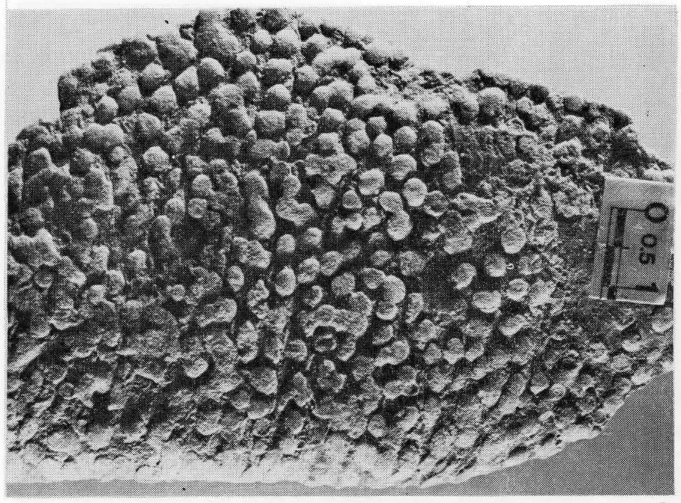
1. The surface of the colony, calical view (površina kolonije odozgo); Zl. 51, × 1.
2. Transverse section of the corallites showing budding in more sides (poprečni presjek koralita pokazuje pupanje na više strana); Thin section (mikroskopski preparat); Zl. 35 a, × 4.

3–5. *Gonicora socialis* (Roemer)

3. The surface of the colony, calical and partly side view of the corallites (površina kolonije odozgo i mjestimično sa strane koralita); Zl. 1, × 1.
4. Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 1, × 4.
5. Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 14 b, × 4.

6–7. *Aplophyllia sexradiata* Roniewicz

6. The surface of the limestone showing longitudinal and transverse corallites (površina vapnenca s uzdužnim i poprečnim koralitima); Zl. 33, × 1.
7. Transverse section of one corallite (poprečni presjek jednog koralita); Thin section (mikroskopski preparat); Zl. 33 b, × 4.



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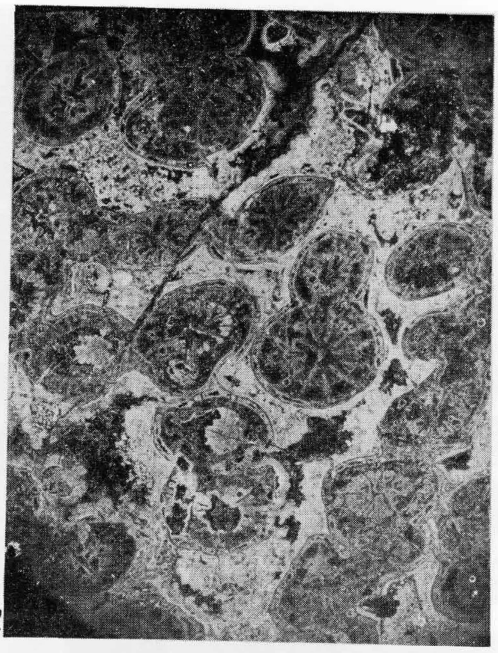

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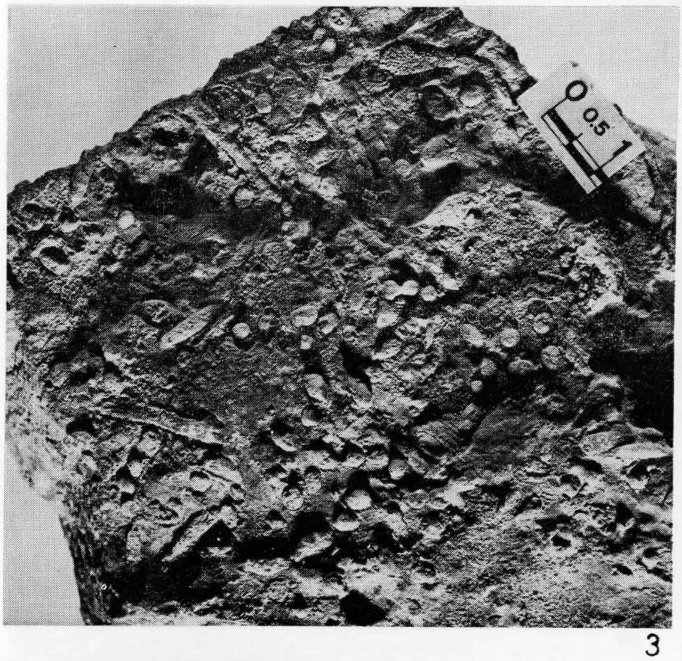

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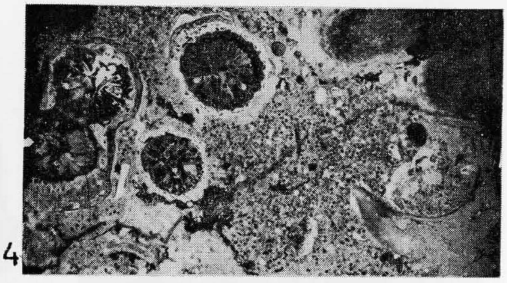

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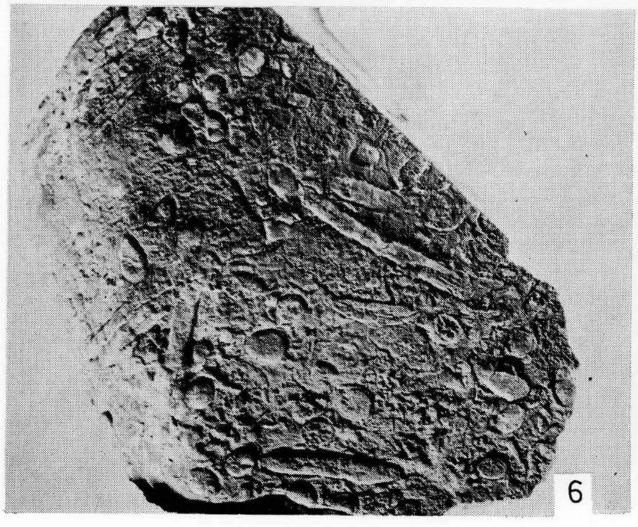

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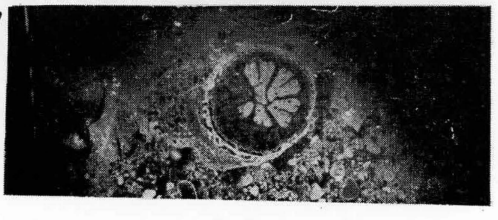

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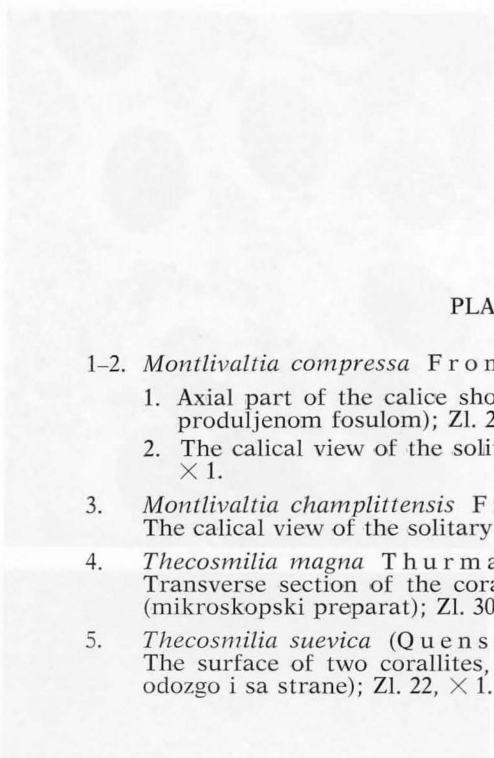


PLATE – TABLA IV

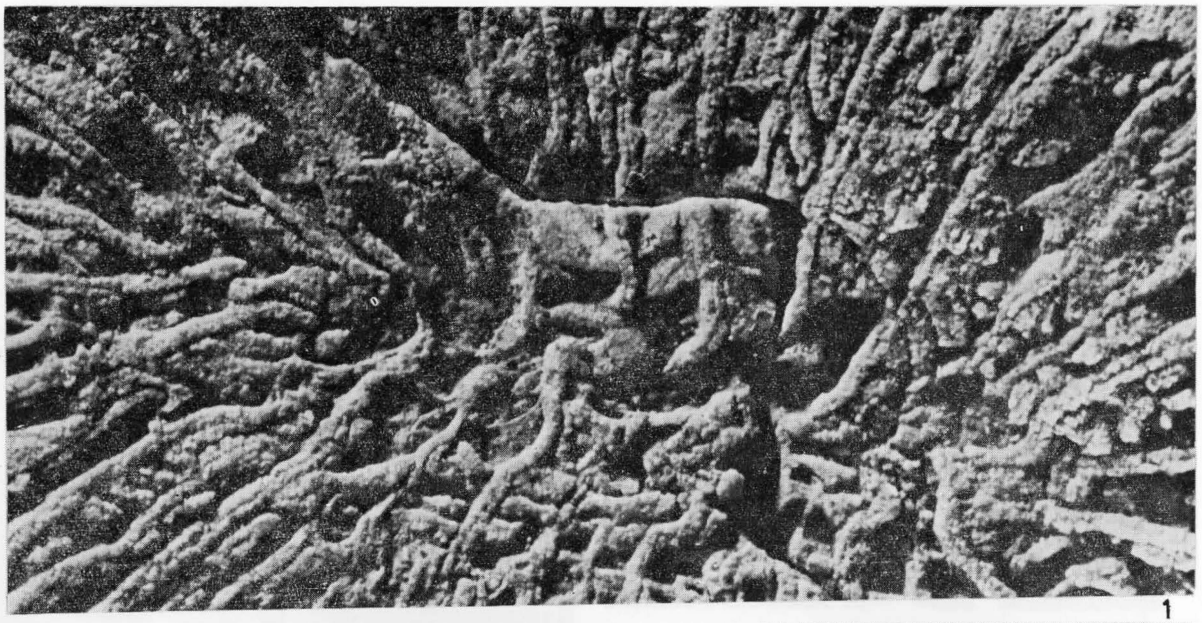
1–2. *Montlivaltia compressa* F r o m e n t e l

1. Axial part of the calice showing prolongated fossula (aksijalni dio čaške s produljenom fosulom); Zl. 21, × 4.
2. The calical view of the solitary corallum (solitarni koralum odozgo); Zl. 21, × 1.

3. *Montlivaltia champlittensis* F r o m e n t e l
The calical view of the solitary corallum (solitarni koralum odozgo); Zl. 23, × 1.

4. *Thecosmilia magna* T h u r m a n n & E t a l l o n
Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 30, × 4.

5. *Thecosmilia suevica* (Q u e n s t e d t)
The surface of two corallites, calical and side view (površina dvaju koralita, odozgo i sa strane); Zl. 22, × 1.



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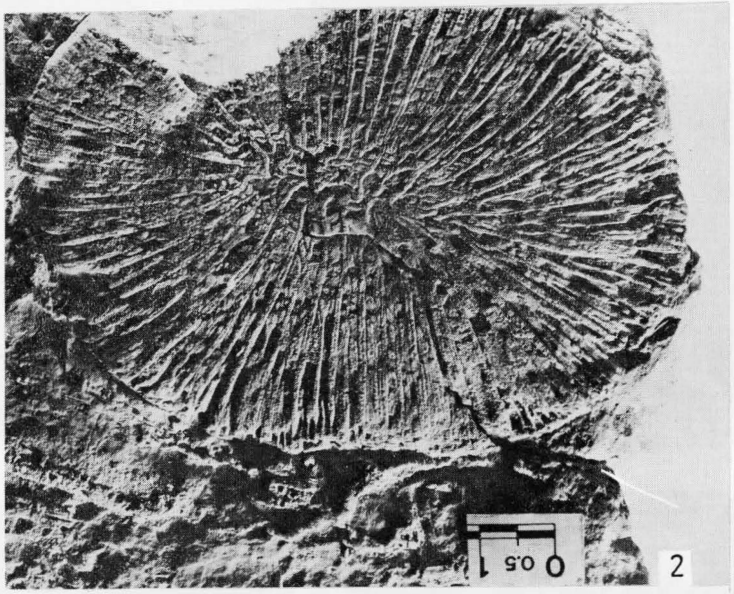

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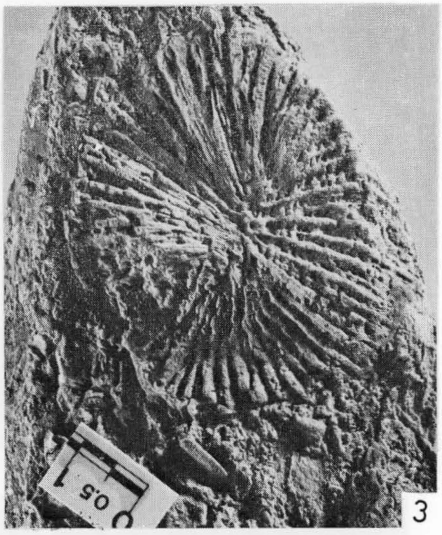

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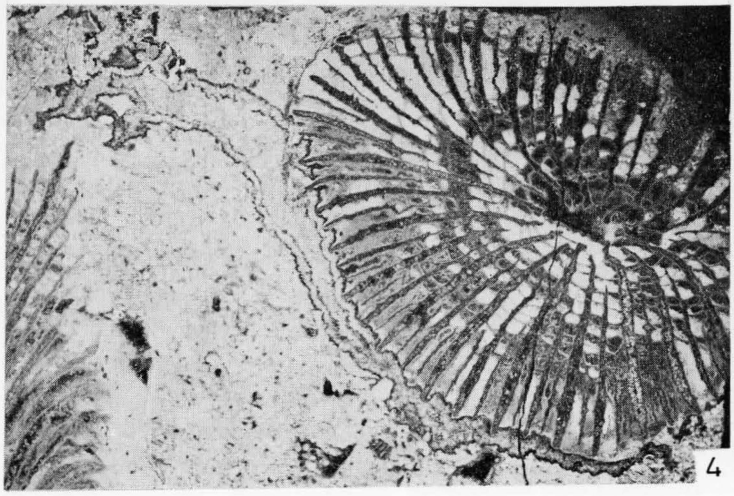

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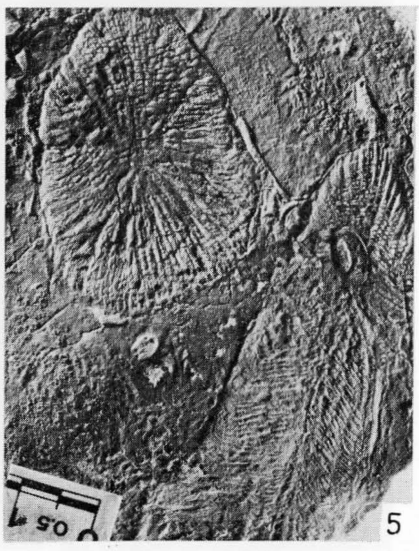

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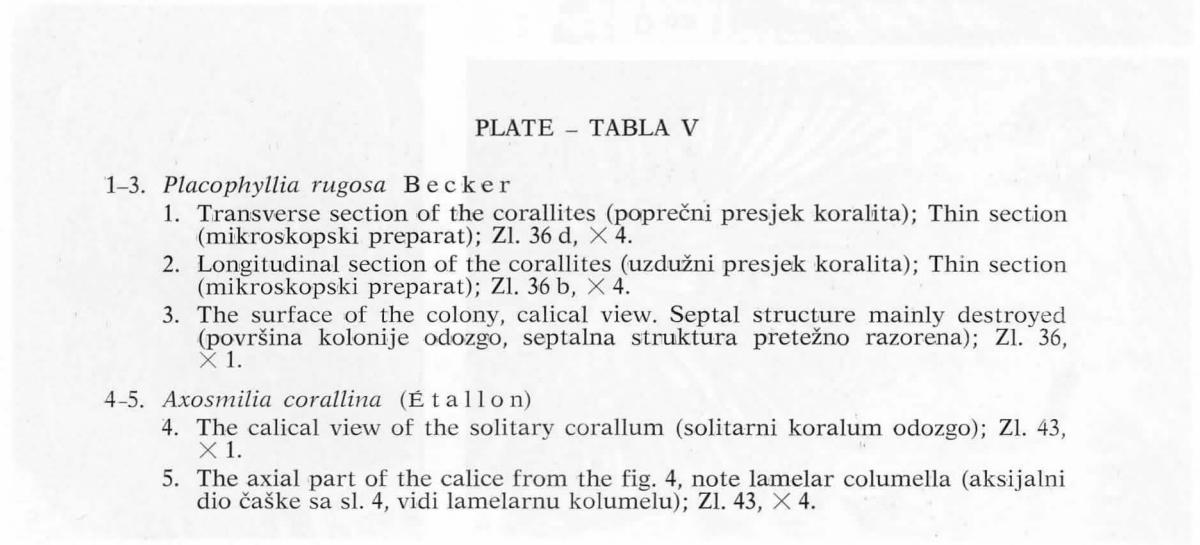


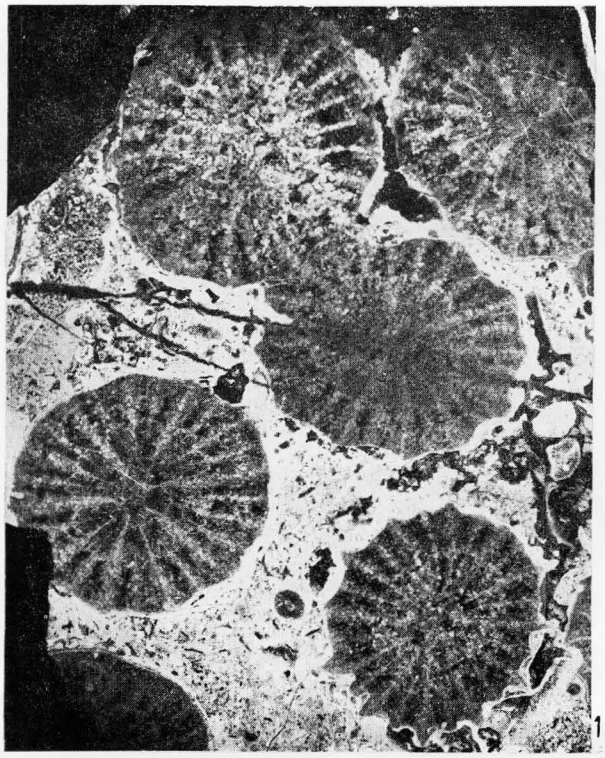
PLATE – TABLA V

1–3. *Placophyllia rugosa* Becker

1. Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 36 d, × 4.
2. Longitudinal section of the corallites (uzdužni presjek koralita); Thin section (mikroskopski preparat); Zl. 36 b, × 4.
3. The surface of the colony, calical view. Septal structure mainly destroyed (površina kolonije odozgo, septalna struktura pretežno razorena); Zl. 36, × 1.

4–5. *Axosmilia corallina* (Étallon)

4. The calical view of the solitary corallum (solitarni koralum odozgo); Zl. 43, × 1.
5. The axial part of the calice from the fig. 4, note lamelar columella (aksijalni dio čaške sa sl. 4, vidi lamelarnu kolumelu); Zl. 43, × 4.



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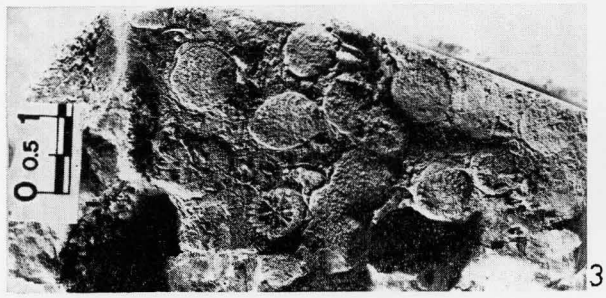

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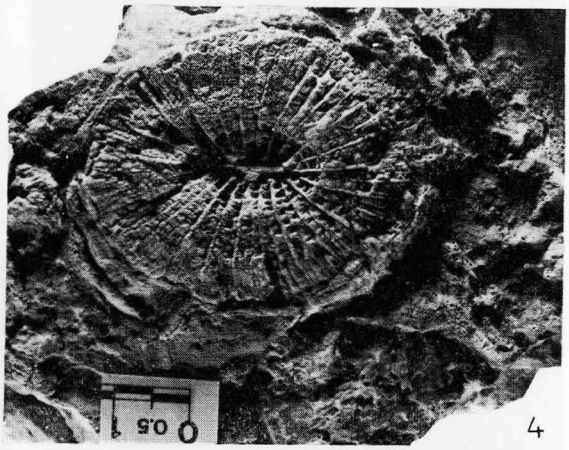

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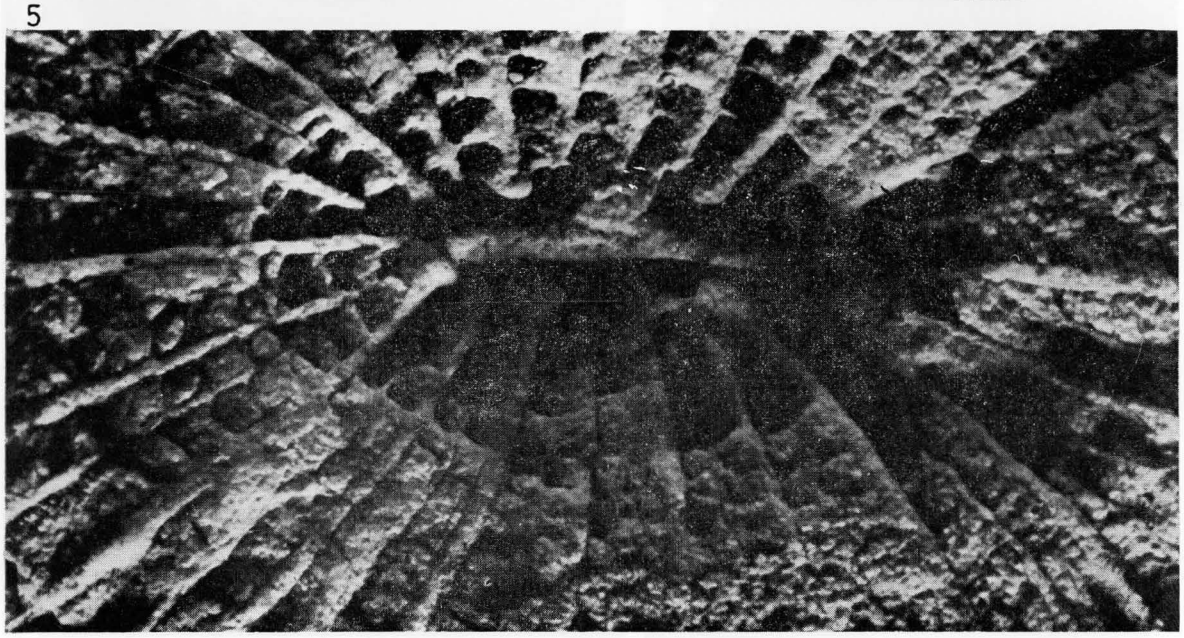


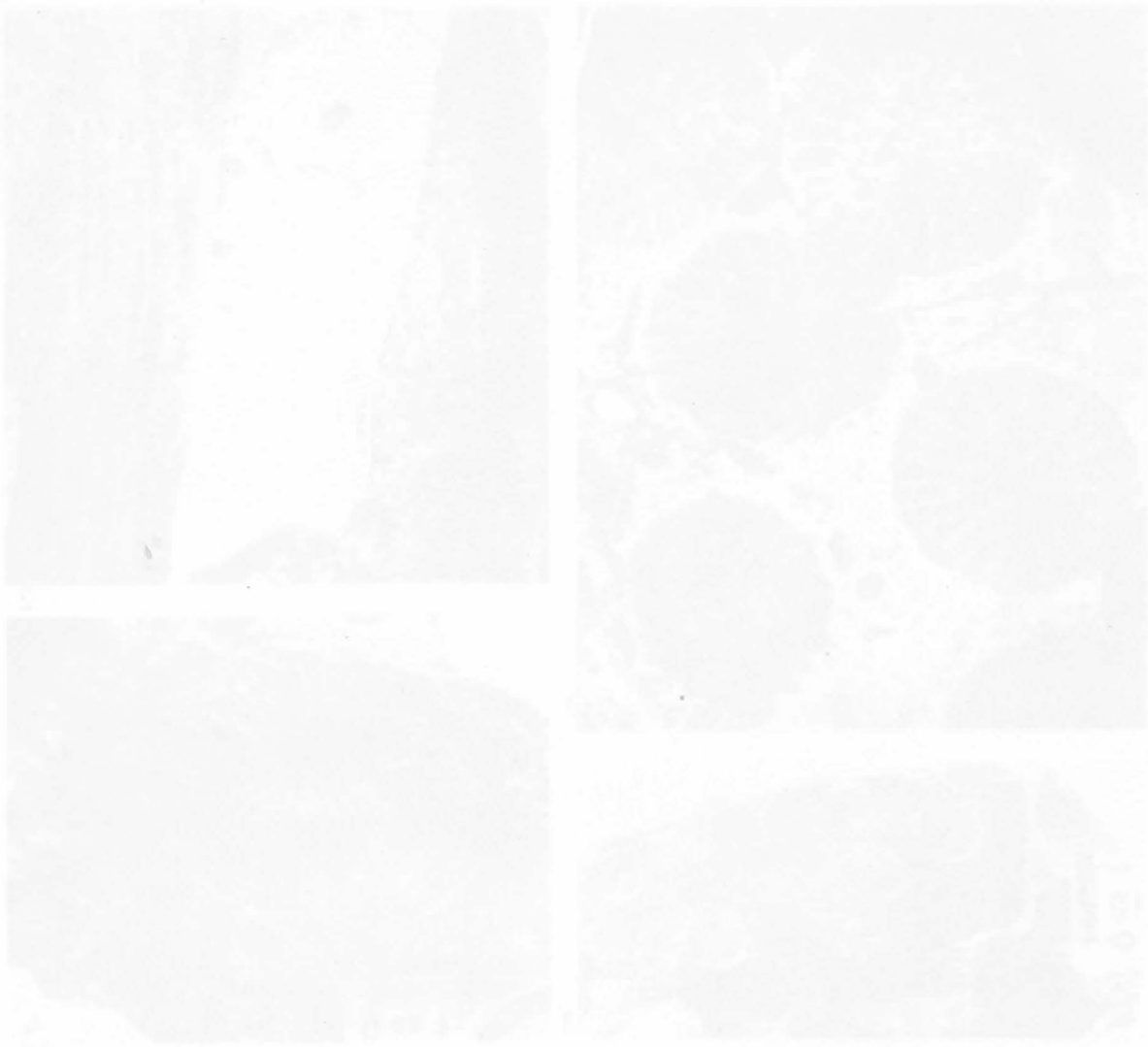
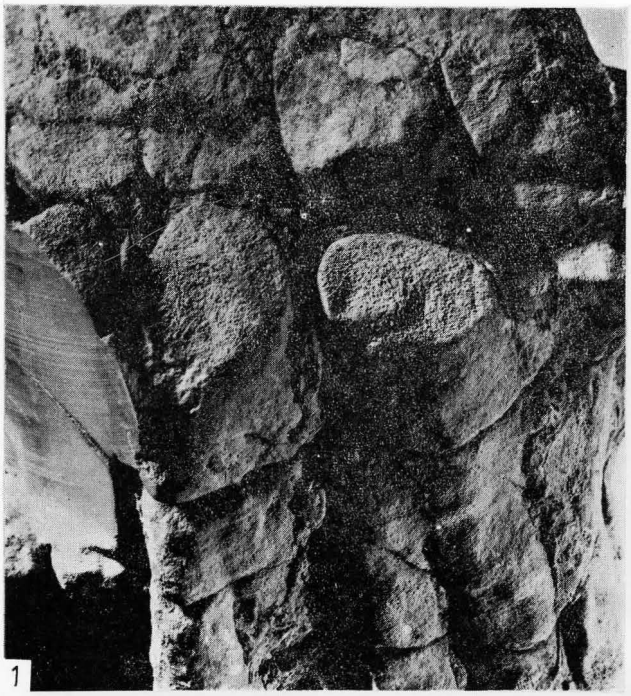


PLATE – TABLA VI

1–4. *Dermoseris nodosa* K o b y

1. The surface of the colony, calical and side view (površina kolonije odozgo i sa strane); Zl. 4. × 1.
2. Longitudinal section of the corallite (uzdužni presjek koralita); Thin section (mikroskopski preparat); Zl. 4 a, × 4.
3. Transverse section of two corallites (poprečni presjek dvaju koralita); Thin section (mikroskopski preparat); Zl. 4 b, × 4.
4. Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 49 a, × 4.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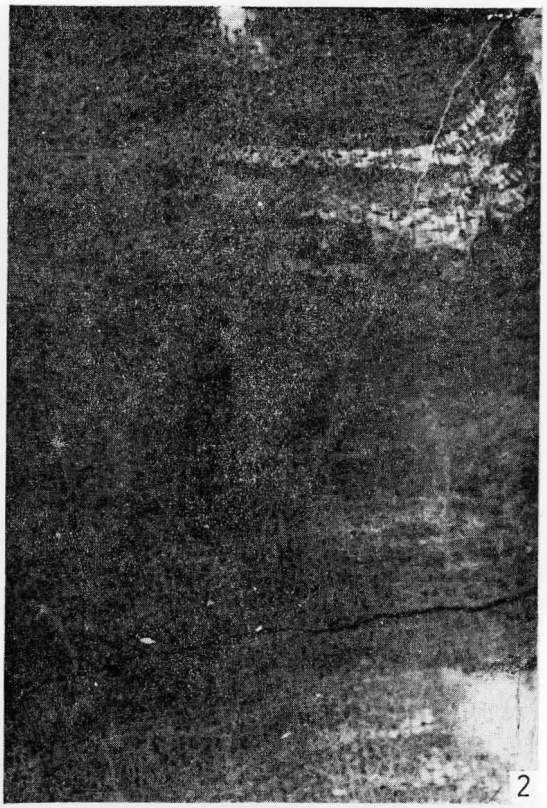
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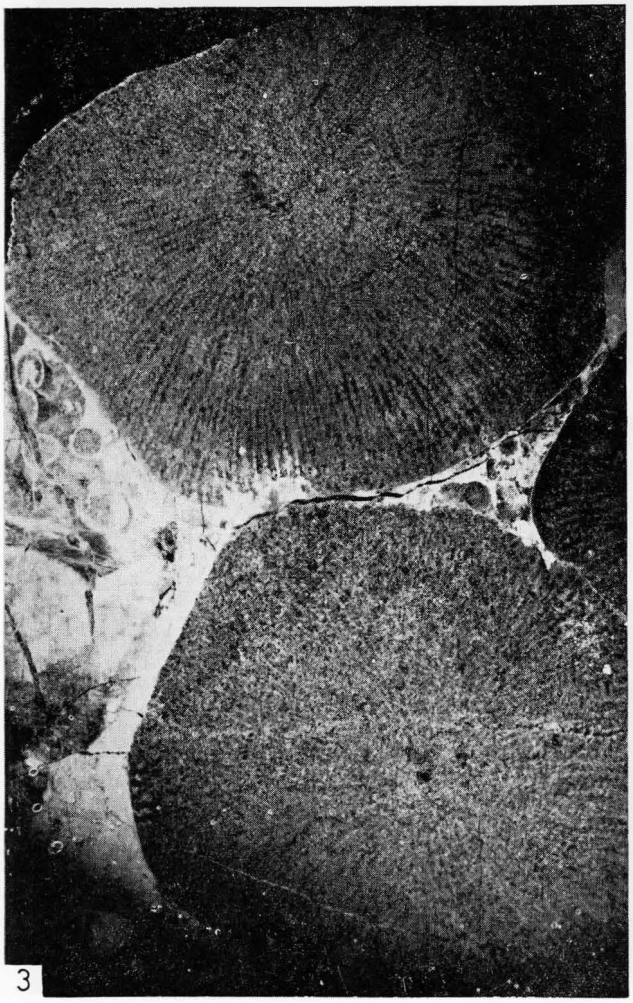
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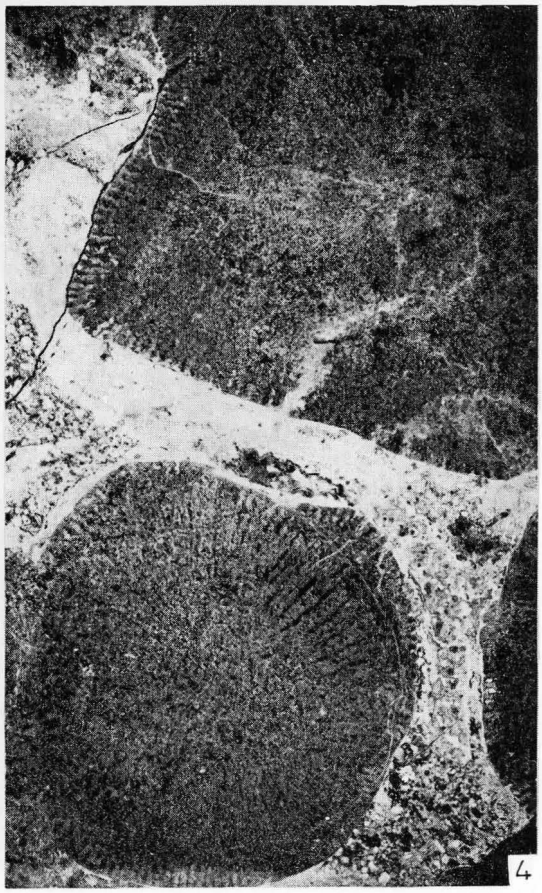
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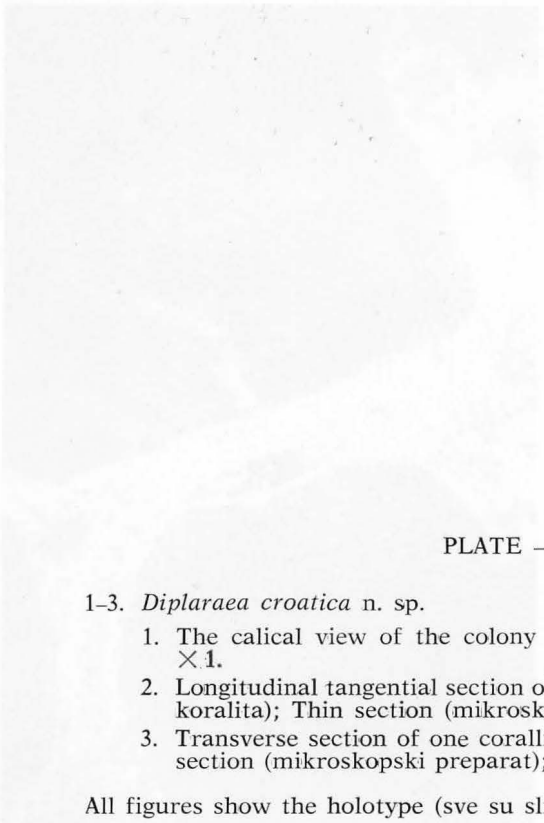


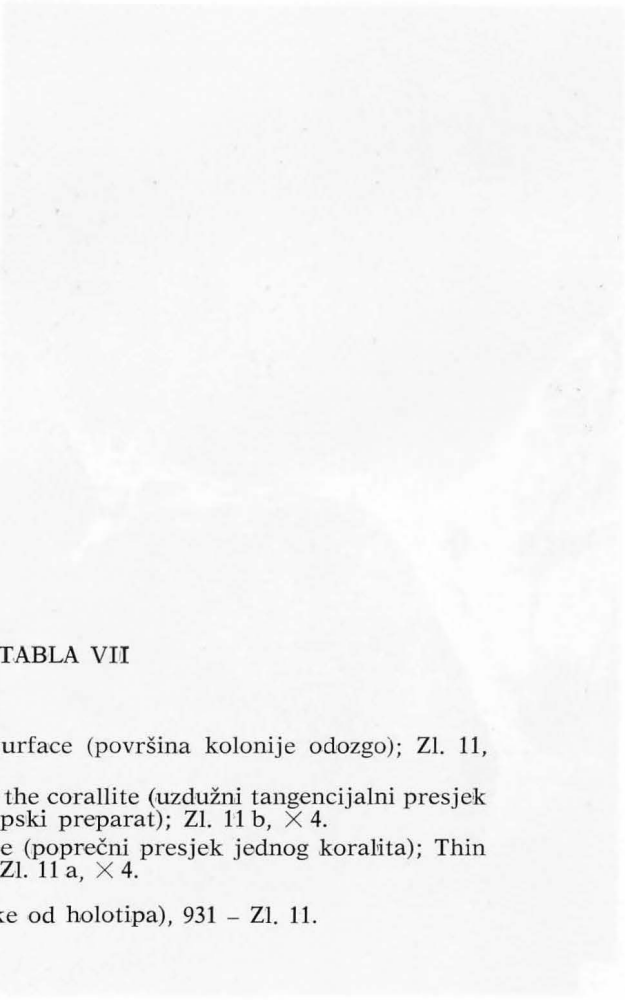
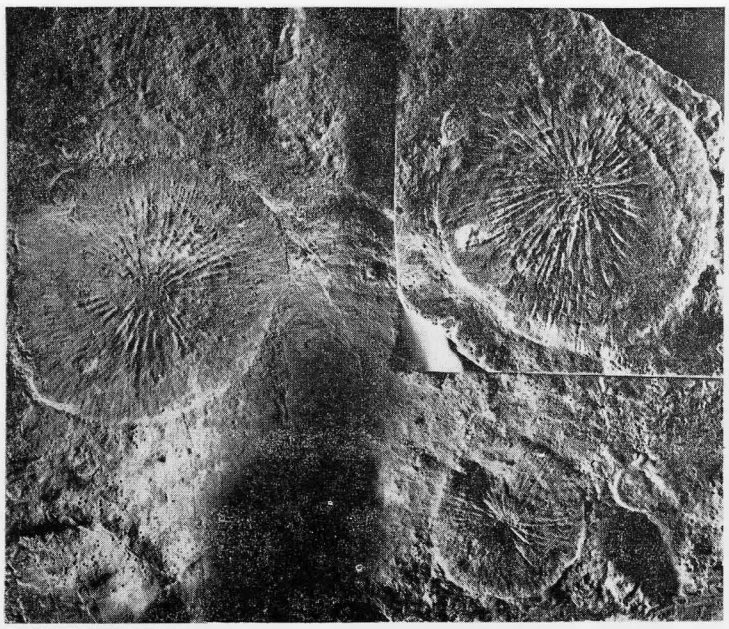


PLATE – TABLA VII

1–3. *Diplaraea croatica* n. sp.

1. The calical view of the colony surface (površina kolonije odozgo); Zl. 11, × 1.
2. Longitudinal tangential section of the corallite (uzdužni tangencijalni presjek koralita); Thin section (mikroskopski preparat); Zl. 11 b, × 4.
3. Transverse section of one corallite (poprečni presjek jednog koralita); Thin section (mikroskopski preparat); Zl. 11 a, × 4.

All figures show the holotype (sve su slike od holotipa), 931 – Zl. 11.



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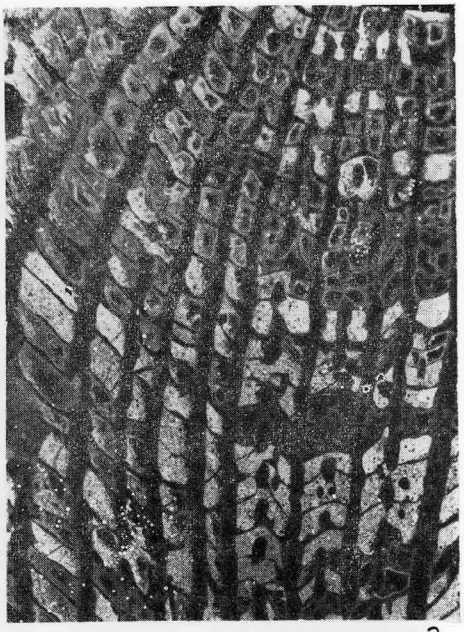

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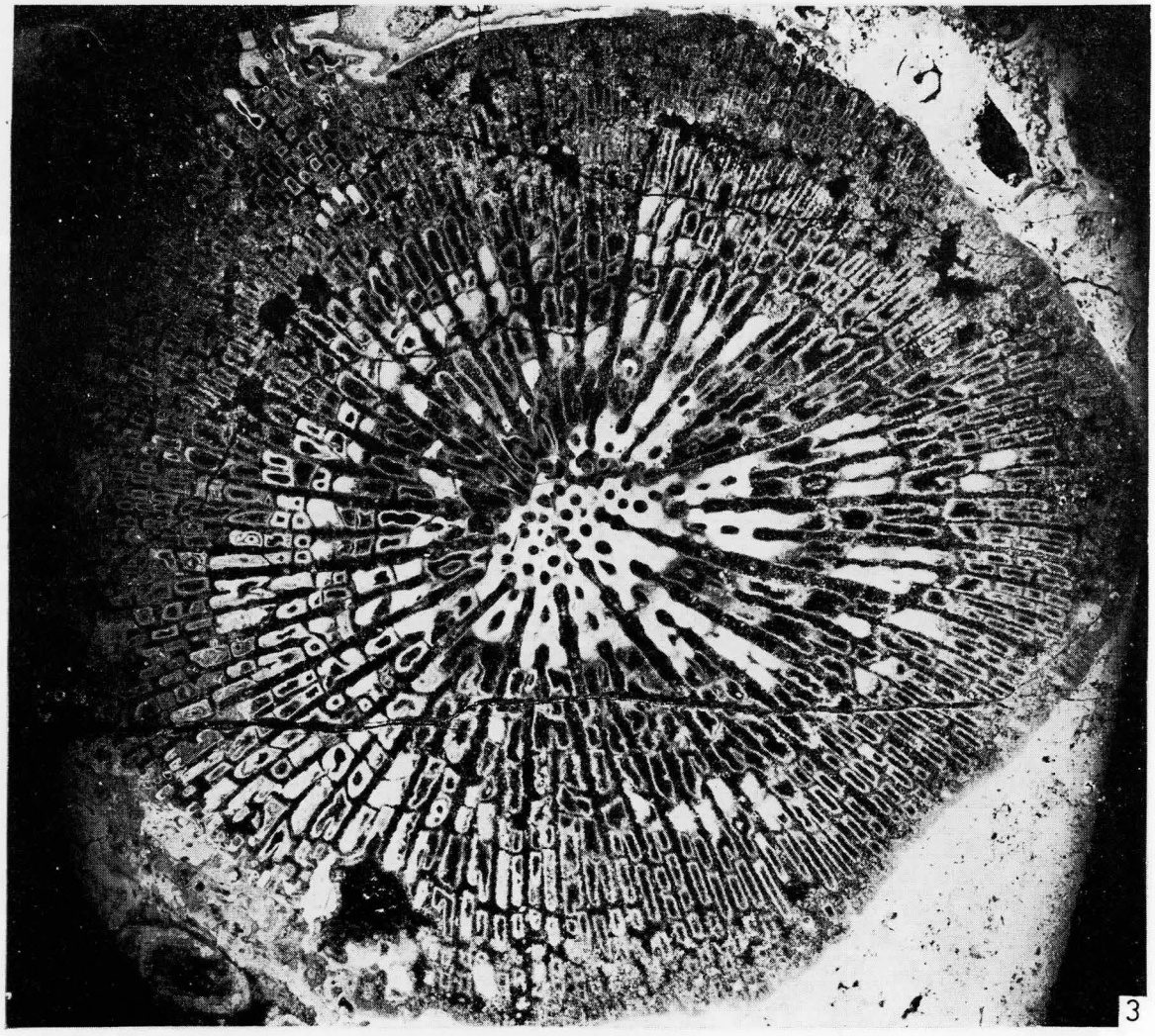

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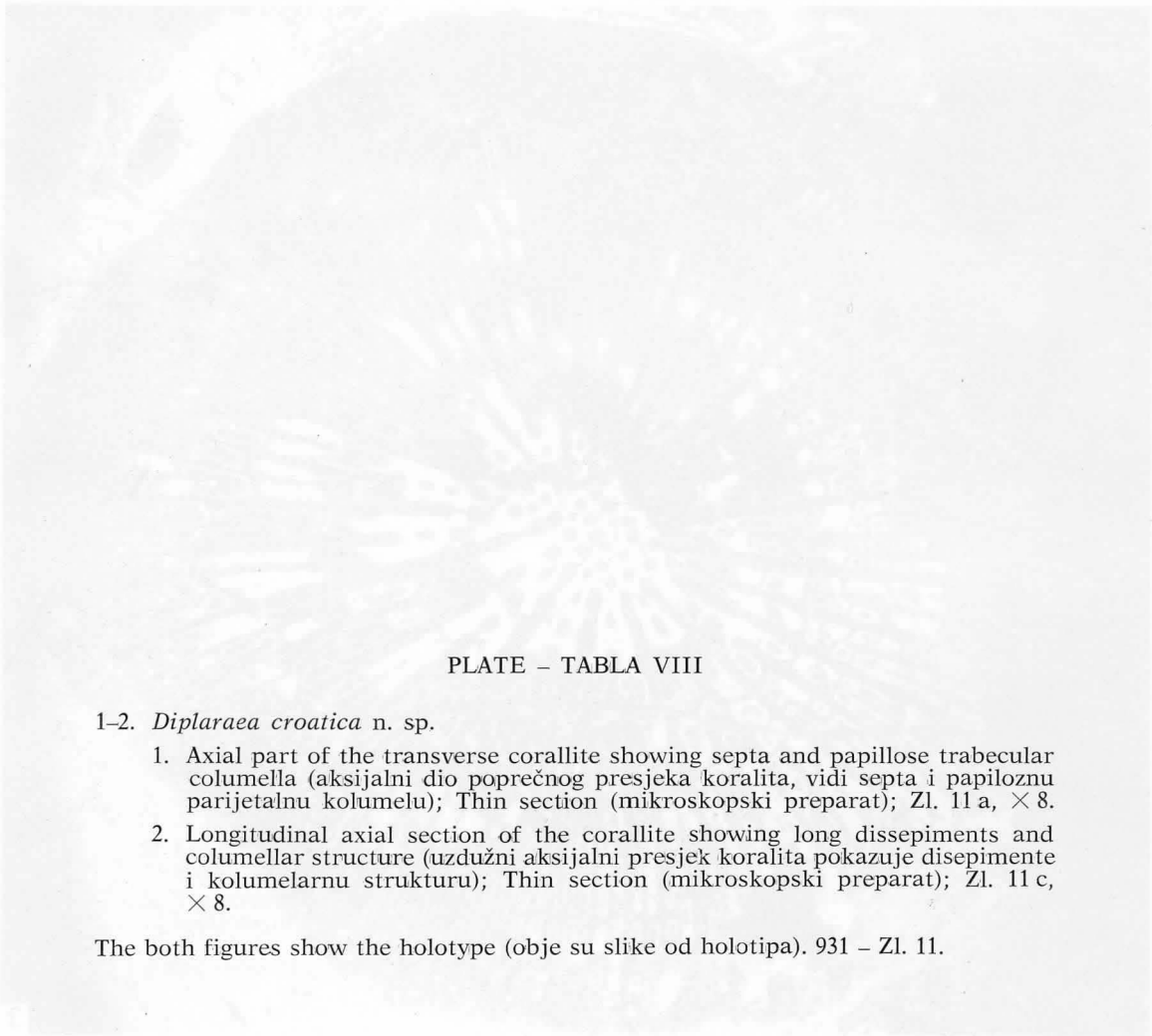
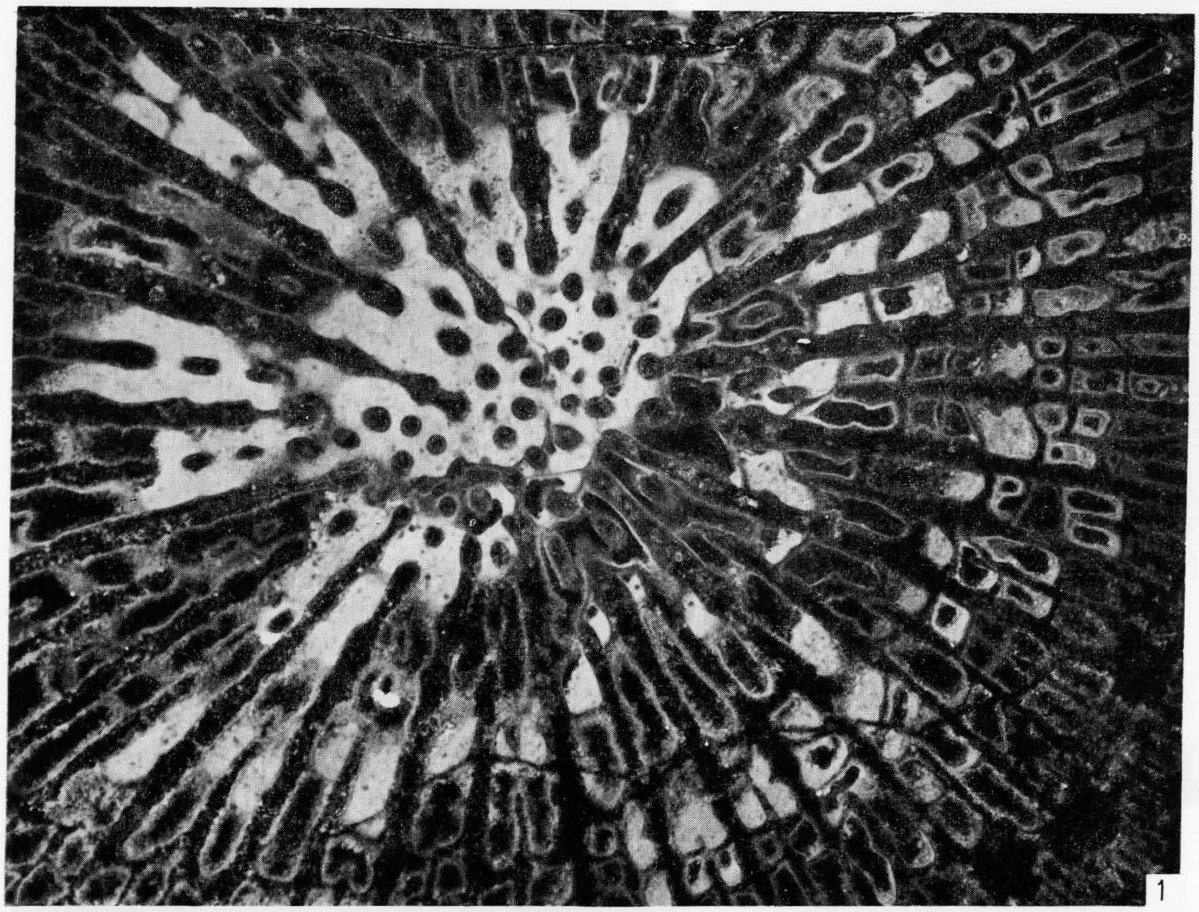


PLATE – TABLA VIII

1–2. *Diplaraea croatica* n. sp.

1. Axial part of the transverse corallite showing septa and papillose trabecular columella (aksijalni dio poprečnog presjeka koralita, vidi septa i papiloznu parijetalnu kolumelu); Thin section (mikroskopski preparat); Zl. 11 a, × 8.
2. Longitudinal axial section of the corallite showing long dissepiments and columellar structure (uzdužni aksijalni presjek koralita pokazuje disepimente i kolumelarnu strukturu); Thin section (mikroskopski preparat); Zl. 11 c, × 8.

The both figures show the holotype (obje su slike od holotipa). 931 – Zl. 11.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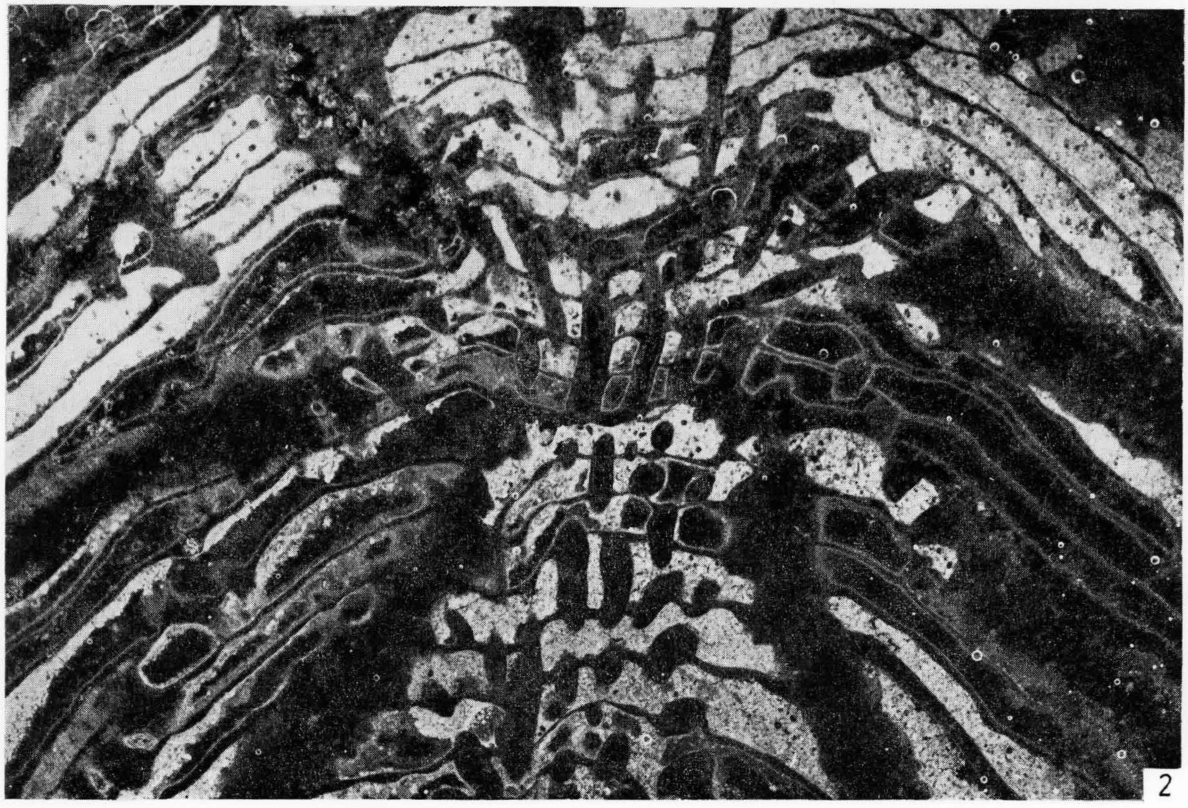
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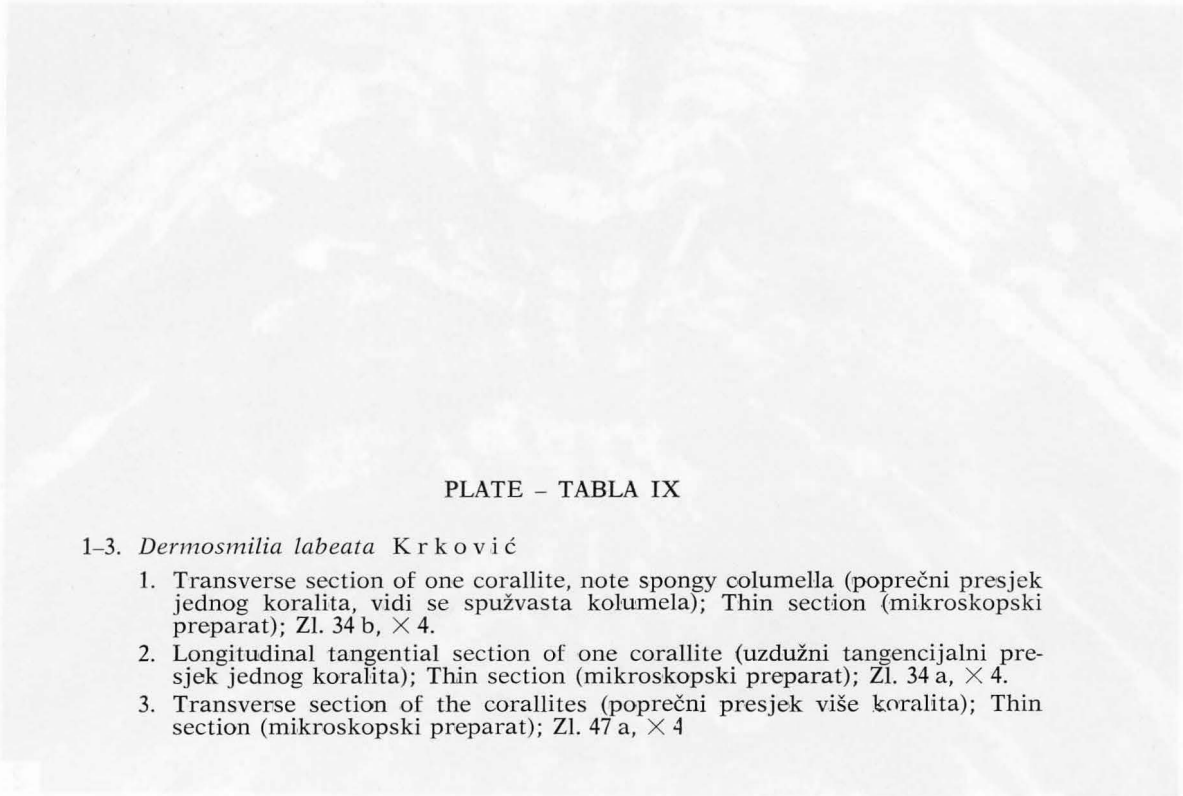
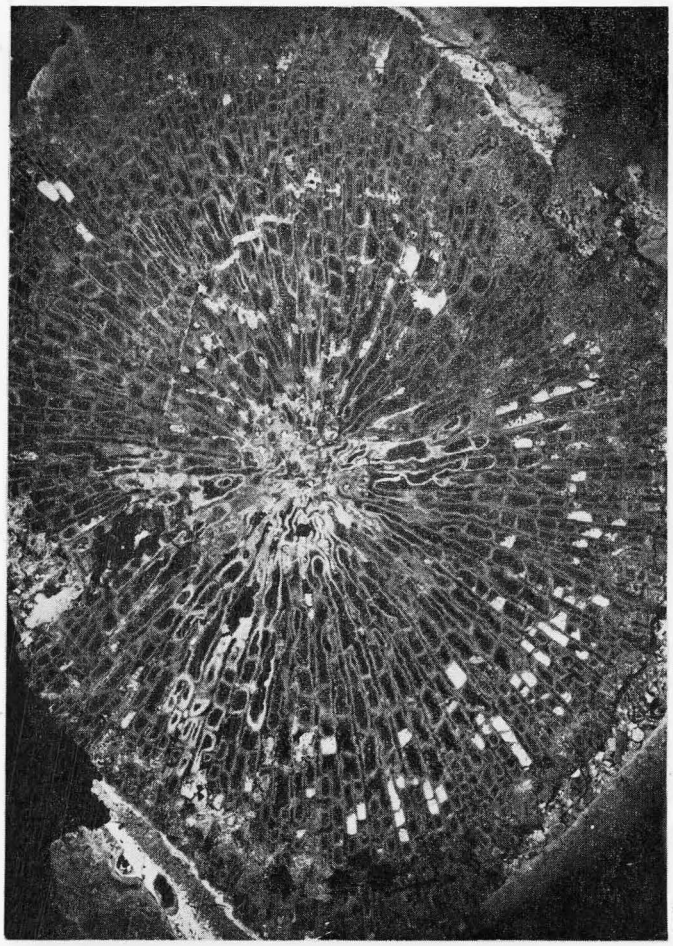


PLATE – TABLA IX

1–3. *Dermosmilia labeata* K r k o v i ć

1. Transverse section of one corallite, note spongy columella (poprečni presjek jednog koralita, vidi se spužvasta kolumela); Thin section (mikroskopski preparat); Zl. 34 b, × 4.
2. Longitudinal tangential section of one corallite (uzdužni tangencijalni presjek jednog koralita); Thin section (mikroskopski preparat); Zl. 34 a, × 4.
3. Transverse section of the corallites (poprečni presjek više koralita); Thin section (mikroskopski preparat); Zl. 47 a, × 4



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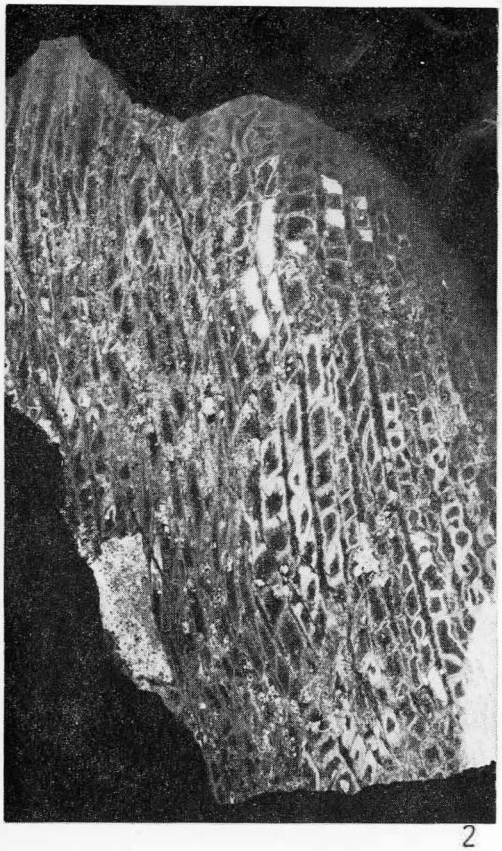

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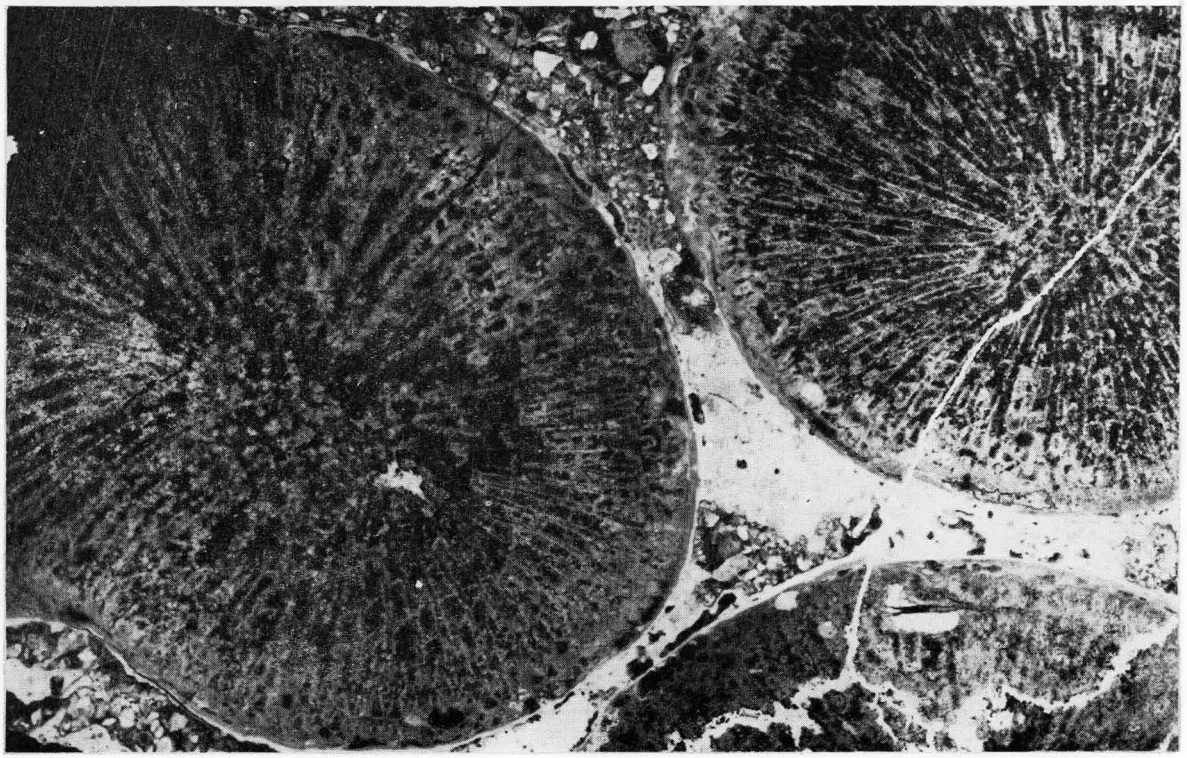


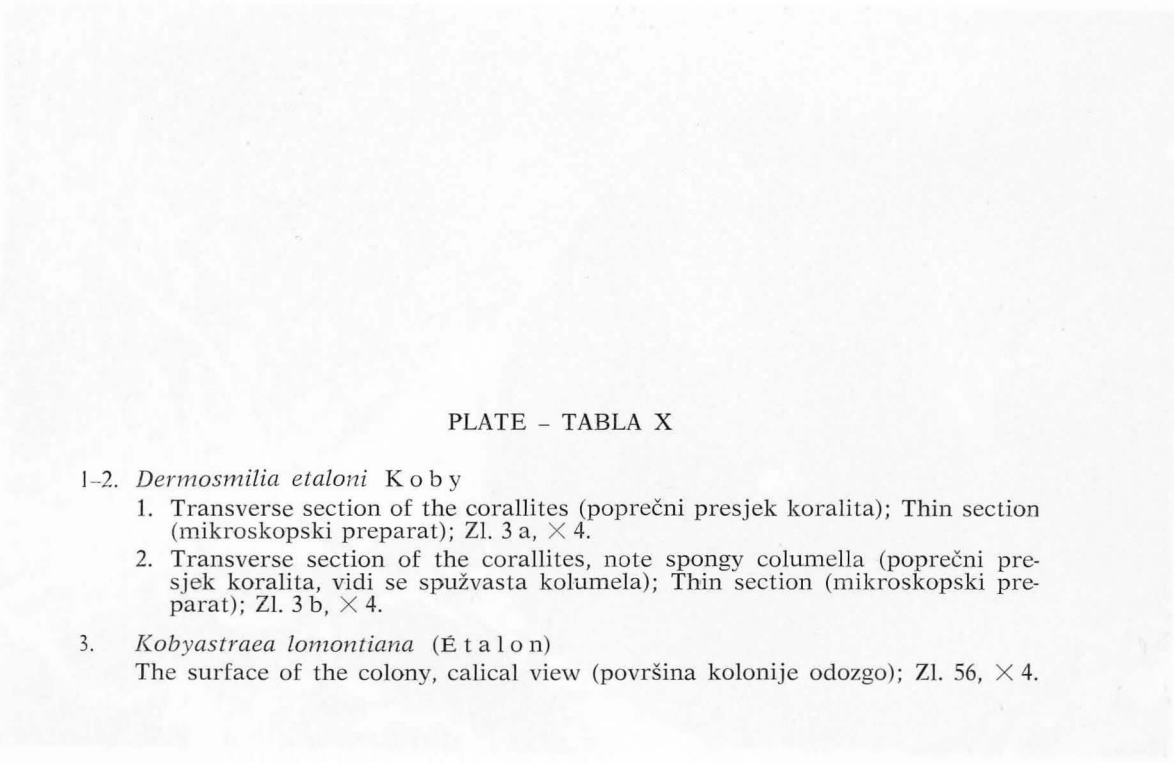
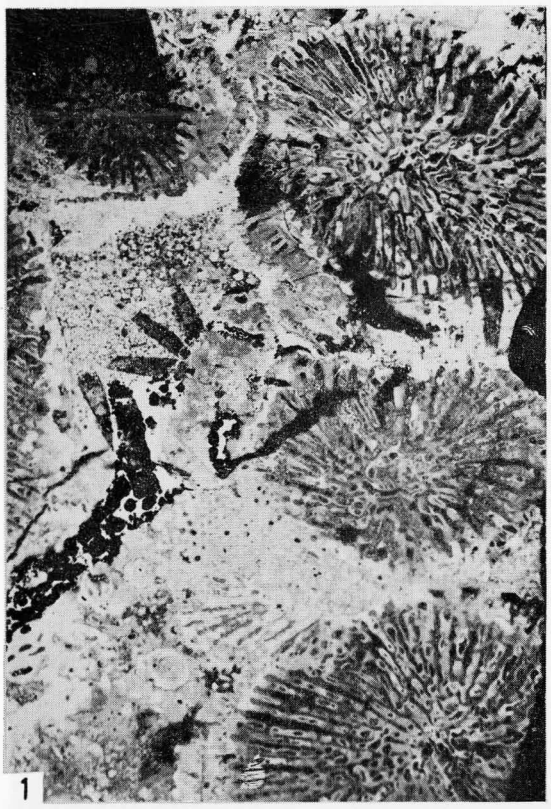


PLATE – TABLA X

1–2. *Dermosmilia etaloni* K o b y

1. Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 3 a, × 4.
2. Transverse section of the corallites, note spongy columella (poprečni presjek koralita, vidi se spužvasta kolumela); Thin section (mikroskopski preparat); Zl. 3 b, × 4.

3. *Kobyastraea lomontiana* (É t a l o n)
The surface of the colony, calical view (površina kolonije odozgo); Zl. 56, × 4.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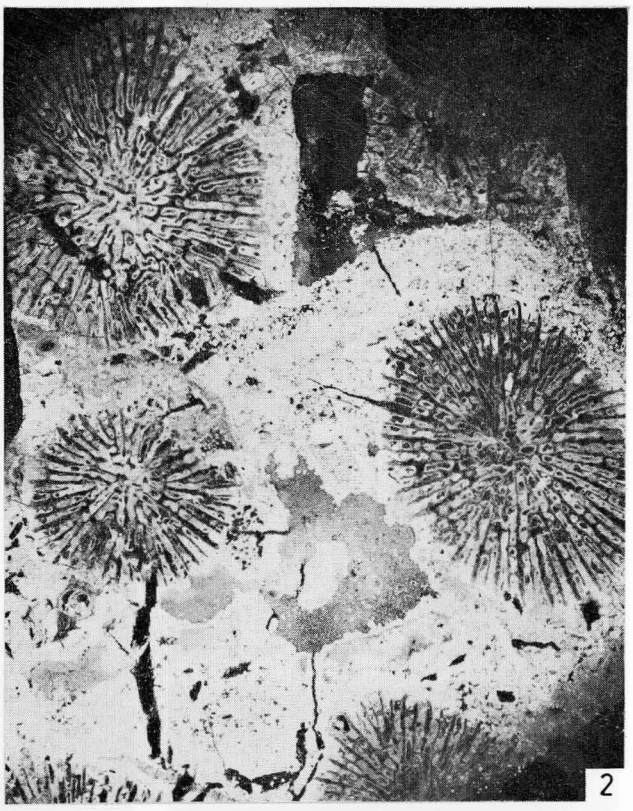
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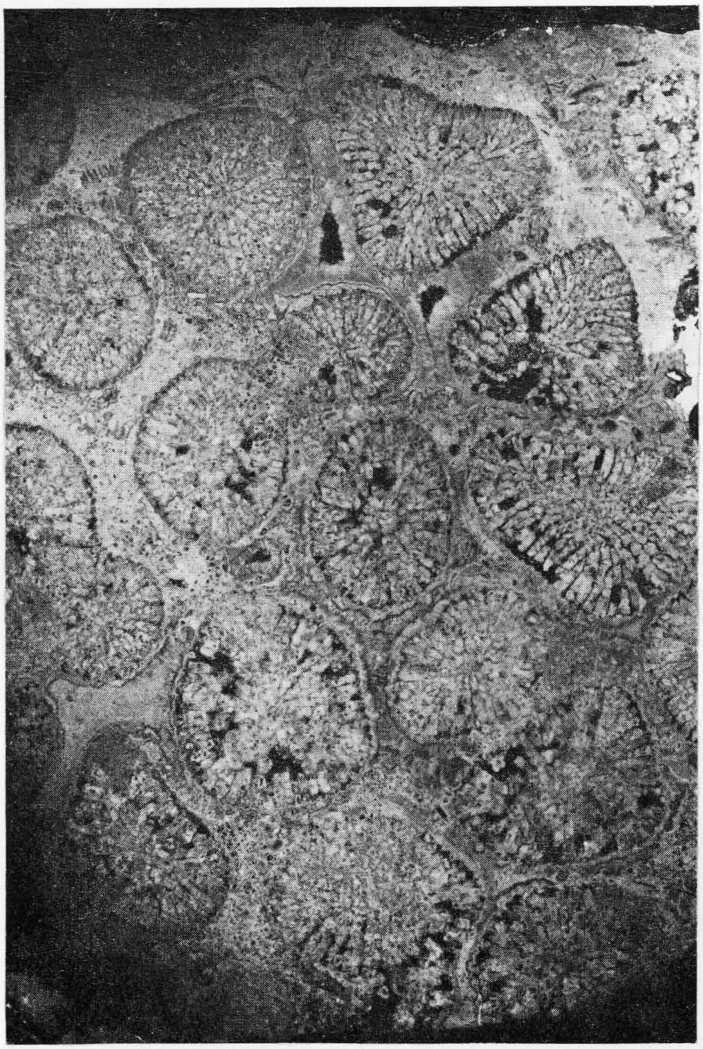
PLATE – TABLA XI

1–4. *Calamophylliopsis flabellum* (M i c h e l i n)

1. Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 37 a, × 4.
2. Longitudinal section of the corallites (uzdužni presjek koralita); Thin section (mikroskopski preparat); Zl. 37 b, × 4.
3. Longitudinal section of the colony (uzdužni presjek kolonije); Thin section (mikroskopski preparat); Zl. 32 a, × 4.
4. Transverse section of the corallites (poprečni presjek koralita); Thin section (mikroskopski preparat); Zl. 38 b, × 4.
5. The surface of the colony, calical view (površina kolonije odozgo); Zl. 45, × 1.



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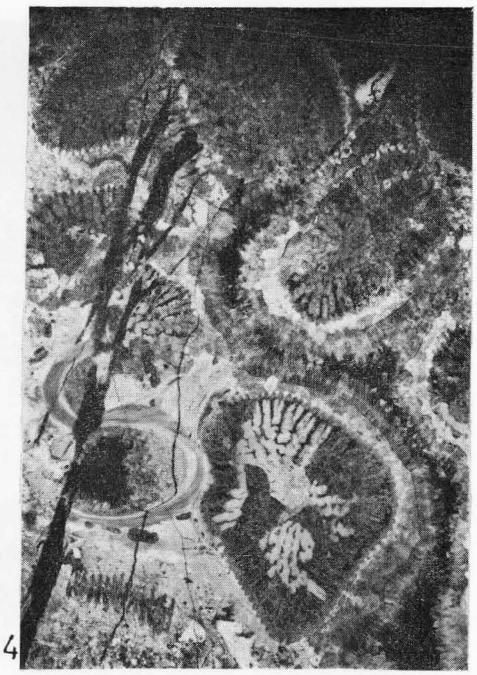

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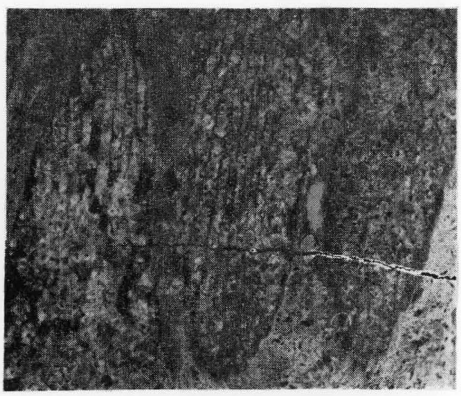

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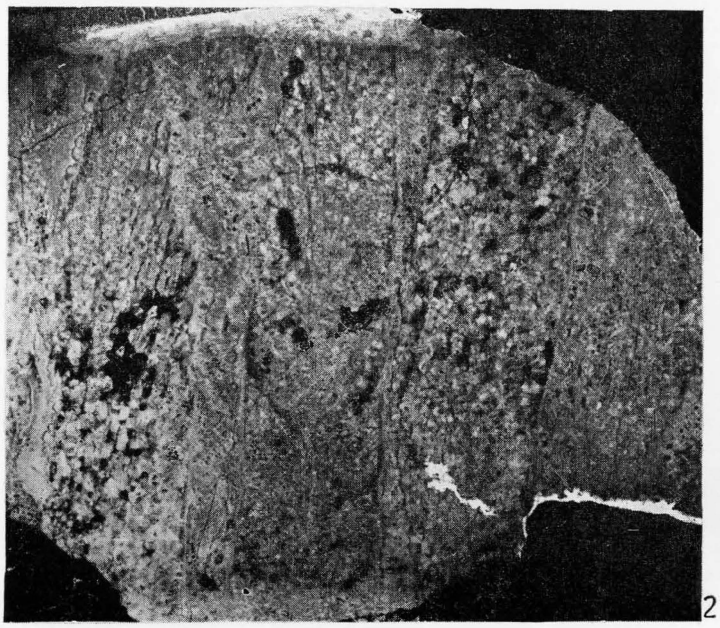

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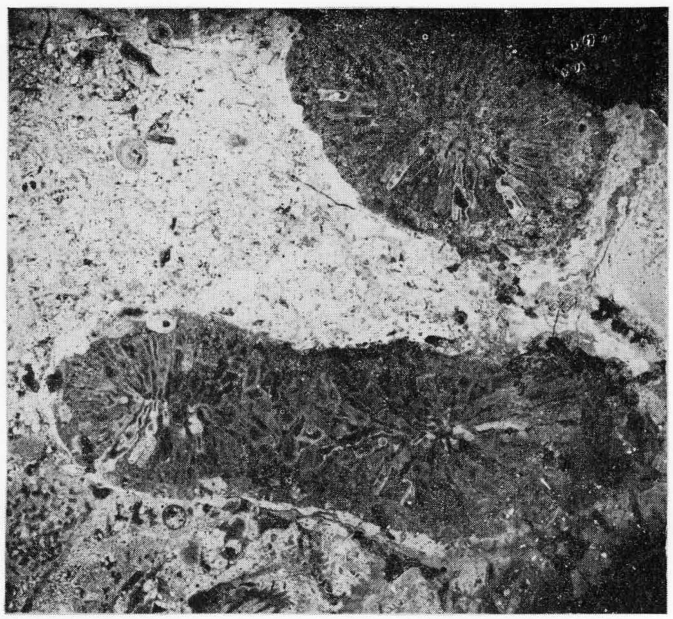
PLATE – TABLA XII

1–3. *Aplosmilia coalescens* E l i á š o v á

1. Transverse section of two corallites (poprečni presjek dvaju koralita); Thin section (mikroskopski preparat); Zl. 2 b, × 4.
2. Longitudinal section of one corallite (uzdužni presjek jednog koralita); Thin section (mikroskopski preparat); Zl. 2 a, × 4.
3. The surface of the colony, slightly oblique view of corallites (površina kolonije s malo kosim poprečnim presjecima koralita); Zl. 2, × 1.



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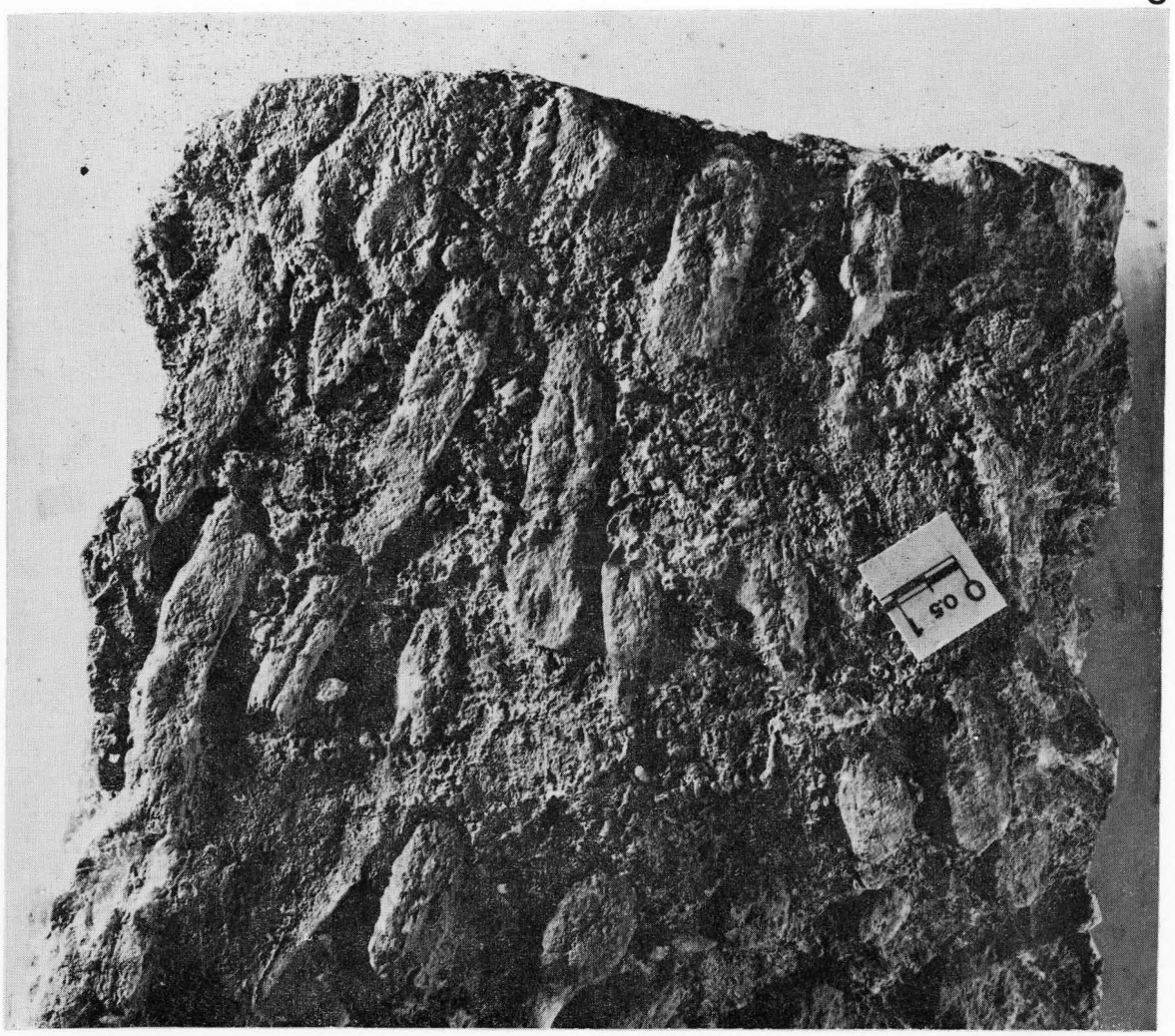

PALAEONTOLOGIA JUGOSLAVICA, Jugosl. akad., Zagreb

1–15

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