

**HIDROZOJI IN KORALE IZ JURSKIH
IN KREDNIH SKLADOV
V JUŽNOZAHODNI JUGOSLAVIJI**

(Z eno sliko v tekstu in 9 tablami slik)

**SOME HYDROZOANS AND CORALS FROM JURASSIC
AND CRETACEOUS STRATA OF SOUTHWESTERN
JUGOSLAVIA**

(With one Figure in Text and 9 Plates)

DRAGICA TURNŠEK

SPREJETO NA SEJI ODDELKA ZA PRIRODOSLOVNE VEDE
RAZREDA ZA PRIRODOSLOVNE IN MEDICINSKE VEDE
SLOVENSKE AKADEMIJE ZNANOSTI IN UMETNOSTI
DNE 15. JANUARJA 1968

UVOD

Dr. Rajka Radoičić, vodja mikropaleontološkega oddelka pri Zavodu za geološka i geofizička istraživanja v Beogradu, mi je poslala v obdelavo fosilni material iz južnih Dinaridov in mi dovolila, da objavim rezultate. Na voljo mi je dala tudi stratografske podatke. Za vse se ji na tem mestu najlepše zahvaljujem.

Poslani material je iz petih nahajališč v Črni gori (Bukovik med Nikšićem in Šavnikom, Orah severovzhodno od Nikšića, planina Njegoš, Vjeternik med Titogradom in Kolašinom, Kržanje severovzhodno od Titograda), iz dveh v Bosni in Hercegovini (Bjelašnica pri Gackem, Kozluk severno od Zvornika) in iz dveh v zahodni Srbiji (Dragačevo, Skrapež južnovzhodno od Kosjerića).

Fosili so deloma jurske, deloma kredne starosti. Določenih je pet vrst hidrozojev, od katerih so štiri nove, in štiri vrste koral. Pri dveh koralnih kolonijah je bila mogoča le generična determinacija. Opisane so tele vrste:

Hidrozoji:

Actinostromaria zonata n. sp.
Actinostromaria turonica n. sp.
Hudsonella media Turnšek
Cladocoropsis cretacea n. sp.
Cylicopsis verticalis n. sp.

Korale:

Heliocoenia (Decaheliocoenia) regularis n. sp.
Microsolena aff. *distefanoi* Prever
Microphyllia sp.
Lochmaeosmilina sp.
Actinaraea minuta Roniewicz
Actinacis martiniana d'Orbigny

SISTEMATSKI OPIS

HYDROZOA

Ordo: SPHAERACTINOIDEA

Superfamilia: ACTINOSTROMARIICAE Hudson 1959

Familia: ACTINOSTROMARIIDAE Hudson 1955

Genus: *Actinostromaria* Haug 1909

Actinostromaria zonata n. sp.

Tab. 1—3

Derivatio nominis: ima zonarno retikularno zgradbo

Holotypus: vzorec 03851 A, B

Locus typicus: Bukovik med Nikšićem in Šavnikom, Črna gora

Stratum typicum: zgornji portlandij

Material: 2 koloniji, od katerih so izdelani 4 zbruski

Diagnoza: *Actinostromaria* s širokimi koncentričnimi pasovi ali latilaminami, brez pravih astroriz.

Opis: Mikrostruktura je ortogonalna. Temna osrednja črta je tanka, vlakna niso dolga.

Cenosteji so polkrožne oblike. V njem prevladujejo vertikalni elementi, ki so tanki in precej dolgi. Navadno so prekinjeni samo ob latilaminah. Prečni ali horizontalni elementi so kratki, vedno le med dvema vertikalnima elementoma. To so lamine in redke tabule. Tabule so večkrat postavljene v istem nivoju.

Pravih cenostilnih in astroriznih cevi ni. Med skeletnimi elementi so le različno veliki in različno oblikovani vmesni prostori.

Latilamine so izrazite. To niso črte oziroma ploskve, ampak široki pasovi, ki potekajo po vsem cenosteu vzporedno s površino in približno vzporedno med seboj. V teh latilaminarnih zonah so skeletni elementi tako natrpani, da retikulum popolnoma zgubi svojo pravo ortogonalno zgradbo.

Glede na ortogonalno mikrostrukturo in ortogonalni retikulum pripada primerki brez dvoma rodu *Actinostromaria*.

Primerjava: Po retikularni strukturi se nova vrsta še najbolj približuje vrsti *Actinostromaria maxima* iz valanginijskih skladov v Švici (Schnorf, 1960, 470) in primerku iz aptijskih skladov v Bolgariji, ki ga je E. Flügel (1960) opisal kot *Actinostromaria cantabrica*, loči pa se od njiju po dimenzijah in po tem, da ima zonarno strukturo.

A. Milan (1966) omenja koncentrične pasove pri svoji novi vrsti *Actinostromaria concentrica*. Pri tej vrsti se retikulum v koncentričnih pasovih samo zgosti, kar si lahko razlagamo s periodičnim enakomernim zastojem v rasti oziroma s krepitvijo cenosteja. Pri moji novi vrsti pa se v latilaminah spremeni tudi retikularna struktura; to govori za to, da je kolonija v določenih nivojih spreminjala način življenja. Poleg tega je skelet pri novi vrsti finejši od skeleta pri vrsti *A. concentrica*, vmesni prostori so širši kot skelet.

V podolžnem preseku je na prvi pogled nova vrsta podobna tudi hetetidi *Varioparietes lamellosus* Schnorf-Steiner (1963), loči pa se po mikrostrukturi in po bolj pravokotnem retikulu.

Pojav latilamin s posebno retikularno strukturo je važen faktor pri rasti kolonije, zato je postavitve nove vrste upravičena.

Dimenzije: Debelina vertikalnih elementov 0,07—0,13 mm, debelina horizontalnih elementov 0,03—0,07 mm, širina vmesnih prostov



X nahajališča fosilov — finding places of fossils

rov 0,13—0,23 mm, včasih tudi do 0,32 mm. Razdalja med latilaminami 0,96—1,98 mm, širina latilamin 0,32—0,82 mm. V navadnem retikulu pride na 2 mm 8 do 10 skeletnih elementov, v latilaminah pa tudi do 20.

Razširjenost: Oba primerka je našla R. Radoičić v Bukoviku med Nikšićem in Šavnikom v Črni gori. Kot združbo jima omenja dicerase in nekoliko niže algo *Clypeina jurassica*. Sklade, v katerih je dobila hidrozojsko vrsto, uvršča v zgornji portlandij. Glede na veliko podobnost nove vrste s spodnjekrednima vrstama *Actinostromaria maxima* in *A. cantabrica* bi morda tudi črnogorska vrsta kazala bolj na spodnjo kredo.

Actinostromaria turonica n. sp.

Tab. 4

Derivatio nominis: imenovana po turonskih skladih, v katerih je bila najdena

Holotypus: vzorec 07362

Locus typicus: dolina reke Skrapež jugozahodno od Kosjerića

Stratum typicum: spodnji del srednjega turona

Material: 1 obrus, 4 zbruski, 9 kolonij

Diagnoza: majhna paličasta *Actinostromaria* z močno izraženimi koncentričnimi laminami.

Opis: Mikrostruktura je ortogonalna. Cenostej ima obliko drobne paličke z izrastki. Vertikalni elementi so ravni in potekajo vzporedno z daljšo osjo cenostej in radialno od sredine navzven. Večkrat se ustavljajo ob horizontalnih elementih. Horizontalne lamine so pogostne in precej debele, med njimi pa so še kratki horizontalni izrastki, ki ne presežejo razdalje enega vmesnega prostora.

Cenostilnih in astroriznih cevi ni. Ves skelet je enakomerna ortogonalna mreža, značilna za rod *Actinostromaria*. V prečnem preseku je retikulum črvjavost in točkast.

Dimenzije: Debelina vertikalnih elementov 0,03—0,05 mm, debelina koncentričnih lamel 0,03—0,06 mm, razdalja med laminami 0,2 do 0,35 mm, širina vmesnih prostorov 0,05—0,10 mm.

Primerjava: Po rasti in strukturi cenostej ter po dimenzijah je nova vrsta najbolj podobna vrsti *Actinostromaria coacta* Schnorf iz valanginijskih skladov Švice. Toda nova vrsta ima mnogo izrazitejše in debelejšje prečne lamine. Po retikularni zgradbi je nova vrsta podobna vrstam rodu *Burgundia*, vendar jo ortogonalna mikrostruktura izključuje iz tega rodu. Zaradi horizontalnih lamel se nova vrsta ne more primerjati z nobeno drugo vrsto rodu *Actinostromaria*. Ker so pa prav lamine eden najvažnejših gradbenih elementov, je ta razloček zadosten razlog za postavitev nove vrste.

Razširjenost: Novo vrsto je našla R. Radoičić v dolini reke Skrapež južnovzhodno od Kosjerića v zahodni Srbiji. Ta teren je podrobno obdelala M. Pašić (1957), pozneje pa je to področje razisko-

vala tudi D. Pejović. Po sporočilu R. Radoičićeve so skladi z najdbo hidrozoja turonske starosti.

Superfamilia: MILLEPORELLICAE Hudson 1959

Familia: PARASTROMATOPORIDAE Hudson 1959

Genus: *Hudsonella* Turnšek 1966

Hudsonella media Turnšek

1966, *H. media*, Turnšek, pp. 363-364, tab. 15, sl. 1-4

Kolonija iz Črne gore je enaka primerkom iz Slovenije, ki so bili najdeni v več krajih v srednjem favnističnem področju skupaj s koralami in hetetidami ter parastromatoporidnimi hidrozoji v skladih spodnjega malma.

R. Radoičić je našla kolonijo v nahajališču Planinica na planini Njegoš v skladih tik pod skladi z algo *Clypeina jurassica*, torej v spodnjem kimmeridgiju. Primerki imajo terensko številko 07620.

Familia: MILLEPORIDIIDAE Yabe et Sugiyama 1935

Genus: *Cladocoropsis* Felix 1906

Cladocoropsis cretacea n. sp.

Tab. 5

Derivatio nominis: imenovana po krednih skladih, v katerih nastopa

Holotypus: vzorec 07253 d

Locus typicus: Orah, severovzhodno od Nikšića

Stratum typicum: spodnja kreda, hauterivij

Material: 6 zbruskov

Diagnoza: *Cladocoropsis* z velikim cenostejem, dolgimi vertikalnimi elementi in cevmi.

Opis: Mikrostruktura je vlaknato klinogonala, ponekod nejasna. Cenostej je paličast z nepravilnimi in številnimi odebelitvami. Radialni elementi so debeli, ravni ali vijugasti, brez horizontalnih izrastkov. Na nekaterih mestih so spojeni med seboj. Med skeletom so radialne cevi, ki so večinoma ravne in dolge. Ponekod se dve sosednji cevi spojata po kratkem prečnem kanalu. V prečnem preseku je retikul črvjavost. Cevi gredo nespremenjene do zunanjih robov cenostej, zato ne opazujemo aksialnega in perifernega retikula.

Dimenzije: Debelina cenostilne vejice 4 do 8 mm, širina zooidnih cevi 0,13—0,23 mm, debelina skeletnih elementov 0,10—0,20 mm.

Primerjava: Po obliki cenostej in po mikrostrukturi se more nova vrsta primerjati z vrsto *C. mirabilis*. Po velikosti cenostej je bližja vrsti *C. dubertreti*. Loči pa se bistveno od njiju po tem, da ima precej dolge ravne radialne zooidne cevi, ki potekajo do roba cenostej. Ta pojav je znan tudi pri vrsti *C. lata* (Fenninger et Hötzel, 1965), vendar so pri tej vrsti cevi krajše in vijugaste.

Dolge vzporedne cevi pri novi vrsti nas spominjajo na rod *Parastromatopora*, zlasti na vrsto *P. memorianaumanni* (Yabe et Sugiyama, 1935), vendar nima drugih važnih značilnosti rodu *Parastromatopora*, to je tabul in horizontalnih lamel, zato jo uvrščam v rod *Cladocoropsis*.

Razširjenost: Novo vrsto je dobila R. Radoičić v hauterivijskih skladih v kraju Orah severovzhodno od Nikšića. V istih skladih se pojavlja alga *Pianella annulata*.

Superfamilia: BURGUNDIICAE Turnšek 1967

Familia: STROMATOPORINIDAE Kühn 1928

Genus: *Cylicopsis* Le Maitre 1935

Cylicopsis verticalis n. sp.

Tab. 6, tab. 7, sl. 1—3

Derivatio nominis: ime po prevladujočih vertikalnih elementih

Holotypus: vzorec 03587 A, B, C

Locus typicus: Vjeternik med Titogradom in Kolašinom

Stratum typicum: zgornja jura, apnenec s sferaktinijami

Material: 2 koloniji, od katerih je narejenih 5 zbruskov (03587 A, B, C in 03587 a, b)

Diagnoza: *Cylicopsis* s prevladujočimi vertikalnimi elementi, redkimi psevdolaminami in velikimi aksialnimi astroriznimi cevmi.

Opis: Mikrostruktura je homogena, drobnozrnata. V cenostejju prevladujejo vertikalni elementi, ki so malenkostno vijugasti, vendar gredo neprekinjeno skozi ves cenostej.

Horizontalne elemente predstavljajo tabule in redke lamine. Tabule so zelo debele, postavljene so navadno v isti višini. Tako nastanejo za rod *Cylicopsis* značilne psevdolamine. Pri tej vrsti so psevdolamine zelo redke. Še manj je pravih lamin, ki so navadno le med dvema sosednjima vertikalnima elementoma.

Pravih cenostilnih cevi ni, pač pa se med sosednjimi vertikalnimi elementi pojavljajo dolgi vmesni prostori. Posebnost cenostejja so veliki astrorizni sistemi. To so velike široke osrednje astrorizne cevi, od katerih v več nivojih izhajajo astrorize pod poševnim kotom. Tudi v prečnem retikulu, ki je črvivast, močno izstopajo osrednje astrorizne cevi.

Zrnata oziroma homogena mikrostruktura in značilna retikularna zgradba s psevdolaminami dovoljuje uvrstitev nove vrste v rod *Cylicopsis*.

Dimenzije: Debelina vertikalnih elementov 0,03—0,05 mm, debelina psevdolamin 0,03—0,045 mm, širina vmesnih prostorov 0,045 do 0,10 mm, širina osrednjih astroriznih cevi 0,33—0,5 mm, širina astroriznih krakov 0,12—0,15 mm. Na dva milimetra pride 12 do 15 skeletnih elementov.

Primerjava: Nova vrsta ima redke psevdolamine in prevladujoče vertikalne elemente, zato je ena najbolj skrajnih radialnih oblik tega rodu, ki se približuje rodu *Syringostromina*. Predstavlja torej nasprotje z vrsto *Cylicopsis lata*, ki ima številne horizontalne elemente (glej Turnšek, 1966, 37).

Od vseh doslej znanih vrst se nova vrsta loči po obliki astroriznih sistemov. Ti sistemi so podobni sistemom pri rodu *Syringostromina*. Menim pa, da je pojav psevdolamin važnejši za sistematiko kot oblika astroriz, zato uvrščam novo vrsto v rod *Cylicopsis* in ne v rod *Syringostromina*. Nova vrsta tudi nima pravih tankih horizontalnih lamin, kakršne so pri rodu *Syringostromina* (cf. Lecompte, 1952, 14, Fenninger et Hötzl, 1965, 36). Različne oblike astroriz pa smo ugotovili že pri več rodovih.

Razširjenost: Oba primerka nove vrste je našla R. Radoičić v kraju Vjeternik med Titogradom in Kolašinom v Črni gori, v apnencih z elipsaktinijami. Radoičićeva uvršča te sklade v zgornjo juro, nekako v portlandij. V Sloveniji smo dobili vrste rodu *Cylicopsis* v enaki združbi, to je skupaj z elipsaktinijami. Naša nahajališča so spodnjemalmske starosti. Menim, da bi tudi črnogorsko nahajališče verjetno mogli uvrstiti v isto dobo, zlasti še, ker je Radoičićeva dobila tudi v Črni gori elipsaktinije na nekaterih krajih v spodnjem malmu (Radoičić, 1964, 1966).

ANTHOZOA

Ordo: HEXACORALLIA

Familia: STYLINIDAE d'Orbigny 1851

Genus: *Heliocoenia* Etalon 1959

Subgenus: *H. (Decaheliocoenia)* Koby 1881

Heliocoenia (Decaheliocoenia) regularis n. sp.

Tab. 8, sl. 1—3

Derivatio nominis: ime po pravilno razvrščenih septah v koralitu

Holotypus: vzorec 05855

Locus typicus: Bjelašnica pri Gackem, Hercegovina

Stratum typicum: kimmeridgij

Diagnoza: *H. (Decaheliocoenia)* z gostimi čašicami.

Opis: Natančne opise in revizijo rodu je izdelala Roniewicz (1965, 201—210). Naš primerek popolnoma ustreza podrodu *Decaheliocoenia*. V čašah je 6 sistemov sept. Septa imajo dvojno simetrijo, srednji septalni sistem je reduciran, tako da dobimo vedno po 20 obrobni sept. Do sredine pride 6 sept. Čašice so pogostne, večinoma enake, le nekatere redke so nekoliko manjše in deformirane. Take imajo več sept reduciranih. Razdalja med dvema sosednjima sredinama čašic je 1,6 do 2 mm. Oblika čašic je okrogla ali rahlo ovalna, nekatere so nepravilne. Kolumela je ovalna, sploščena. Stena med čašicami je ostra, ni pa vmes drugega cenostejja.

Primerjava: Nova vrsta se loči od drugih vrst omenjenega podrodu po večji gostoti čašic. Med čašami je le ostra črta ali periteka, ni pa drugega cenosteja. Po tej lastnosti je vrsta bližja podrodu *Hexaheliocoenia*, število sept in simetrija pa je pri novi vrsti izključno značilna za podrod *Decaheliocoenia*.

Opisana vrsta se močno približuje primerku s planine Rumiye v Črni gori, ki ga je D. Krković opisala kot *Heliocoenia cf. variabilis*. Toda ta avtorica že sama ugotavlja, da so čašice gostejše in da gre mogoče za novo vrsto (Krković, 1960, 168).

Razširjenost: Od podrodu *H. (Decaheliocoenia)* je znanih 5 vrst iz raznih krajev Evrope. Povsod nastopajo v zgornjejurskih večinoma oxfordijskih skladih. Naša nova vrsta je najdena na Bjelašnici jugozahodno od Gackega v Hercegovini. Radoičićeva (1966, 15) je skladom s to najdbo pripisala srednjemalmsko starost.

Familia: MICROSOLENIDAE Koby 1890

Genus: *Microsolena* Lamouroux 1921

Microsolena aff. *distefanoi* Prever

Tab. 9, sl. 1

1964, *Microsolena distefanoi*, Morycowa, 86–87, Pl. 25, fig. 2, Pl. 26, fig. 1 a-b, 2

1966, *Microsolena distefanoi*, Morycowa, 536–537, Pl. 32, fig. 7

Natančne opise je podala Morycowa. Naš primerek je tamna-steroidna kolonija s površinskimi čašicami v obliki jamic. Kolumela je rudimentirana. Radialni elementi so septa, ki so precej debela in nekoliko vijugasta. Sten med čašicami ni. Razdalja med čašicami je 3 do 4 mm. Število sept v enem koralitu je okrog 30 do 35. Premer čašic je približno 7 mm. V premeru so čašice večinoma okrogle, nekatere ovalne.

Primerjava: Naš primerek ima vse značilnosti vrste *M. distefanoi*, le septa so bolj vijugasta. Značilno je, da je po svoji zgradbi vrsta zelo podobna skupini Spongiomorphae, ki jo strokovnjaki uvrščajo k hidrozojem. Zlasti v podolžnem preseku spominja *Microsolena distefanoi* kakor tudi nekatere druge vrste tega rodu na retikularno zgradbo spongiomorfid.

Razširjenost: Vrste rodu *Microsolena* so znane večinoma iz jurskih skladov. Iz kredne dobe poznamo samo *M. distefanoi* Prever, *M. besairiei* Alloiteau in nekatere druge.

Vrsto *Microsolena distefanoi* poznamo doslej iz cenomanskih skladov Monte d'Ocre v Italiji, iz cenomanskih skladov Jastrzębie v poljskih Karpatih in iz neokoma Tater na Poljskem.

Naš primerek je dobila Radoičićeva v senonskih skladih v kraju Kozluk severno od Zvornika v Bosni (vzorec 03803).

Familia: LATOMEANDRIIDAE Alloiteau 1952

Genus: *Microphyllia* d'Orbigny 1849

Microphyllia sp.

Tab. 7, sl. 4

Kolonijska meandroidna korala z redkimi izoliranimi okroglimi ali ovalnimi čašicami. Centri so dobro vidni, stene med čašicami so ostre. Kolumele ni. V izoliranih okroglih čašicah je po 32 sept.

Razširjenost: Večinoma vse vrste rodu *Microphyllia* so doslej znane iz zgornje jure, največ iz oxfordija in kimmeridgija, nekatere tudi iz portlandija. Naš primerek (števil. 03618) je iz Kržanja severovzhodno od Titograda iz zgornjejurskih skladov.

Familia: AMPHIASTRAEIDAE Ogilvie 1897

Genus: *Lochmaeosmia* Wells 1913 (= *Eunomia* Lamouroux 1821)

Lochmaeosmia sp.

Tab. 8, sl. 4–5

Kolonija je faceloidna, meandrična, polipi majhni in stisnjeni. Vmesni prostori med čašicami so relativno veliki. Več čašic je mestoma spojenih, kar Alloiteau razlaga z brstenjem znotraj čašic (1958, 67). V prečnem preseku so čaše nepravilno poligonalne in raznih dimenzij. Septa so debela, kompaktna, njih število je različno. V sredi je stiliformna psevdokolumela.

Po obliki in rasti polipov v koloniji kakor tudi po septah gre pri našem primerku nedvomno za rod *Lochmaeosmia*. Glede na to, da so čašice večinoma močno prekrizalizirane, vrste ne morem določiti.

Razširjenost: Vrste rodu *Lochmaeosmia* so pretežno zgornjejurske oblike. Več vrst tega rodu je dobil Alloiteau v bathonijsko-kalovijskih skladih Madagaskarja (1958, 68–70). Naš primerek je z grebena planine Njegoš v Črni gori (števil. 07520). Radoičićeva pripisuje skladom oxfordijsko-kimmeridgijsko starost.

Familia: ACTINACIDIDAE Waughan et Wells 1943

Genus: *Actinaraea* d'Orbigny 1849

Actinaraea minuta Roniewicz

Tab. 9, sl. 2

1966, *Actinaraea minuta*, Roniewicz, 250–251, Pl. 25, fig. 1 a-b

Opis: Kolonijska korala z majhnimi čašicami, ki so zelo oddaljene druga od druge. Več kot polovica radialnih elementov pripada

periteki. V čašici je 40 do 60 sept, približno polovica jih pride do centra.

Primerjava: Naš primerek po strukturi in dimenzijah ustreza vrsti *A. minuta*, ki jo je prvič opisala Roniewicz. Po njenih ugotovitvah se ta vrsta loči od drugih vrst tega rodu po majhnem premeru čašic in po drobnem skeletu. Omeniti moram še veliko podobnost vrste *A. minuta* s skupino Spongiomorphidae, zlasti z rodом *Spongiomorpha*, o katerem bo nekoliko več govora v zaključnem poglavju. Vrsto *Actinaraea* lahko uvrstimo med korale, ker nima radialnih stebričkov kot spongiomorfide in tudi ne koncentričnih lamel. Struktura čašic v prečnem preseku jasno kaže, da ne gre za astorizne sisteme hidrozojev, ampak za koralne čašice. Septa so med čašicami strnjena, pri astoriznih tvorbah pa se kraki popolnoma izgube med črvivastim retikulom. Naš primerek je torej korala z zelo nagubanimi in nepravilnimi septami ter ponekod veliko periteko, kar vrsto na videz močno približuje spongiomorfidam.

Razširjenost: Roniewicz je dobila to vrsto na Poljskem v zgornjem oxfordiju. Naš primerek je najden pri Planinici na planini Njegoš (št. 07605) v skladih, ki jih Radoičićeva uvršča v dogger.

Genus: *Actinacis* d'Orbigny 1849

Actinacis martiniana d'Orbigny

Tab. 9, sl. 3

1958, *Actinacis martiniana*, Alloiteau, 177–178, Pl. 18, fig. 3; Pl. 29, fig. 1–3

Opis: Masivna okroglasta kolonijska korala z redkimi okroglimi čašicami. Sept je 24. Septa prvega in drugega cikla segajo do sredine koralita, septa 3. in 4. cikla so krajša. Navadno je 12 sept dolgih (skupaj po 2), krajša septa so med dolgimi v obliki črke V. V nekaterih koralitih so posamezna septa rudimentirana ali reducirana in jih je samo po 20. Čašice se dobro ločijo od medkoralitnega črvivastega tkiva. Prave stene med čašicami ni. Razdalja med centri posameznih čašic je 2 do 3 mm, premer koralita je 1.9 do 2 mm.

Primerjava: Naš primerek se ujema z opisom originalnega D'Orbignyjevega holotipa, ki ga je objavil Alloiteau (1958, 178). Ta vrsta je zelo podobna tudi Tornquistovi vrsti *Neostroma sumatrensis*, ki jo je avtor imel za hidrozoja (1909, 1118–1123), pozneje pa je bila prišteta k rodu *Actinacis* (Wells, 1956, F393). Gre pa nedvomno za drugo vrsto, ker ima *A. martiniana* veliko bolj pravilno septalno zgradbo.

Razširjenost: Holotip je iz zgornjesantonijjskih skladov Francije. Tudi večina drugih vrst tega rodu je iz zgornje krede. Naš primerek (vzorec št. D667) je iz maastrichtskih skladov v Dragačevu v zahodni Srbiji.

STRATIGRAFSKE IN EKOLOŠKE UGOTOVITVE

Opisane vrste hidrozojev in koral so nov prispevek k poznavanju grebenske favne v Jugoslaviji. Obdelani so posamezni primerki iz raznih nahajališč in stratigrafskih horizontov od liade do zgornje krede. Zadovoljivo gradivo za ugotavljanje paleoekoloških razmer nudijo predvsem najdbe hidrozojev.

Kljub skromnemu številu obdelanih vrst lahko med hidrozojsko favno v jugozahodni Jugoslaviji in favno v Sloveniji ugotovimo neko podobnost. Čeprav gre v Črni gori za nekatere nove vrste, pripadajo te rodovom, ki so v Sloveniji zelo razširjeni. Prav rodovi ali celo vsa združba hidrozojev so namreč važni znanilci za posamezna področja in za določene stratigrafske horizonte. V posameznih geoloških obdobjih so izumrle cele skupine ali se pojavile nove. Le redki rodovi hidrozojev so daljši čas ostali nespremenjeni. Združba v posameznih geoloških obdobjih je bila potemtakem precej stalna. Zato že po eni vrsti lahko sklepamo na drug grebenski živelj. Pri natančnejšem raziskovanju terena in nabiranju favne bi gotovo dobili še druge vrste in rodove.

S slovensko hidrozojsko favno najlažje primerjamo nove najdbe rodov *Cladocoropsis*, *Hudsonella* in *Cylicopsis* v južnozahodni Jugoslaviji. Rod *Cladocoropsis* je bil znan iz Črne gore že dalj časa (Radoičić 1957). To je od vseh mezozojskih hidrozojev najbolj permanentna oblika. Največji regionalni obseg je dosegla vrsta *C. mirabilis* v spodnjem malmu. Druge vrste so redkejšje. Ob ugodnih razmerah so nekateri predstavniki rodu *Cladocoropsis* skoraj nespremenjeni naselili razna področja tudi v kredni dobi, vendar jih je številčno manj. V Črni gori je sedaj prvič opisana vrsta *Cladocoropsis cretacea* iz spodnjekrednih skladov. To je edino nahajališče in poznamo samo nekaj primerkov te vrste. V zadnjem času so geologi (Polšak in Milan, 1964; Sartoni in Crescenti, 1962; Buser, osebno sporočilo), odkrili še druge spodnjekredne kladokoropsise, vendar favna še ni obdelana. Cenostej nove vrste je velik; to potrjuje mojo domnevo, da se je pri rodu *Cladocoropsis* cenostej v glavnem postopoma večal (Turnšek, 1966, 380, 382). V tej zvezi pa nastane vprašanje, kaj je s pojavom vrste *Cladocoropsis mirabilis* v senonskih skladih, ki jih Polšak in Milan (1966) omenjata pri Plitvičkih jezerih. Makroskopsko so te oblike podobne vrsti *Cladocoropsis mirabilis*, toda zdi se mi, da imajo nekoliko drugačno mikrostrukturo skeletnih elementov. Verjetno je šla diferenciacija v razvoju v več smeri.

Vrsta *Cylicopsis verticalis* se pojavlja v Črni gori skupaj z elipsaktinijami, torej z isto združbo kot druge vrste tega rodu v Sloveniji. Tudi glede starosti se nahajališča verjetno ujemajo, saj je Radoičićeva dobila elipsaktinije v Črni gori tudi v skladih spod-

njega malma. Pri vrsti *Cylicopsis verticalis* prevladujejo v cenosteju vertikalni skeletni elementi; to pomeni, da je ta vrsta ena najbolj razvitih med vrstami rodu *Cylicopsis* (razvoj pri fosilnih hidrozojih teži namreč k vertikalnosti). V primerjavi s slovenskimi nahajališči bi črnogorsko najdbo mogli uvrstiti k najvišjemu elipsaktinijskemu horizontu, nekako v kimmeridgij. Poleg tega pa je nova vrsta važna v paleontološkem oziru, saj predstavlja obliko, ki se najbolj približa rodu *Syringostromina* in tako dopolnjuje razvojni niz v družini Stromatoporinidae.

Vidimo, da se pojavljata v Črni gori *Cladocoropsis*, ki ustreza južnemu favnističnemu področju v Sloveniji, in *Cylicopsis* v združbi z elipsaktinijami, ki ga lahko primerjamo s slovenskim severnim favnističnim področjem, kjer prevladujejo aktinostromaridni hidrozoji. Rod *Hudsonella* pa je predstavnik parastromatoporidnega tipa hidrozojev, ki smo ga dobili v Sloveniji v srednjem favnističnem področju. Tako torej najdba vrste *Hudsonella media* v Črni gori dokazuje, da moremo tudi v jugozahodni Jugoslaviji govoriti o različnih hidrozojskih favnističnih področjih. Zato lahko sklepamo, da so vsaj v zgornji juri vladale v Črni gori in Sloveniji enake sedimentacijske razmere. Te so bile po vsej verjetnosti enake v vseh Dinaridih. Prevladovala je plitvomorska grebenska favna, ki je uspevala na podmorskih grebenih, barierah in šelfih, vmes so se raztezali globlji predeli, kjer dobimo cefalopodno in drugo pelagično favno. Ni nujno, da so bili grebeni na vsem ozemlju spojeni, ker pri hidrozojih lahko domnevamo, da so se razmnoževali po meduzni generaciji, ki ni pri nas nikjer fosilno ohranjena. Edino razmere za rast in razvoj polipov so morale biti enake. Zlasti važna se mi zdi temperatura, ki je bila najugodnejša v spodnjem malmu, ko so grebenske tvorbe na ozemlju Dinaridov zavzemale največji regionalni obseg.

Nekaj novega za Dinaride je najdba rodu *Actinostromaria* v krednih skladih. Kredni hidrozoji doslej pri nas še niso bili znani. Zato lahko najdbo vrste *Actinostromaria turonica* primerjamo le s podobno favno v Švici, ki je veljala za posebno sedimentacijsko grebensko področje v Evropi. Za dokončno primerjavo in povezavo bi bilo seveda potrebno poznavanje vse grebenske ali vsaj hidrozojske združbe v naših krednih nahajališčih.

Iz nahajališč v jugozahodni Jugoslaviji sem obdelala tudi nekaj koral. Zanimivo je, da je večina obdelanih vrst podobna hidrozojski skupini Spongiomorphaidea. Mrežasta skeletna zgradba brez izrazitih sept pri rodovih *Microsolena*, *Actinaraea* in *Actinacis* močno spominja na hidrozojsko strukturo, ali natančneje, na strukturo spongiomorfid. Skupino Spongiomorphaidea so prvotno uvrščali h koralam. Prvi je to skupino opisal Frech iz triadnih skladov Salzkammerguta. Ustanovil je posebno družino, za katero je med drugim pomembno, da nima pravih sept (Frech, 1890, 68). Vrste iz te sku-

pine je pozneje opisal Yabe iz jurskih skladov Japonske. Pri opisu »spongiomorfidnih koral« uporabljajo vse strukturne elemente hidrozojev, kakor so vertikalni stebrički, horizontalne lamine, zvezdasta razvrstitev trabekul. Primerja jih celo s hidrozojskim rodом *Actinostroma* (Yabe et Sugiyama, 1931, 103—104). Pozneje je Le Maître (1935) podobne oblike dobila v liadnih skladih Maroka in jih uvrstila k tetrakoram. Kühn (1939) je družino Spongiomorphaidea uvrstil med Hydrozoa, ker se mu zdijo opisane značilnosti bližje hidrozojem kot koralam. To uvrstitev so sprejeli tudi poznejši paleontologi (Hill et Wells, 1956, Flügel, 1959, in drugi). Družina Spongiomorphaidea je danes predstavnik samostojnega hidrozojskega reda Spongiomorphaidea.

Pri podrobni obdelavi fosilnih primerkov iz jugozahodne Jugoslavije sem prišla do naslednjega stališča. Ugotovila sem, da je pri nekaterih primerkih uvrstitev h koralom ali hidrozojem prav težavna. Raziskovalci koral najdejo zadosti gradbenih elementov, da primerek uvrstijo h koralam, po drugi strani pa je struktura medkoralitnega tkiva taka, da je bližja hidrozojski retikularni zgradbi. Take lastnosti ima skupina Spongiomorphaidea, ki združuje nekatere koralne in hidrozojske gradbene elemente in predstavlja takó vmesno skupino med hidrozoji in koralami. Menim, da jo lahko imamo za samostojno skupino fosilnih knidarijev, podobno kot hetetide. Hetetide so mezozojski nasledniki tabulatnih koral, spongiomorfide pa izhajajo po vsej verjetnosti iz rugoznih koral, vendar so v razvoju ubrale samostojno pot vmes med heksakoralami in hidrozoji. Pred dokončno sistematsko uvrstitvijo pa bo treba skupino Spongiomorphaidea še temeljito revidirati. Rod *Cylicopsis*, ki je bil najprej uvrščen k tej skupini (Le Maître, 1935), je danes prištet k pravih hidrozojem, k redu Sphaeractinoidea (Flügel, 1961, 138). Nekatere koralne vrste iz rodov *Microsolena*, *Actinaraea* in *Actinacis* pa bi po vsej verjetnosti upravičeno prišteteli k skupini Spongiomorphaidea.

Večina koralnih rodov iz jugozahodne Jugoslavije je pri nas prvič najdena. Edino nova vrsta *Heliocoenia* (*Decaheliocoenia*) *regularis* je podobna primerku s planine Rumiye v Črni gori, ki ga je Krković imenovala *Helicoenia cf. variabilis*. Drugo koralno favno pa sem mogla primerjati s podobno zgornjejursko favno iz Poljske (*Actinaraea minuta* Roniewicz) ter z jursko in kredno favno iz Francije, Poljske, Italije in Madagaskarja (*Microsolena distefanoi* Prever, *Actinacis martiniana* d'Orbigny in druge).

Zanimivo je, da obdelanih črnogorskih koral ni mogoče primerjati s koralami iz vzhodne Srbije (Kochanský-Devidé, 1951), ker se ne ujemajo niti v enem rodu. Potemtakem moramo v jugozahodni Jugoslaviji in vzhodni Srbiji računati z dvema različnima sedimentacijskima področjema.

SUMMARY

SOME HYDROZOANS AND CORALS FROM JURASSIC AND CRETACEOUS STRATA OF SOUTHWESTERN JUGOSLAVIA

Introduction

Dr. Rajka Radoičić, head of the Department of Micropalaeontology at the Institute for Geological and Geophysical Research in Beograd, has sent me fossil material from Southern Dinarids to be determined, and has allowed me to publish the results of my research. The stratigraphical particulars have also been given to my disposal. In this place I wish to express my thanks to her.

The material is from five localities in Montenegro (Bukovik between Nikšić and Šavnik, Orah northeast of Nikšić, Njegoš Mountain, Vjeternik between Titograd and Kolašin, Kržanje northeast of Titograd), from two localities in Bosnia and Herzegovina (Bjelašnica near Gacko, Kozluk north of Zvornik), and from two localities in western Serbia (Dragačevo, and Skrapež southeast of Kosjerić). These localities are partly of Jurassic, and partly of Cretaceous age.

Five species of hydrozoans have been determined — of which four are new ones — and four species of corals. For two coral colonies the generic determination only could be made. The following species are described in the present study.

Hydrozoans:

Actinostromaria zonata n. sp.

Actinostromaria turonica n. sp.

Hudsonella media Turnšek

Cladocoropsis cretacea n. sp.

Cylicopsis verticalis n. sp.

Corals:

Heliocoenia (*Decaheliocoenia*) *regularis* n. sp.

Microsolena aff. *distefanoi* Prever

Microphyllia sp.

Lochmaeosmilia sp.

Actinaraea minuta Roniewicz

Actinacis martiniana D'Orbigny

Systematic palaeontology

Actinostromaria zonata n. sp.

Pl. 1—5

Derivatio nominis: Species has a zonate reticular structure

Holotypus: Specimen 03851 A, B

Locus typicus: Bukovik between Nikšić and Šavnik, Montenegro

Stratum typicum: Upper Portlandian

Material: two colonies, of which four thin sections have been made.

Diagnosis: *Actinostromaria* with wide concentric belts or latilaminae, without real astrorhizae.

Description: Microstructure is orthogonal. The central dark line is thin, the fibres are not long.

Coenosteum has semi-circular shape. Vertical elements predominate. They are thin, but rather long, usually interrupted only at latilaminae. Transverse elements are short, always only between two vertical elements. These are laminae and rare tabulae. Tabulae are frequently placed in the same level.

The real coenosteal and astrorhizal tubes do not occur. Between skeletal elements there are interspaces of various size and of various shape.

Latilaminae are well expressed. They are not lines or planes, but wide belts, which extend through the whole coenosteum parallel to the surface and parallel to each other. In these latilaminae the skeletal elements are so dense and irregular, that they completely change the orthogonal reticular structure of coenosteum.

Comparison: On the basis of its orthogonal microstructure and orthogonal reticulum the species belongs, without any doubt, to the genus *Actinostromaria*. With its special latilaminar structure it differs from all the species that have been known so far.

With its reticular structure the new species approaches most closely the species *Actinostromaria maxima* from the Valanginian strata in Switzerland (Schnorf, 1960, 740), and the specimen from the Aptian strata in Bulgaria, described by Flügel as *Actinostromaria cantabrica* (Flügel, 1960), but it differs from them in dimensions and in the fact that it has zonate structure.

Milan (1966) has mentioned concentric belts in his new species *A. concentrica*. In this species the reticulum in concentric belts becomes denser only, which can be explained as being due to periodical uniform stagnations in growth, or to the strengthening of the coenosteum. In my new species the reticular structure in latilaminae is also changed which indicates that in certain levels the colony had changed its way of life. Moreover, the skeleton of the new species is thinner than in the species *A. concentrica*, and the interspaces wider than its skeletal elements.

In longitudinal section the new species at first sight resembles also the chaetetida *Varioparietes lamellosus* Schnorf-Steiner (1963), but it differs from the latter in having an orthogonal microstructure, and in its reticulum which is more rectangular.

The appearance of latilaminae with a special reticular structure is an important factor in the growth of the colony, and this justifies its establishment as a new species.

Dimensions: The thickness of vertical elements 0.07—0.13 mm., the thickness of transverse elements 0.03—0.07 mm., the width of interspaces 0.13—0.23 mm., sometimes also up to 0.32 mm. The distance between latilaminae 0.96—1.98 mm., the width of latilaminae 0.32—0.82 mm. In the ordinary reticulum there are 8 to 10 skeletal elements in 2 mm, in latilaminae even up to 20.

Distribution: Both specimens have been found by R. Radoičić at Bukovik, between Nikšić and Šavnik, in Montenegro. They appeared together with *Diceras* sp., and somewhat lower *Clypeina jurassica* was

found. The strata containing this hydrozoon has been placed into the Upper Portlandian. Judging by the great similarity of this new species with the Lower Cretaceous species *Actinostromaria maxima* and *A. cantabrica*, the new Montenegrin species may perhaps also belong to the Lower Cretaceous.

Actinostromaria turonica n. sp.

Pl. 4

Derivatio nominis: the species is named after the Turonian strata, in which it was found.
Holotypus: specimen 07562
Locus typicus: Skrapež, western Serbia
Stratum typicum: Turonian
Material: nine specimens (one polished surface and four thin sections).

Diagnosis: Small rod-like *Actinostromaria* with well expressed transverse laminae. Coenosteum has the shape of a thin little rod with offsets.

Vertical elements are straight and run parallel to the longer axis of the coenosteum and radial from centre outwards. They often stop at transverse laminae. Transverse laminae are frequent and rather thick. Between laminae are also short transverse trabeculae which do not surpass the distance of one interspace.

Coenosteal and astrorhizal tubes do not occur. The whole skeleton is an uniform orthogonal net, characteristic of the genus *Actinostromaria*. In transverse section the reticulum is vermiculate and dotted.

Dimensions: The thickness of vertical elements 0,03–0,05 mm., the thickness of concentric lamellae 0,03, 0,06 mm., the distance between laminae 0,2–0,35 mm., the width of interspaces 0,05–0,1 mm.

Comparison: With the growth and structure of its coenosteum, and with its dimensions the new species resembles most closely the species *Actinostromaria coacta* Schnorf, from the Valanginian strata in Switzerland. The transverse laminae of the new species, however, are better expressed and thicker. With its reticular structure the new species resembles species belonging to the genus *Burgundia*, yet the orthogonal microstructure excludes it from this genus. With its transverse lamellae the new species cannot be compared with any other species of the genus *Actinostromaria*.

Transverse laminae are one of the most important building elements of hydrozoans, therefore a difference in them is sufficient reason to establish a new species.

Distribution: The new species was found by R. Radoičić in the valley of the river Skrapež, southeast of Kosjerić, in western Serbia. According to R. Radoičić the strata containing the hydrozoon belong to the Turonian age.

Cladocoropsis cretacea n. sp.

Pl. 5

Derivatio nominis: the species is named after the Cretaceous strata, in which it occurs.
Holotypus: specimen 07253 d
Locus typicus: Orah, NE of Nikšić, Montenegro
Stratum typicum: Hauterivian
Material: many polished surfaces and 6 thin sections

Diagnosis: *Cladocoropsis* with large coenosteum and with long radial zooidal tubes and vertical elements.

Description: Microstructure is fibrous clinogonal, in some spots indistinct. Coenosteum is rod-like with irregular and numerous offsets. Radial elements are thick, straight or tortuous, without transverse trabeculae. In some places they are joined among themselves. In the skeleton there are radial tubes, which are generally straight and long. In some places two neighbouring tubes join after a short transverse canal. In transverse section the reticulum is vermiculate. The tubes extend uninterruptedly to the external edges of coenosteum, therefore we do not observe axial and peripheral reticula.

Dimensions: The thickness of coenosteal branch 4–8 mm., the width of zooidal tubes 0,13–0,23 mm., the thickness of skeletal elements 0,10–0,20 mm.

Comparison: With the shape of its coenosteum and with its microstructure the new species may be compared with the species *C. mirabilis*. With the size of its coenosteum it stands closer to the species *C. dubertreti*. It differs, however, essentially from both with its rather long straight radial zooidal tubes. These tubes run from the center to the edge of the coenosteum. This is also known in the species *C. lata* (Fenninger et Hötzel, 1965), but in this species the tubes are shorter and winding. The long and parallel tubes of the new species remind us of the genus *Parastromatopora*, especially of the species *P. memorianaumanni* (Yabe et Sugiyama, 1935), but it has no tabulae and transverse lamellae, important characteristics of the genus *Parastromatopora*. For this reason I place it in the genus *Cladocoropsis*.

Distribution: the new species has been found by Radoičić in Hauterivian beds at Orah, northeast of Nikšić, in Montenegro. I have attributed to this species the specimens of thin sections 07253 a-f.

Cylicopsis verticalis n. sp.

Pl. 6; Pl. 7, figs. 1–3

Derivatio nominis: the species is named after its predominant vertical elements.
Holotypus: specimen 03587 A, B, C
Locus typicus: Vjeternik between Titograd and Kolašin, Montenegro
Stratum typicum: the Upper Jurassic limestone
Material: two colonies, of which 5 thin sections have been made (03587 A, B, C, and 03587 a, b).

Diagnosis: *Cylicopsis* with predominant vertical elements, with rare pseudolaminae and large axial astrorhizal tubes.

Description: Microstructure is homogeneous, fine granular. In coenosteum vertical elements predominate, which are slightly winding, but they run uninterruptedly through the whole coenosteum.

Transverse elements are represented by tabulae and rare laminae. Tabulae are very thick, aligned usually in the same level. Thus pseudolaminae develop which are typical of the genus *Cylicopsis*. In this species pseudolamina are very rare. Even more rare are the real laminae, which occur usually only between two neighbouring vertical elements.

There are no real coenosteal tubes, but long interspaces appear between the neighbouring vertical elements.

Particularity of coenosteum are large astrorhizal systems. These are large wide central astrorhizal tubes, from which in several levels astrorhizae proceed under an obtuse angle.

In the transverse section the reticulum is vermiculate, but there are many closed slings. The axial astrorhizal tubes are better visible.

Dimensions: the thickness of vertical elements 0,03—0,05 mm., the thickness of pseudolaminae 0,03—0,045 mm., the width of interspaces 0,045—0,10 mm., the width of the axial astrorhizal tubes 0,33—0,50 mm., the width of astrorhizal canals 0,12—0,15. There are 12 to 15 skeletal elements at a distance of 2 millimetres.

Comparison: granular, homogeneous microstructure and the characteristic reticular structure with pseudolaminae allow us to allocate the new species to the genus *Cylicopsis*. The new species has rare pseudolaminae and predominant vertical elements, it is therefore one of the most radial forms of this genus, and it approaches the genus *Syringostromina*. It thus represents the opposition to the species *Cylicopsis lata*, which has numerous transverse elements and which therefore approaches most closely the genus *Stromatopora* (cf.: Turnšek, 1966, 37, 84).

The new species differs from all so far known species in the shape of its astrorhizal systems. These systems resemble those of the genus *Syringostromina*. Nevertheless I think the appearance of pseudolaminae to be more important for its classification than the shape of astrorhizae, and I place therefore the new species in the genus *Cylicopsis* and not into the genus *Syringostromina*. Neither has the new species any real thin transverse laminae, such as they can be found in the genus *Syringostromina* (cf.: Lecompte, 1952, 14; Fenninger et Hötzel, 1965, 36). Various forms of astrorhizae have already been found in several genera.

Distribution: Both specimens of the new species have been found by R. Radoičić at Vjeternik, between Titograd and Kolašin, in Montenegro, in limestones containing Ellipsactinians. According to Radoičić, these strata belong to the Upper Jurassic, approximately to the Portlandian. In Slovenia the species of the genus *Cylicopsis* have been found in similar associations, that is, together with Ellipsactinians. These finding places are of the Lower Malmian age. In my opinion the finding place in Montenegro could also be placed into the same age, especially since the Ellipsactinidae have also been found in some places in Montenegro in the Lower Malmian (Radoičić, 1964, 1966).

Heliocoenia (Decaheliocoenia) regularis n. sp.

Pl. 8, figs. 1—5

Derivatio nominis: the species is named after the regular arrangement of the septae in its corallites.

Holotypus: specimen 05855

Locus typicus: Bjelašnica, near Gacko, Herzegovina

Stratum typicum: Kimmeridgian

Diagnosis: *H. (Decaheliocoenia)* with dense corallites.

Description: Thorough descriptions and the revision of the genus were made by Roniewicz (1965, 201—210). Our specimen wholly corres-

ponds to the subgenus *Decaheliocoenia*. The corallites have six systems of septae. Septae have double symmetries, the middle septal system is reduced, so that we always get 20 peripheral septae. Six septae reach to the centre. Corallites are frequent, mostly equal, a few only are somewhat smaller and deformed. These have several septae reduced. The distance between two neighbouring centres of calyxes is 1,6—2 mm. The shape of calyxes is round or slightly oval, some are irregular. Columella is oval, flattened. The wall between corallites is sharp, jagged, but there is no other coenosteum between corallites.

Comparison: The new species differs from other species of this subgenus in the greater density of its corallites. Between corallites there is only a sharp line or peritheca. There is no other coenosteum. With this characteristics the new species stands closer to the subgenus *Hexaheliocoenia*, but the number of septae and the symmetry of the new species is characteristic only of the subgenus *Decaheliocoenia*.

The species here described approaches closely the sample from the Rumija Mountain in Montenegro, which has been described by Krković as *Heliocoenia* cf. *varibabilis*. This author has already found that its corallites are denser and that it probably represents a new species (Krković, 1960, 168).

Distribution: Five species of the subgenus *H. (Decaheliocoenia)* have been known, and that from Switzerland, France, Crimea, Poland, Portugal and from Montenegro. They occur everywhere in the Upper Jurassic strata, mostly in those belonging to the Oxfordian and Kimmeridgian. Our new species was found on Bjelašnica, near Gacko, in Herzegovina. Radoičić placed these strata into the Middle Malmian — Kimmeridgian (1966, 15).

Microsolena aff. *distefanoi* Prever

Pl. 9, fig. 1

A thorough description was given by Morycowa (1964, 1966). Our specimen has all the characteristics of the species *M. distefanoi*, only septae are more tortuous. It also resembles Spongiophoidea.

The specimen has been found by Radoičić in Senonian strata, at Kozluk, near Zvornik, in Bosnia (n. 05805).

Microphyllia sp.

Pl. 7, fig. 4

Our specimen (num. 05618) has been found at Kržanje northeast of Titograd, in Montenegro. It is of the Upper Jurassic age.

Lochmaeosmilia sp.

Pl. 8, figs. 4—5

Our specimen has been found on the ridge of the Njegoš Mountain, in Montenegro (num. 07520). Radoičić ascribed it the Oxfordian — Kimmeridgian age.

Actinaraea minuta Roniewicz

Pl. 9, fig. 2

The structure of our specimen corresponds to that of the species *Actinacis minuta*, described by Roniewicz (1966). It may be added that the species of the genus *Actinaraea* are very similar to the hydrozoan group Spongiomorpha, especially to the genus *Spongiomorpha*. Still, the species *Actinaraea minuta* has neither radial pillars, nor concentric lamellae. The structure of corallites in transverse section shows clearly that it does not belong to the astrorhizal systems of hydrozoans, but rather to coral calyxes. The septae between corallites are joined here, while in the astrorhizae they disappear among the vermiculate reticulum. Thus this specimen is a coral with much folded and irregular septae, and in some places with a large peritheca, which at the first sight reminds us of the group Spongiomorpha.

Our specimen of *Actinaraea minuta* was found in the village Planinica, on the Njegos Mountain (num. 07605), in the Middle Jurassic strata.

Actinacis martiniana D'Orbigny

Pl. 9, fig. 3

Our specimen corresponds with the description of the original holotype of D'Orbigny, described by Alloiteau (1958, 178). This species resembles also closely Tornquist's species *Neostroma sumatrensis* (1909, 1118—1123), with the difference that its corallite has a much more regular septal structure.

The specimen (num. D 667) was found at Dragačevo, in western Serbia, in Maastrichtian strata.

Stratigraphical and ecological conclusions

The species of hydrozoans and corals described in the present study represent a new contribution to our knowledge of the reef fauna from Yugoslavia. The study examines individual specimens from various findings and from various stratigraphic horizons, from the Liassic to the Upper Cretaceous strata.

In spite of the small number of examined species, we can find some similarity between the hydrozoan fauna of Southern Dinarids and that from Slovenia. Although we have found some new species in Montenegro, these species actually belong to genera which are widely spread in Slovenia. It is the genera or even the whole association of hydrozoans, that are important heralds for individual areas, as well as for certain stratigraphic horizons. In individual geological periods the whole groups became extinct or new ones appeared. Very few genera only of hydrozoans remained unchanged over a long period. The association in individual geological periods was thus rather stable. We may therefore judge on the basis of one species only of other reef members.

The new findings of the genera *Cladocoropsis*, *Hudsonella*, and *Cylicopsis* in Southern Dinarids may best be compared with hydrozoan fauna

from Slovenia. The genus *Cladocoropsis* has been known for some time already from Montenegro (Radoičić, 1957). This is of all the Mesozoic hydrozoans the most permanent form. The greatest regional extent was reached by the species *C. mirabilis* in the Lower Malmian. Other species are more rare. Under favourable conditions various regions were inhabited by some almost unchanged representatives of the genus *Cladocoropsis* also during the Cretaceous period, but they are less numerous. The species *C. cretacea* from the Lower Cretaceous strata from Montenegro is described here for the first time. This is its only finding place and a few specimens only of this species are known. Recently some other species belonging to the genus *Cladocoropsis* from the Lower Cretaceous have been discovered (Polšak et Milan, 1964, Sartoni et Crescenti, 1962, Buser, direct information), but this fauna has not yet been determined. The coenosteum of our new species is very large, and this confirms my suggestion that the development of the genus *Cladocoropsis* was characterized mainly with the growth of the size of its coenosteum (Turnšek, 1966). In this connection the question arises, how to explain the appearance of the species *Cladocoropsis mirabilis* in Senonian beds near Plitvice that have been mentioned by Polšak et Milan (1965). Macroscopically these forms resemble closely those from the Malmian, but their microstructure seems to be a little different.

The species *Cylicopsis verticalis* appears in Montenegro together with Ellipsactinians, that is in the same association as do other species of this genus in Slovenia. As regards their age, these localities probably agree, since Ellipsactinians have been found in Montenegro also in the Lower Malmian strata (Radoičić, 1964). In the species *Cylicopsis verticalis* vertical elements predominate in the coenosteum, and for this reason this species is one of the most developed among the species belonging to the genus *Cylicopsis*. In comparison with the finding places from Slovenia, findings from Montenegro could be placed into the highest Ellipsactinian horizon, approximately into the Kimmeridgian. Moreover, the new species is very important in palaeontological respect. It represents the form, which comes closest to the genus *Syringostromina* and it completes the line of evolution in the family Stromatoporidae.

Hence it appears that *Cladocoropsis* in Montenegro corresponds to the southern faunistic region in Slovenia, and *Cylicopsis*, in association with Ellipsactinians, may be compared with northern faunistic region in Slovenia. Genus *Hudsonella* is a representative of parastromatoporiid type of hydrozoans which was found in Slovenia in the middle faunistic region. The finding of the species *Hudsonella media* in Montenegro proves, that we speak of various hydrozoan faunistic regions also in southwestern Yugoslavia. We may therefore conclude that at least during the Upper Jurassic there existed the same sedimentation conditions in Montenegro, in south Slovenia, and probably in all the Dinarids. The shallow marine reef fauna which prospered on the submarine reefs, barriers, and shelves had been prevalent. Between them lay deeper areas, in which cephalopods and

other pelagic fauna can be found. It is not necessary that these reefs were continuous over the whole Dinaric region: the hydrozoan can namely be supposed to have propagated by way of a generation of medusae which in our country is nowhere preserved in fossils. The conditions for the growth and development of polyps only had to be the same. Especially the temperature seems to me important for the growth of the hydrozoans: it was most favourable in the Lower Malmian, when reef formations covered the greatest regional extent in the territory of Dinarids.

Something new in the region of Dinarids is the finding of the genus *Actinostromaria* in Cretaceous strata. Cretaceous hydrozoans have not been known from our country so far. For this reason the finding of the species *Actinostromaria turonica* may only be compared with the similar fauna from Switzerland which is known as a special sedimental reef region in Europe. For a definite comparison and connection it would naturally be necessary to know all the reef, or at least the hydrozoan associations from our Cretaceous finding places.

The study deals also with some corals from southwestern Yugoslavia. It is interesting that the majority of the species here discussed resembles the hydrozoans, especially the group Spongiomorphaidea. The reticular skeletal structure without distinct septae of the genera *Microsolena*, *Actinaraea* and *Actinacis* reminds us strongly of the structure of the hydrozoans.

The group Spongiomorphaidea was originally allocated to the Anthozoans. Frech (1890, 68) was the first who described this group from the Triassic beds of Salzkammergut. He established a special family, whose characteristics is among other things the absence of real septae. Some species belonging to this group were later described by Yabe and Sugiyama (1931, 103—104) from the Jurassic strata in Japan. In their descriptions of »spongiomorphoid corals« the authors used all the structural elements of hydrozoans, such as vertical pillars, transverse laminae, stellate arrangement of trabeculae, and others. They compared them even with the hydrozoan genus *Actinostroma*. A little later similar forms from the Liassic strata in Morocco were described by Le Maitre (1935), who placed them in the tetracorals. Kühn (1939) placed the family Spongiomorphidae among the hydrozoans, because he considered that the described characteristics stand nearer to the hydrozoans than to the corals. This classification was accepted by other palaeontologists (Hill et Wells, 1956, Flügel, 1959, and others). The family Spongiomorphidae is now considered as the representative of an independent hydrozoans order Spongiomorphaidea.

In my detailed study of the fossil specimens from southwestern Yugoslavia I have come to the following conclusion. I have found that it is very difficult to allocate some specimens either to the corals or to the hydrozoans. Scholars working on corals have found sufficient quantity of structural elements to classify a specimens among the corals; on the other hand, the structure of the intercorallite tissue is such that it stands closer to the hydrozoan reticular structure. The group Spongiomorphaidea has some coral and hydrozoan structural elements, and it thus represents an intermediate

group between the hydrozoans and the corals. I believe that it could be considered as an independent group of the fossil Cnidaria, similarly as is the case with the Chaetetidae. Chaetetidae are Mesozoic descendants from the tabulate corals, while the Spongiomorphaidea descend most probably from the Rugosa, and had taken in their development their own way between scleractinians and hydrozoans. The group Spongiomorphaidea, however, should be carefully revised before it is definitely placed into the whole system. The genus *Cylicopsis* was originally ascribed to this group (Le Maitre, 1935); today it is placed in the real hydrozoans, into the order Sphaeractinoidea (Flügel, 1961, 138). Some coral species belonging to the genera *Microsolena*, *Actinaraea*, and *Actinacis* could be in all probability with full justification allocated to the Spongiomorphaidea.

The majority of examined coral genera from southwestern Yugoslavia has now been found for the first time in our country. The new species *Heliocoenia* (*Decaheliocoenia*) *regularis* is the only one which resembles the specimen from the Rumija Mountain, in Montenegro, which has been named by Krković *Heliocoenia* cf. *variabilis*. Other coral fauna could be compared with the similar Upper Jurassic fauna from Poland (*Actinaraea minuta*), and with the Jurassic and Cretaceous fauna from France, Poland, Italy, and Madagascar (*Microsolena distefanoi*, *Actinacis martiniana*, and others).

It is interesting that these corals from Montenegro discussed in the present study cannot be compared with those from eastern Serbia (Kochansky-Devidé, 1951), because they do not agree even in a single species. Consequently we must reckon with two different sedimentation regions in southwestern Yugoslavia and in eastern Serbia.

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TABLE — PLATES

Vse fotografije, razen mikrostrukture, so negativni, zato je skelet bel, vmesni prostori pa temni

All the photos, except those of the microstructure, are negatives; the skeleton is therefore white, interspaces dark

Foto — Photo: Carmen Narobé

TABLA — PLATE 1

Sl. 1—4, Fig. 1—4. *Actinostromaria zonata* n. sp.
Bukovik, zgornji portlandij — Upper Portlandian

- 1 podolžni presek, zbrusek — longitudinal thin section, holotip, 03851 A, $\times 4$
 2 prečni presek, zbrusek — transverse thin section, holotip, 03851 B, $\times 4$
 3 podolžni presek, zbrusek — longitudinal thin section, 03851 a, $\times 4$
 4 prečni presek, zbrusek — transverse thin section, 03851 b, $\times 4$

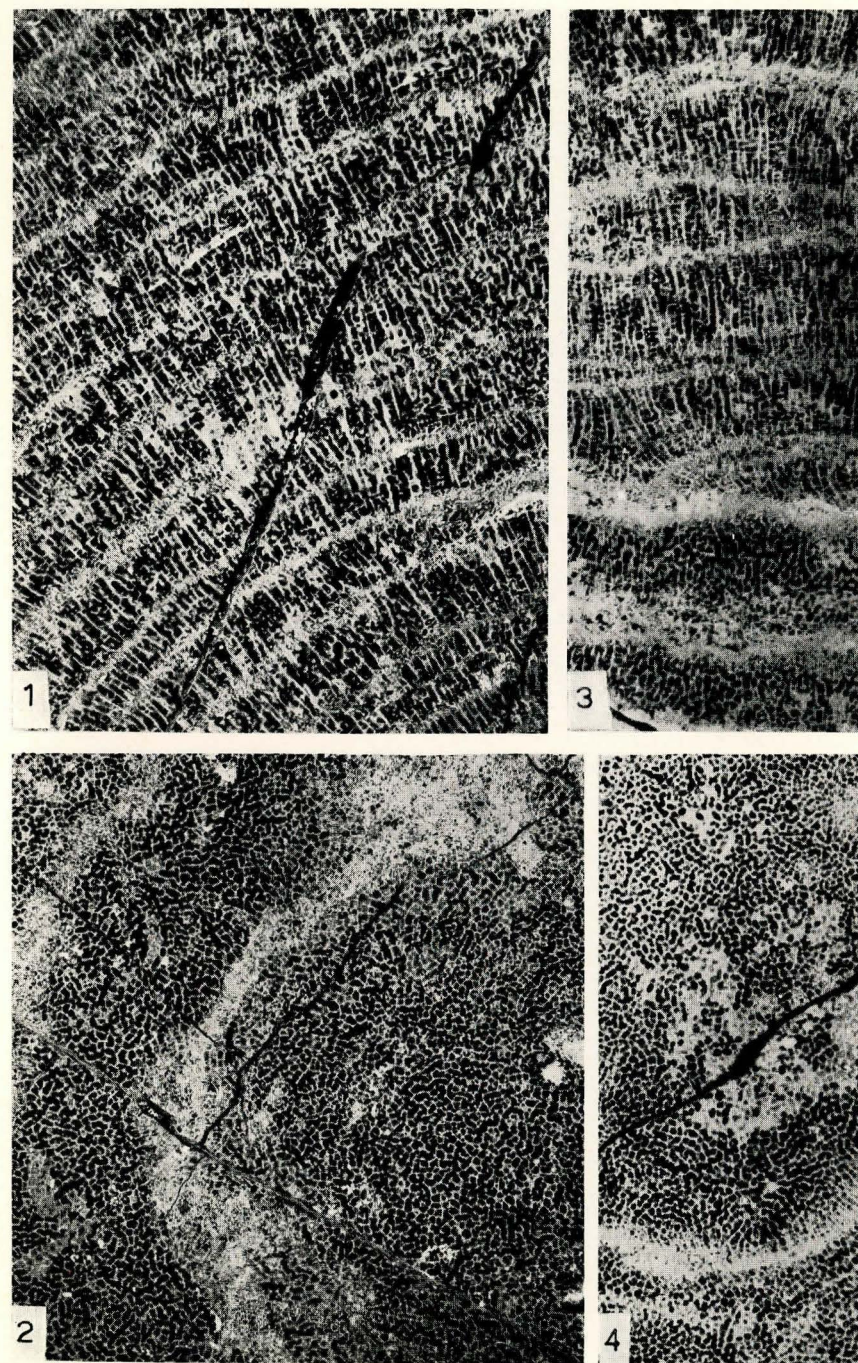


TABLA — PLATE 2

Sl. 1—2, Fig. 1—2. *Actinostromaria zonata* n. sp.
 Bukovik, zgornji portlandij — Upper Portlandian
 1 podolžni presek — longitudinal thin section, holotip, 05851 A, $\times 8$
 2 prečni presek — transverse thin section, holotip, 05851 B, $\times 8$

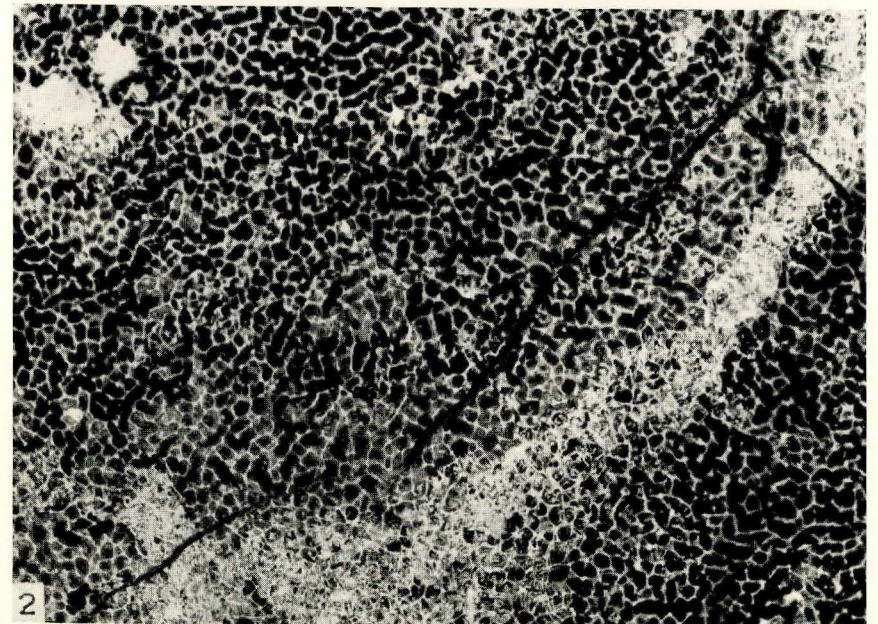
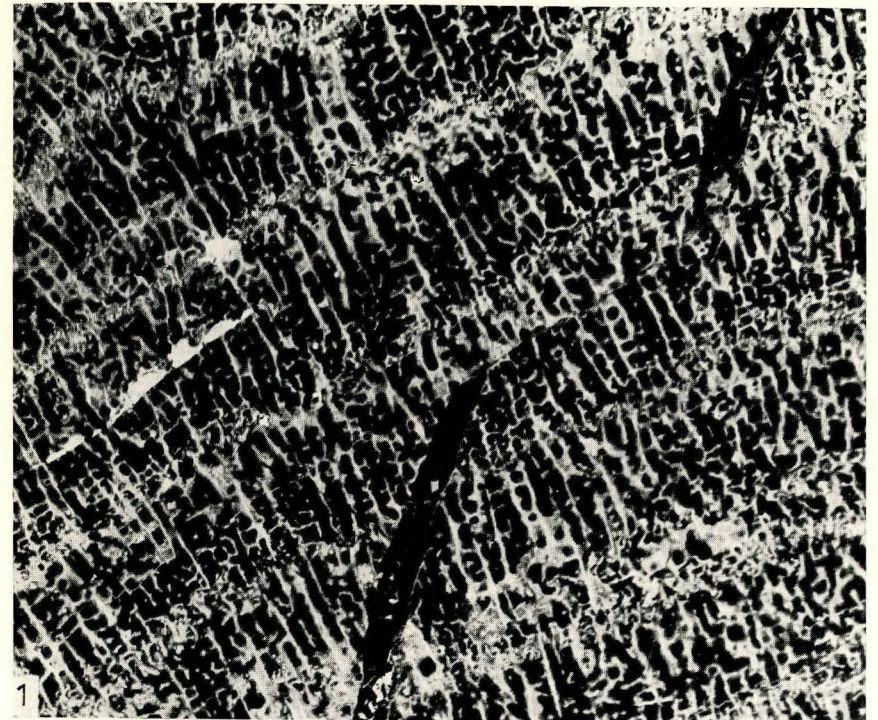
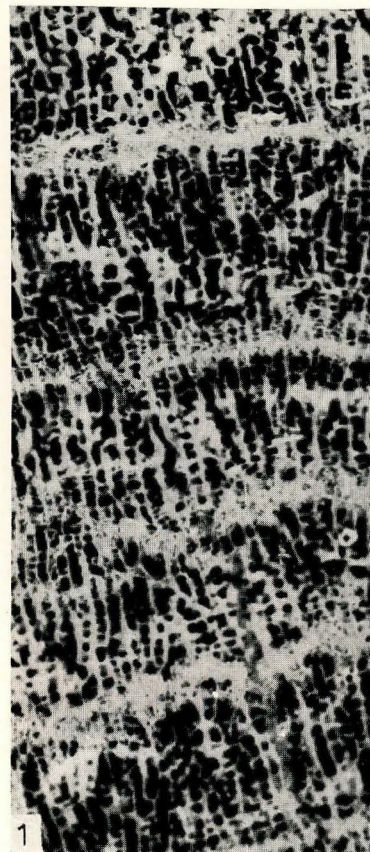


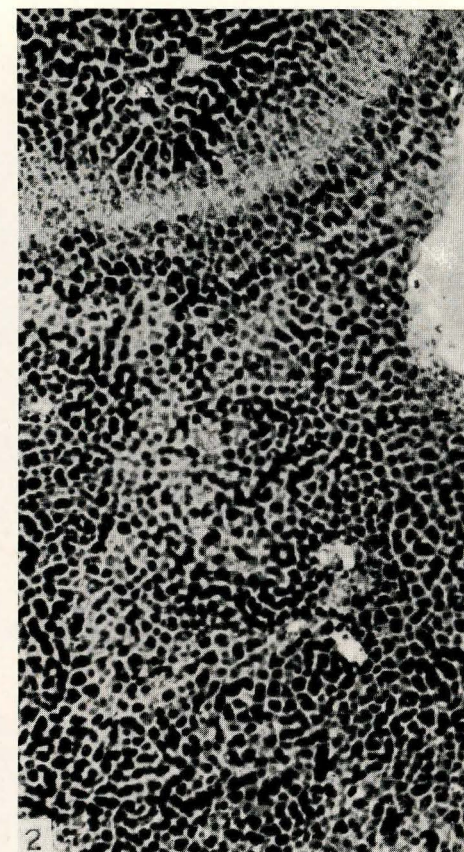
TABLA — PLATE 5

Sl. 1—4, Fig. 1—4. *Actinostromaria zonata*, n. sp.
Bukovik, zgornji portlandij — Upper Portlandian

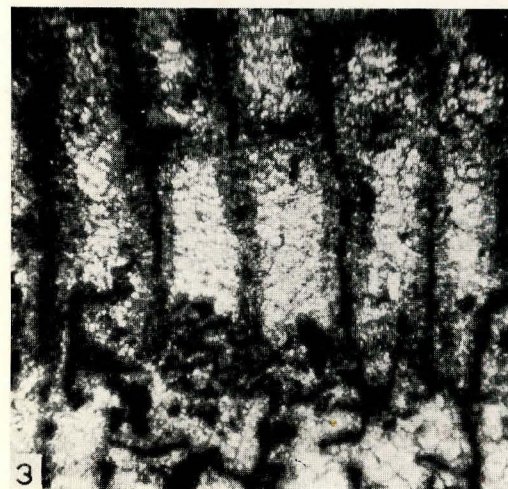
- 1 podolžni presek — longitudinal thin section, 03851 a, $\times 8$
2 prečni presek — transverse thin section, 03851 b, $\times 8$
3 mikrostruktura — microstructure, 03851 A, $\times 55$
4 mikrostruktura — microstructure, 03851 B, $\times 55$



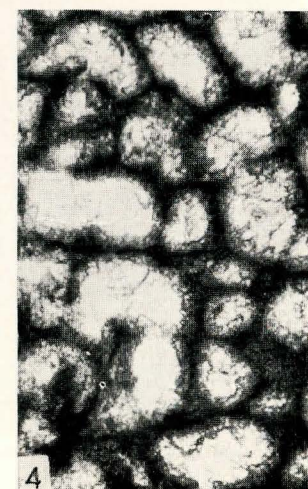
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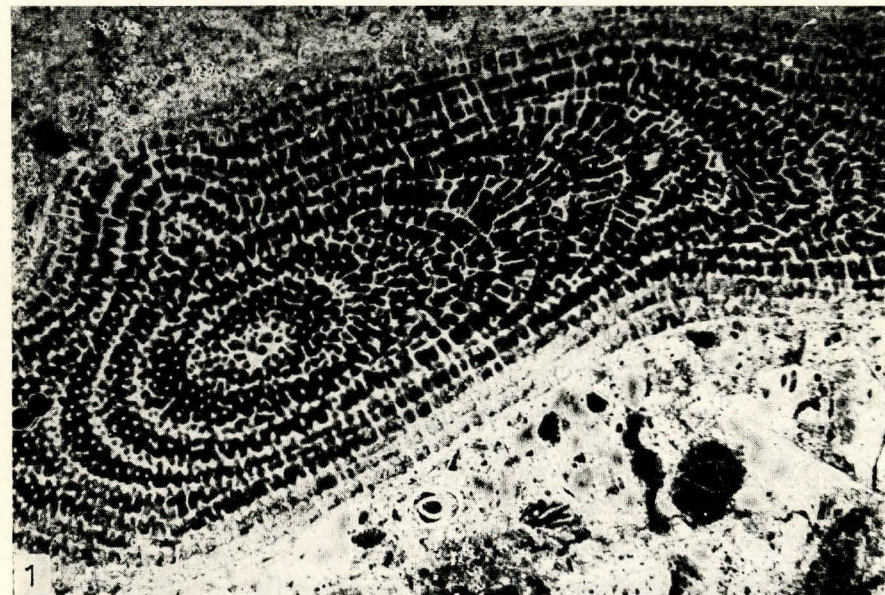


TABLA — PLATE 4

Sl. 1—2, Fig. 1—2. *Actinostromaria turonica* n. sp.
Skrapič, turon — Turonian

1 podolžni (nekoliko poševni) presek — longitudinal (slightly oblique) thin section, holotyp,
07362 a, $\times 8$
2 prečni presek — transverse thin section, holotyp 07362 d, $\times 8$

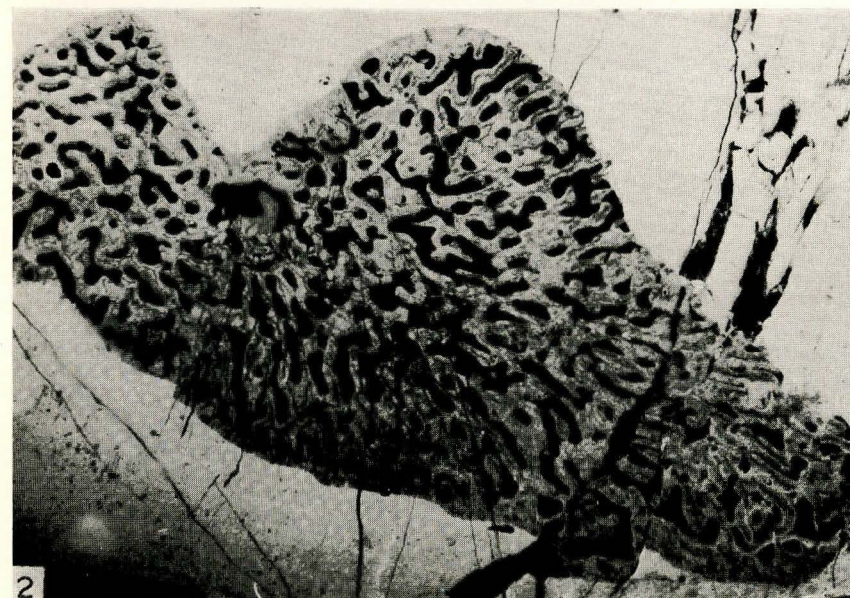
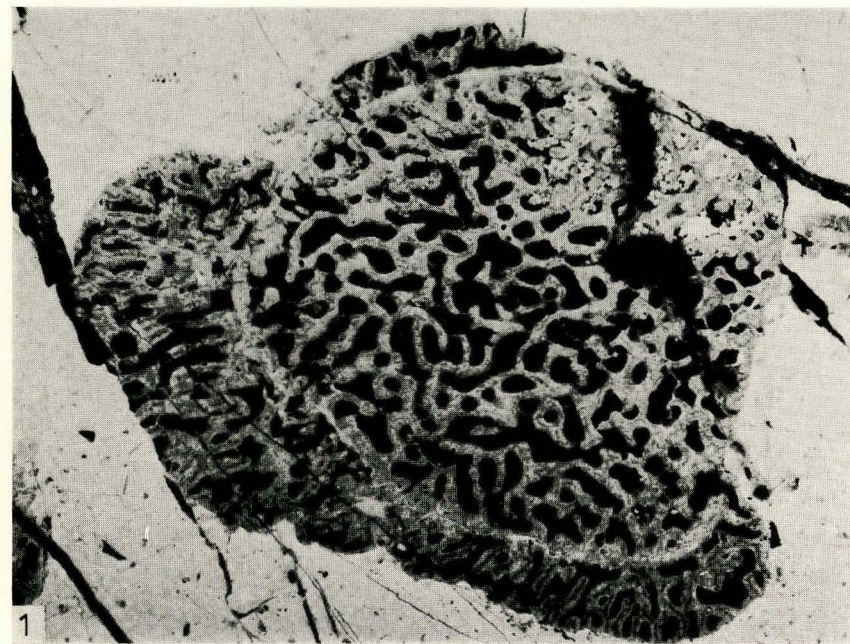


TABLA — PLATE 5

Sl. 1—2, Fig. 1—2. *Cladocoropsis cretacica* n. sp.

Orah, spodnja kreda, hauterivij — Hauterivian

1 prečni in poševni presek cenostilne vejice — transverse and oblique section of the coenosteal branch, 07253 a, $\times 8$

2 podolžni presek — longitudinal thin section, holotip 07253 b, $\times 8$

TABLA — PLATE 6

Sl. 1—2, Fig. 1—2. *Cylicopsis verticalis* n. sp.

Vjeternik, zgornja jura — Upper Jurassic

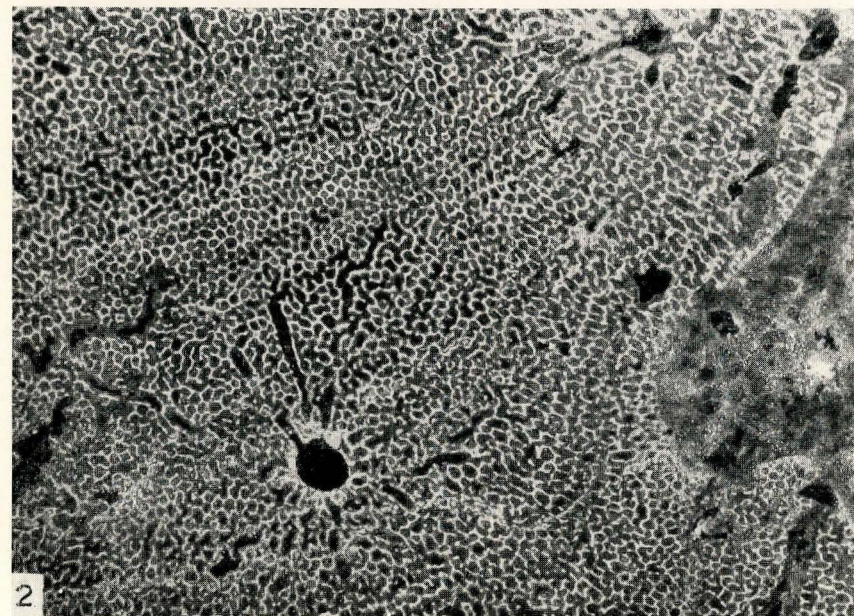
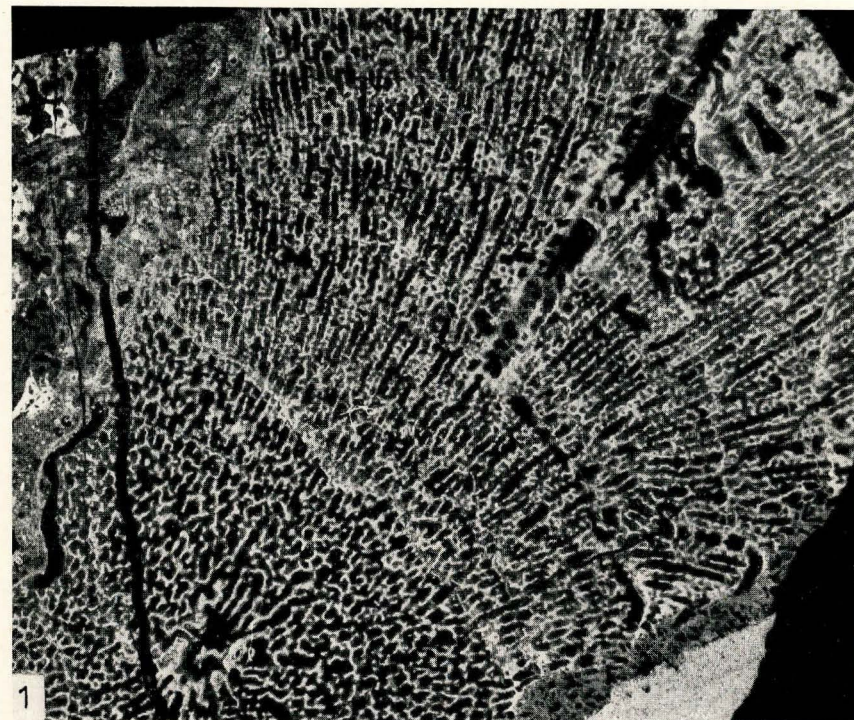
1 podolžni presek — longitudinal thin section, holotip, 05587 A, $\times 8$ 2 prečni presek — transverse thin section, 05587 B, $\times 8$ 

TABLA — PLATE 7

Sl. 1—3, Fig. 1—3. *Cylicopsis verticalis* n. sp.

Vjeternik, zgornja jura — Upper Jurassic

1 podolžni presek — longitudinal thin section, holotip, 05587 B, $\times 4$ 2 prečni presek — transverse thin section, 05587 b, $\times 4$ 3 mikrostruktura — microstructure, holotip, 05587 A, $\times 55$ Sl. 4, Fig. 4. *Microphyllia* sp.

Kržanje, zgornja jura — Upper Jurassic

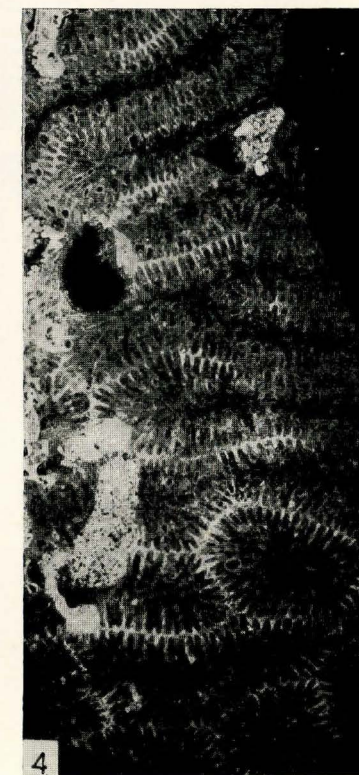
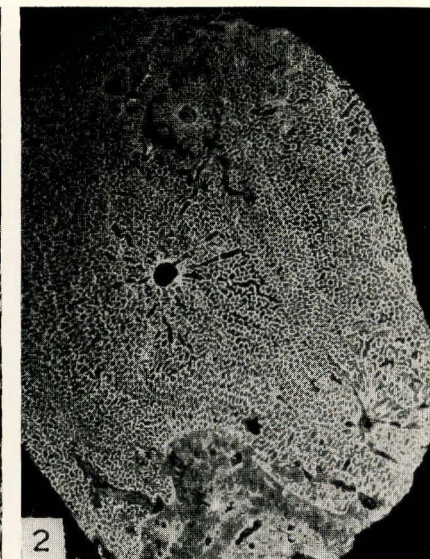
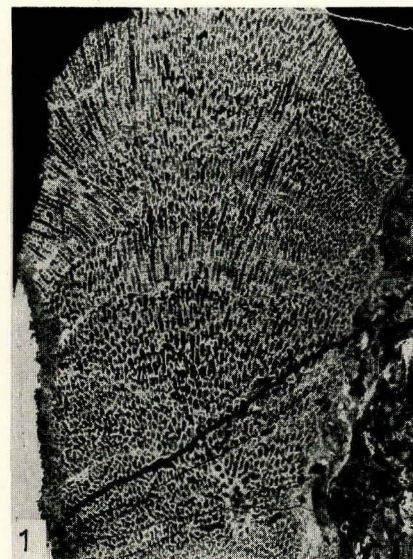
prečni presek — transverse thin section, 05618 a, $\times 4$ 

TABLA — PLATE 8

Sl. 1—5, Fig. 1—5. *Heliocoenia (Decaheliocoenia) regularis* n. sp.

Bjelašnica pri Gackem, kimmeridgij — Kimmeridgian

1 prečni presek — transverse thin section, holotip, 05855 c, $\times 8$
2 podolžni presek — longitudinal thin section, holotip, 05855 a, $\times 8$
3 prečni presek — transverse thin section, 05855 c, $\times 4$ Sl. 4—5, Fig. 4—5. *Lochmaeosmillia* sp.

Planina Njegos, oxfordij-kimmeridgij — Oxfordian-Kimmeridgian

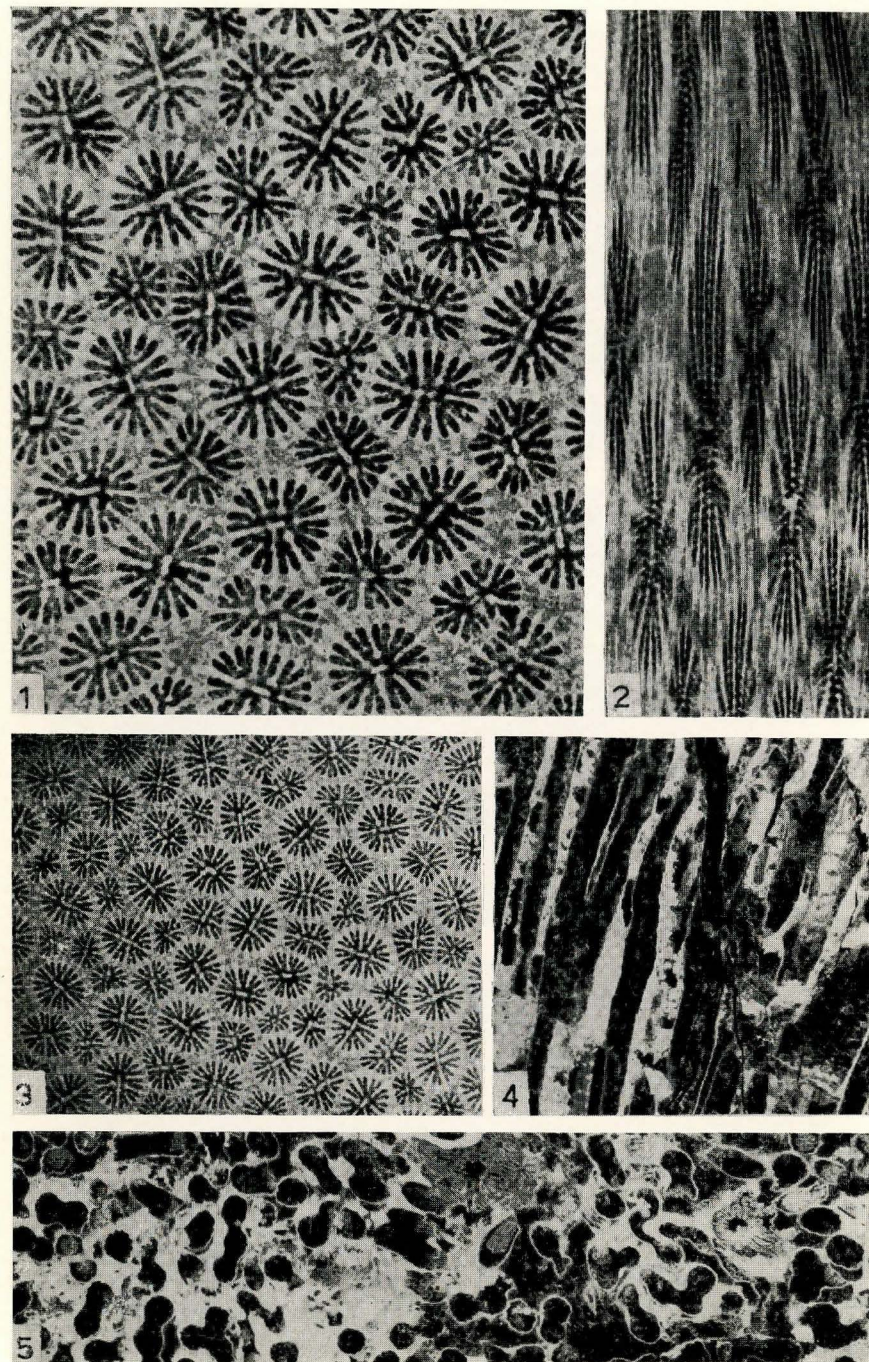
4 podolžni presek — longitudinal thin section, 07520 b, $\times 4$
5 prečni presek — transverse thin section, 07520 a, $\times 4$ 

TABLA — PLATE 9

Sl. 1, Fig. 1. *Microsolena* aff. *distefanoi* Prever
Kozluk, senon — Senonian

prečni presek — transverse section, 05803 b, $\times 4$

Sl. 2, Fig. 2. *Actinaraea minuta* Roniewicz
Planina Njegoš, dogger — Middle Jurassic

prečni in podolžni presek kolonije — transverse and longitudinal section of the colony,
07605 a, $\times 4$

Sl. 3, Fig. 3. *Actinacis martiniana* d'Orbigny
Dragačevo, maastricht — Maastrichtian

prečni presek — transverse thin section, D 667 b, $\times 4$

