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WEST CARPATHIANS ALGAE OF THE GENUS TRIPLOPORELLA STEINMANN, 1880 — APPLICATION TO BARATTOLO'S CLASSIFICATION

(Text-figs. 7, Pls. 8, Tab.1)

Abstract: The paper introduces a floral register of some Dasyclads of the genus *Triploporella* which have been obtained from the limestone-clasts (except the Štramberk Klippe) of various conglomerate formations of the Western Carpathians. Algarum collection includes 6 taxa and 1 parataxon in the following temporal distribution: *Triploporella remesi* — Upper Tithonian? to Lower Berriasian, *T.? neocomiensis* — Berriasian to Lower Valanginian and Barremian, *T. praturloni* — Barremian to Bedoulian, *T.*? cf. *uragiellifórmis* — Barremian to Bedoulian, *T. marsicana* incl. var. *adriatica* — Upper Barremian to Bedoulian, parataxon *Russoella radoiciciae* — Barremian to Bedoulian and *Triploporella apenninica* — Paleocene. Besides a taxonomic descriptions of thalli, shapes and structures of reproductive organs and illustrations of these algae there are presented also basic microfacial and biofacial characteristics of *Triploporella*-bearing limestones (generally peri-reef facies). Finally, some paleobiogeographic aspects on this subject are discussed.

Резюме: В статье приводится список флоры некоторых мутовчатых сифоней рода *Triploporella*, полученных из известняковых обломков (кроме штрамберского утеса) разных конгломератовых формаций Западных Карпат. Коллекция водорослей содержит 6 таксонов и 1 паратаксон в следующем порядке по времени: *Triploporella remesi* — верхний титон? — нижний берриаз, *T.? neocomiensis* — берриаз — нижний валанжин и баррем, *T. praturloni* — баррем — бедульен, *T.*? cf. *uragiellifórmis* — баррем — бедульен, *T. marsicana*, включая разновидность *adriatica* — верхний баррем — бедульен, паратаксон *Russoella radoiciciae* — баррем — бедульен и *Triploporella apenninica* — палеоцен. Кроме таксономических описаний чехлов, форм и структур органов размножения и иллюстраций этих сифональных водорослей приведена также основная микрофациальная и биофациальная характеристика известняков содержащих *Triploporella*. В заключение обсуждаются некоторые палеобиогеографические аспекты этой темы.

Introduction

Genus *Triploporella* STEINMANN, 1880 associates claviform or cylindrical dasycladacean algae with twofold ramification and cladosporous branches. This specific flora represents examples of developed morphogenesis of fossil calcareous algae and that is the reason for them to attract the attention of algological research. Literary references on *Triploporella* Mesozoic and Pa-

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leocene occurrences of the Western Carpathians are connected with two localities. It is, first of all, the type locality of the species *Triploporella remesi* (STEINMANN) in Štramberk (Steinmann, 1903) where it was repeatedly proved and illustrated from by Pia (1927, p. 75, Fig. 57; 1941, Figs. 9—11) and Andrusov (1938, p. 10, Pl. 2, Fig. 2; 1959, p. 153, Tab. 44, Figs. 2, 15). Later on Barattolo (1982b) included the samples of Paleocene dasycladaceans from the Brezovica locality having been determined as *Dactylopora gusici* sp. nov. by Bystrický (1976) into the emended taxon of *Triploporella apenninica* BARETTI. There have been no other occurrence notices from the Western Carpathians region available. However, *Triploporella* thin-section samples have been completed for a long time and preserved in microfacial studies of the authors of this paper who rendered their material for complex registration under the analytical guarantee of the first author (J. S.). For the way of processing was intentionally chosen the inventory list since the synonymy and bibliography of the genus *Triploporella* species is presented in detail in the papers by Bassoullet et al. (1978) and Emberger — Jaffrezo (1975), etc.

The proposed paper is to set a phytoinventory of triploporellas Berriasian (Upper Tithonian?) to Paleocene of the Western Carpathians in which the unifying principle of systematic revaluation of the Štramberk samples, proper species determination of the "Urgonian" group of triploporellas and re-placing of *Dactyloporella gusici* BYSTRICKÝ became taxonomic criteria of Barattolo's classification.

Starting points of Barattolo's classification of the genus Triploporella STEINMANN

Polyvalent and in many aspects ambiguous system of morphological description of *Triploporella* — species has been recently reviewed from the point of view of the type of their reproductive organs (Barattolo, 1980, 1981, 1982 a, b, c). Following this principle the shape and structure of reproductive organs (cyst-containers, non-divided globular corpuscles and the absence of the traces of reproductive organs) give a better possibility for species differentiation of the genus *Triploporella*. Barattolo's classification thus systematizes 15 known species; the base of which is the type of reproductive organs of the pattern species *Triploporella steinmannii (steinmannii - minor - matesina - - decastroi - duplicata - praturloni), Triploporella remesi (remesi - marsicana)* and *Triploporella fraasi (fraasi - karabiensis - uragielliformis - issaënsis - sarda)*. Moreover, the species *Triploporella? neocomiensis* and temporarily *Triploporella apenninica* as well stand off this system.

Inventory

Order *Dasycladales* PASCHER, 1931 emend. FELDMANN, 1938
Family *Dasycladaceae* KÜTZING, 1843 oth. mut. STIZENBERGER, 1860
Sub-family *Dasycladoideae* VALET, 1969

Tribe *Triploporelleae* PIA, 1920 emend. BASSOULLET et al., 1979
Sub-tribe *Triploporellinae* PIA, 1920 emend. BASSOULLET et al., 1979
Genus *Triploporella* STEINMANN, 1880 emend. BASSOULLET et al. 1978, emend. BARATTOLO, 1981

Triploporellas from the Štramberk limestones

Triploporella remesi (STEINMANN, 1903)
(Text-fig. 1; Pl. 1, Figs. 1—4)

Triploporella-occurrences in the Štramberk Limestones was verified only on fragmentary samples. Only several oblique whorly sections show a greater diagnostic value. Primary branches packed into regular verticils show characteristic wine-skin shapes and communicate with the central stem through funnel-shaped narrowings. Their number in whorls has been stated to about 45—55. Reproductive organs are of cladosporate type; each primary branch bears 2—5 globular sporangial corpuscles (reduction of the amount by oblique section). Reproductive organs are calcified and do not show any marks of internal cyst-division. In numerous tangential sections primary branches show subrectangular shapes and alternating position in neighbouring whorls. The tufts of the secondary branches run out from the distal parts of primary branches usually in the number of four hairs. Strong calcification is typical namely in the surrouinding of the axial cavity. Calcitic walls of the primary branches are rather stout, mostly plane and only slightly corrugated. The oblique sections under study suggest spacious central stem.

Remark: The given description of triploporellas from the Štramberk Limestones corresponds with taxonomic nature of the species *Triploporella*

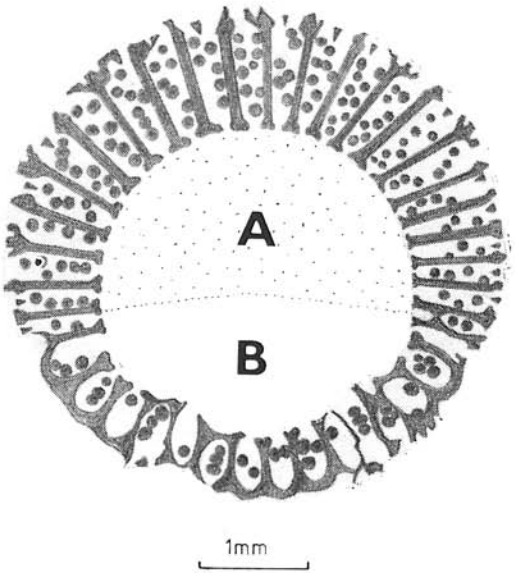


Fig. 1. Sub-transversal section through the thallus *Triploporella remesi* (STEINMANN, 1903).
A. Hypothetical reconstruction.
B. Real whorly section; stout primary branches packed into regular whorl, characteristic wine-skin shapes of primary branches, communication of primary branches with axial cavity through funnel-shaped narrowings, cladosporate position of non-subdivided spores, secondary branches; Štramberk locality.

Table 1

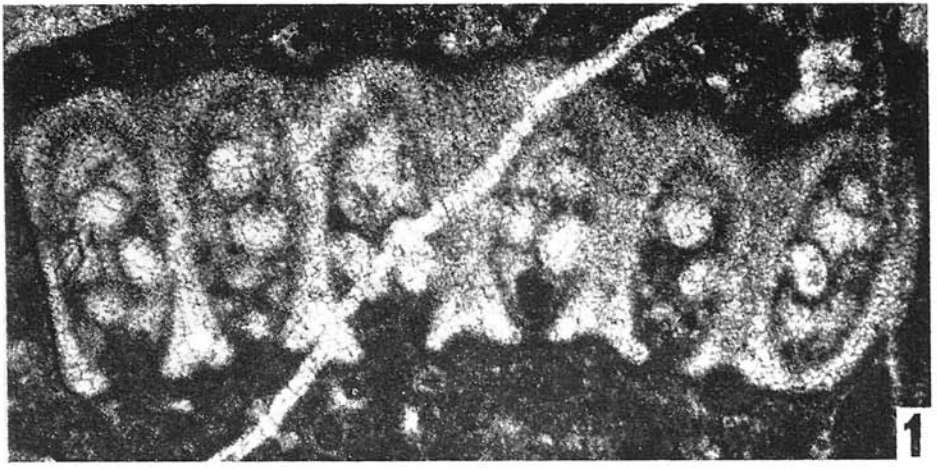
Values of the most significant biometrical parameters (in mm)

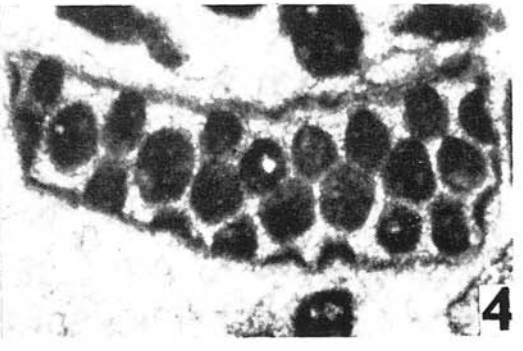
	Triploporella remesi	*Triploporella? neocomiensis*	*Triploporella praturloni*
L = length of the skeleton	—	approx. 3.04	10.25 — 10.31
d = inner diameter of the skeleton	approx. 3.58 — 4.05	0.88 — 0.95	3.08 — 4.40
D = outer diameter of the skeleton	approx. 4.36 — 4.89	1.09 — 1.30	5.35 — 6.56
w = number of pores in a whorl	approx. 45 — 55	—	61 — 68
p'v = vertical width of the primary pore	0.121 — 0.160	0.17 — 0.22	0.281 — 0.308
p'_w = whorly width of the primary pore	0.137 — 0.178	—	0.166 — 0.260
h = height between the verticils	0.19 — 0.22	0.84 — 1.01	0.320 — 0.341
l' = lenght of primary pores	0.424 — 0.450	—	1.02 — 1.13
l'' = length of secondary pores	0.09 — 0.12	—	0.12 — 0.19
p'' = width of secondary pores	0.03 — 0.07	0.16 — 0.17	0.10 — 0.15
D/d = ratio between the outer and inner diameter of the skeleton	approx. 1.2	1.2 — 1.3	1.4 — 1.7
(D —d) : 2 = thickness of the calcification	approx. 0.4	0.11 — 0.16	1.1 — 1.2
a'xa'' = equatorial and axial diameters of the cyst-containers or spores	0.08 — 0.11	—	0.14 — 0.15 × 0.10 — 0.11
c_i = diameter of cysts	—	—	0.04 — 0.06

Triploporella marsicana	*Triploporella? uragielliformis*	*Triploporella apeninnica*	*Russoella radoiciciae*
—	—	6.61By	—
1.04 — 1.57	0.46 — 0.50	0.48 — 0.75By	—
2.58 — 3.19	0.98 — 1.10	1.25 — 3.00By	—
30 — 39	20 — 22	14 — 28	—
0.17 — 0.28	approx. 0.10	0.144 — 0.159	—
0.16 — 0.28	0.09 — 0.11	0.117 — 0.281By	—
approx. 0.20	0.07 — 0.11	0.277 — 0.304By	—
0.64 — 0.89	0.16 — 0.18	0.41 — 1.20	—
—	—	—	—
—	—	—	—
2.0 — 2.4	approx. 2.0	2.6 — 4.0	—
0.8 — 1.3	approx. 0.3	0.4 — 1.1	—
0.06 — 0.09	—	0.12 — 0.18 × 0.6 — 0.13	0.08 — 0.13 × 0.06 — 0.08
—	—	0.03 — 0.08	0.03 — 0.04

Values with the index By are taken from the paper by Bystrický (1976).

Plate 1





remesi (STEINMANN). This morphospecific valuation is confirmed also by the structure of their reproductive organs corresponding to those of the *Triploporella remesi* group (sensu Barattolo, 1980).

Accompanying dasycladacean algae: *Campbelliella striata* (CAROZZI), *Linoporella? capriotica* (OPPENHEIM), *Neoteutloporella socialis* (PRATURLON), *Pseudoepimastopora? jurassica* ENDO, *Pseudoepimastopora cretacea* DRAGASTAN, *Salpingoporella pygmaea* (GÜMBEL), *Salpingoporella* sp., *Clypeina jurassica* FAVRE, *Clypeina? solkani* CONRAD et RADOIČIĆ, *Neomeris?* sp.

Type of microfacies: coralgal bindstones; bioclastic lime packestones- wackestones.

Biostratigraphic markers: *Calpionella alpina* / *Protopeneroplis trochangulata.*

Age: Upper Tithonian? to Lower Berriasian.

Occurrences: Štramberk — Kotouč quarry, Zámek quarry, Jurův kámen Stone (Silesian unit, Outer Flysch Carpathians)

Triploporellas from Lower Cretaceous limestones

Triploporella? neocomiensis RADOIČIĆ, 1963
(Text-figs. 3b, c; Pl. 7, Figs. 1—10)

Medium-sized whorled thallus with a broad axial canal and with articulation of the calcareous sleeve. In the whorls two orders of ramification can be distinguished. Globular primary branches slightly compressed laterally in proximal parts of the whorls are clusterly ramified into narrower secondary branches (secondary ramification appears in the oblique section through distal part of the lowermost whorl in Text-fig. 3b, Pl. 7, Fig. 1). Fragility of the calcareous skeletons causes dissociation of the secondary branch tassels into segments which show elongated star-like and dishevelled shapes in transversal sections. These types of sections were detected in a high amount in one pebble of „Urgonian" limestone in the Považský Hrad-Castle locality. A corresponding way of dissociation of secondary branche tufts of *Triploporella? neocomiensis* has been illustrated also by Chiocchini et Mancinelli (1979 — Pl. III., Fig. 4, Pl. IV., Fig. 2) and can be also derived from the original illustrations by Radoičić, 1963 (see Fig. 3a in the text). Star-like segments of the secondary branches were also observed near the above depicted whole thallus of *Triploporella? neocomiensis* (Pl. 7, Fig. 1a).

Plate 1

Figs. 1—4. *Triploporella remesi* (STEINMANN, 1903), Štramberk reef complex (Outer Western Carpathians), Upper Tithonian — Lower Berriasian.

Fig. 1. - subtransversal section; Jurův kámen Stone locality, thin sec. n_0 KV 863, magnif. 83 ×; Fig. 2. - whorly section; Zámek quarry locality, thin sec. n_0 ZV 46, magnif. 64 ×; Fig. 3. - fragment of the longitudinal section; Zámek quarry locality, thin sec. n_0 ZV 46, magnif. 46 ×; Fig. 4. - tangential section; Kotouč quarry locality, thin sec. n_0 KV 173, magnif. 45 ×.

Remark: According to Barattolo (1980) the species *Triploporella? neocomiensis* RADOIČIĆ is an attribute of another genus and as such it was not involved into the group *Triploporella*-classification.

Accompanying dasycladacean algae: *Salpingoporella* cf. *melitae* RADOIČIĆ.

Type of microfacies: algal-foraminiferal rudstones (reefal rudites).

Biostratigraphic markers: *Protopeneroplis trochangulata* / *Anchispirocyclina lusitanica.*

Age: Berriasian—Lower Valanginian.

Occurrences: Milovice (pebble from conglomerates of the Ždánice—Hustopeče Formation, Ždánice Unit of the Outer Flysch Carpathians). In numerous dissociated fragments it was detected also in the pebble from Cenomanian—Turonian conglomerates of the Klape Unit of the Klippen Belt in the quarry under the Považský Hrad-Castle (for data to stratigraphic place and biofacies of these limestones see *Russoella radoiciciae* description).

Triploporellas from limestones of the "Urgonian facies"

Triploporella praturloni BARATTOLO, 1982
(Text-fig. 4; Pl. 2, Pl. 3, Pl. 4, Figs. 1—3, Pl. 5, Figs. 1—3)

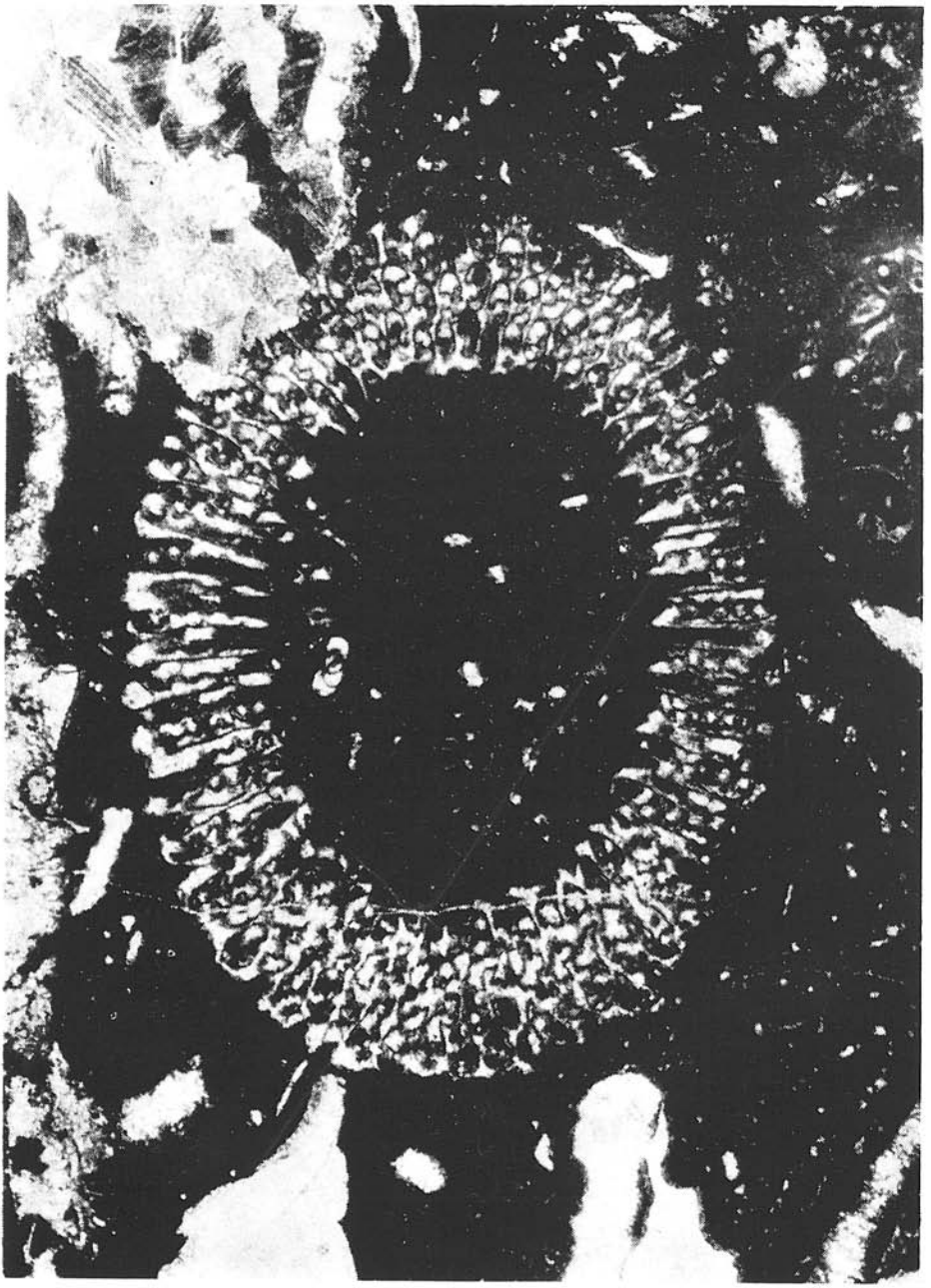
Large-sized claviform thalli bore densely set verticils of primary branches. Primary branches are generally club-shaped, distally widened and alternating in successive whorls. In tangential sections through proximal parts of the whorls they show subrectangular shapes while in distal hemisphere sections of the whorls they are rather eliptic and compressed laterally. The inclination of primary branches changes from more or less perpendicular arrangement in the lower parts of thalli to vertical orientation in subspherical heads. The inner margins of skeletons show denticulation owing to the entrance of the primary branch bases into the central stem. Calcitic walls of primary branches are thin, corrugated and corroded. Primary branches are stuffed with spores of reproductive organs showing structures of divided cyst-containers. Equatorial types of these structures more often appear in longitudinal sections of thalli while the axial ones prevail in whorly sections. A portion of spores, however, display homogeneous structures which were completelly soaked in calcification. Cyst-containers are arranged parallel to the equatorial plane of the whorls in rows fixed on the lateral walls of primary branches. Secondary branches grow in 3 — member tufts on the distal parts of primary branches and because of insufficient calcification can be identified only vaguely.

Remark: Systematic relevance of the described triploporellas is limited by cyst character of their reproductive organs. From the known cystiform

Plate 2

Subtransversal section through the thallus *Triploporella praturloni* BARATTOLO, 1982, pebble from Upper Cretaceous conglomerates of the Klippen Belt, Barremian—Bedoulian; Kotrčiná Lúčka locality, thin sec. n_0 13 605B, magnif. 13 ×.

Plate 2



Triploporella-species the closest analogies are evidently to the taxon of *Triploporella praturloni*, although in comparison with a typical series of its samples from Central Apennines (Praturlon, 1964; Barattolo, 1982a) our samples are bigger namely as to the parameters L — D — d, have a higher number of primary branches per whorl (w = 61—68) and more spacious central stem relative to calcite cover which results in lowering parameter values D/d and (D — d): 2. These size differences represent a rather considerable deviation from sizes given for *Triploporella praturloni*, but for the present they are not considered a critical deviation from its inner-species variability tolerance which would have to be considered at establishing a new taxon.

The species *Triploporella praturloni* was determined by Barattolo (1982a) as an emendated subspecies of *Triploporella fraasi* STEINMANN var. *apenninica* BARETTI in Praturlon, 1964. On the contrary, Barattolo (1982c) established a new taxon of *Triploporella steinmannii* for Mexican species of *Triploporella fraasi* STEINMANN which orginally Praturlon (1964) considered close forms to the variety *apenninica*. If our samples compared to the species *Triploporella steinmannii*, the latter shows more plane and thicker walls of primary branches, stronger calcification around the central siphon and marked narrowing of the proximal ends of primary branches and its reproductive organs are not fixed in the lateral walls of primary branches. In relation to other cystiform species of *Triploporella decastroi* BARATTOLO and *T. matesina* BARATTOLO they show more considerable differences which at the former consist in cyst-container deposition (often outside of the primary branches) and at the latter in thallus shape itself (cylindrical and not claviform). More analogical marks are brought by comparison of our specimens of *Triploporella praturloni* with the species *Triploporella duplicata* (SOKAČ et NIKLER) as the criteria of their species independence are based mostly on size differences (cf. Barattolo, 1982a).

Accompanying dasycladacean algae: *Likanella? danilovae* RADOIČIĆ, *Triploporella*? cf. *uragielliformis* CONRAD et PEYBERNÈS, *Helioporella* cf. *cylindrica* SOKAČ et NIKLER, *Cylindroporella benizarensis* FOURCADE, JEREZ MIR, RODRIGUEZ et JAFFREZO, *Neomeris pfenderae* KONISHI et EPIS.

Type of microfacies: algal — foraminiferal wackestones.

Biostratigraphic markers: *Cuneolina* — *Miliolidae* biofacies; without considerable criterion fossils.

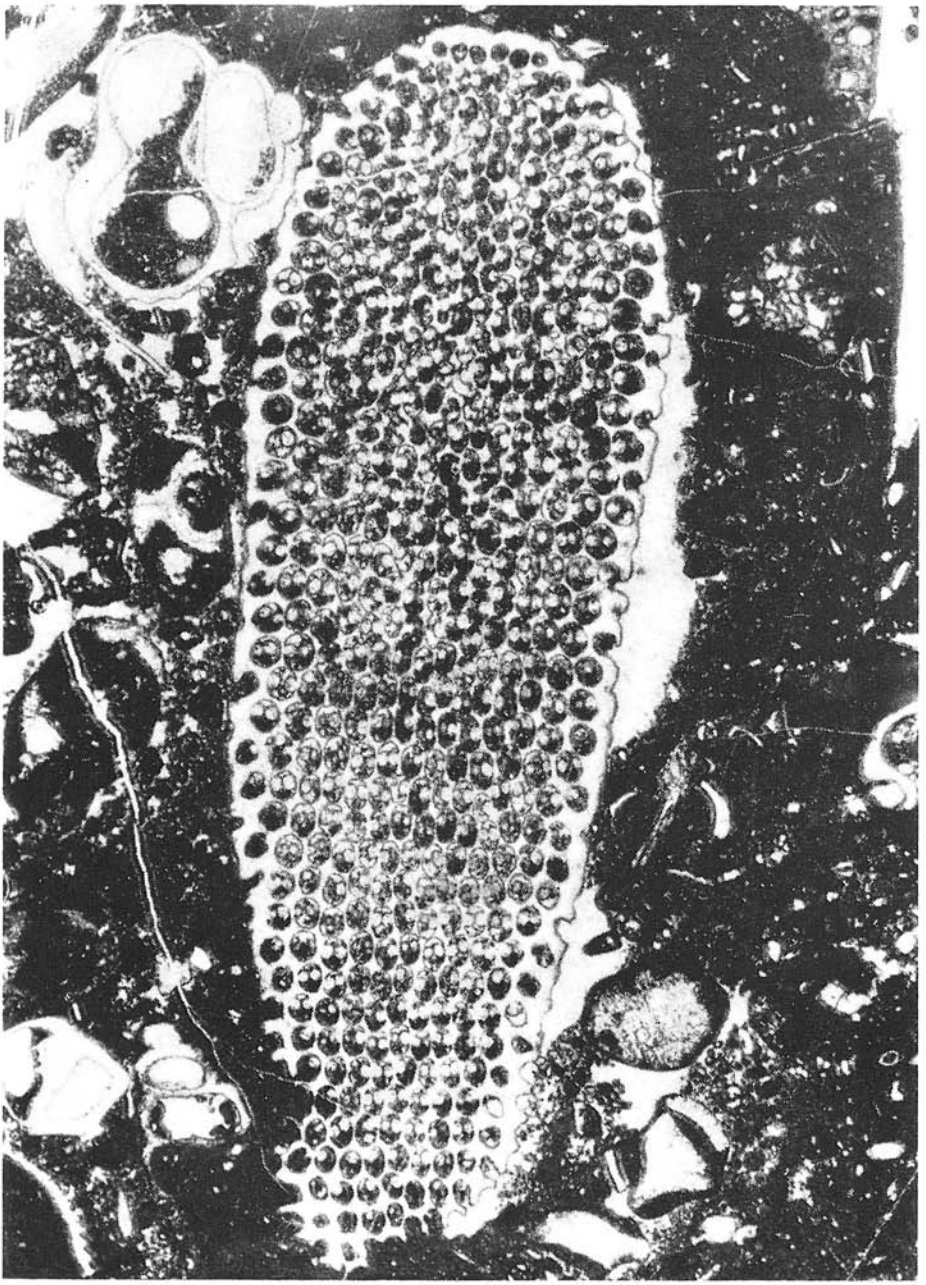
Age: Barremian—Bedoulian.

Occurrences: The matter is a valuable find in a pebble of cream biomicritic limestone from the Upper Cretaceous conglomerates of the Klippen Belt (Kotrčiná Lúčka locality).

Plate 3

Tangential section through the thallus *Triploporella praturloni* BARATTOLO, 1982, pebble from Upper Cretaceous conglomerates of the Klippen Belt, Barremian—Bedoulian; Kotrčiná Lúčka locality, thin sec. n_0 13 605A, magnif. 11 ×.

Plate 3



Triploporella? cf. *uragielliformis* CONRAD et PEYBERNÈS
(Text-fig. 6; Pl. 8, Fig. 2)

Rather elongated thalli with inconclusive *Triploporella*-type of branches. Primary branches regularly arranged are gently inclined to central stem and show a tight insertion of neighbouring whorls. They are pear-shaped and with central stem they communicate through thick pores. The stipe and inserted bases of whorls are not calcified which causes denticulation of the inner margin of central stem. It is not possible to give the exact number of secondary branches and way of ramification. Reproductive organs in primary branches were not observed.

Remark: Species *Triploporella? uragielliformis* was established by CONRAD et PEYBERNÈS (1976) on the basis of its similarity to thalli shapes and branch morphology of the genus *Triploporella*. Generic attribution of this species to *Triploporella* is questionable since they offer certain analogies to other genera of the sub-tribe *Triploporellinae* (e. g. *Trinocladus*, *Montenegrella*). Considering the absence of reproductive organs Barattolo (1980) classed the species *Triploporella? uragielliformis* with the species of the *Triploporella fraasi* group.

Accompanying dasycladaceans algae: *Triploporella praturloni* BARATTOLO, *Likanella? danilovae* RADOIČIĆ, *Helioporella* cf. *cylindrica* SOKAČ et NIKLER, *Cylindroporella benizarensis* FOURCADE, JEREZ MIR, RODRIGUEZ et JAFFREZO, *Neomeris pfenderae* KONISHI et EPIS.

Biostratigraphic markers: *Cuneolina* — *Miliolidae* biofacies; without considerable criterion fossils.

Age: Barremian — Bedoulian.

Occurrences: Kotrčiná Lúčka (pebble from Upper Cretaceous conglomerates of the Kysuce — Pieniny Unit; Klippen Belt.)

Triploporella marsicana PRATURLON, 1964
(Text-fig. 2, Pl. 6, Fig. 1; aff. var. *adriatica* Pl. 6, Figs. 2—7)

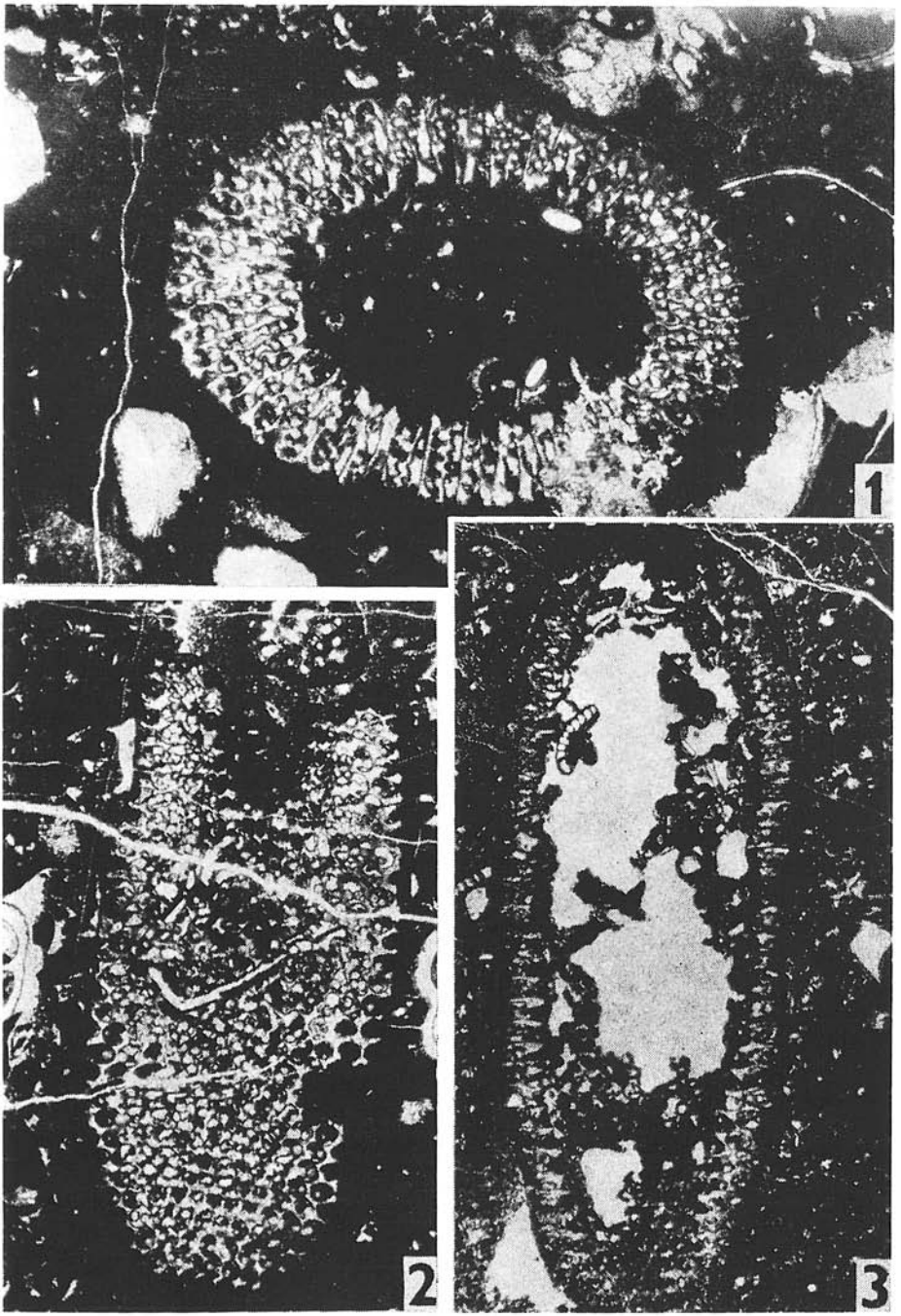
Series of thalli showing rather wide variability of structural patterns of *Triploporella marsicana* PRATURLON. The basic morphological type is cylindrical thallus the central stem of which occupies about 1/2 of the outer diameter (Text-fig. 2, Pl. 6, Fig. 1). Its outer surface is sharply delineated while the inner margin is denticulated. Gradual widening along the length is a characteristic feature of primary branches. They are not eroded and in tangential sections have oval shapes and alternating position in neighbouring whorls.

Plate 4

Figs. 1—3. *Triploporella praturloni* BARATTOLO, 1982, pebble from Upper Cretaceous conglomerates of the Klippen Belt, Barremian—Bedoulian.

Fig. 1. - subtransversal section; Kotrčiná Lúčka locality, thin sec. n_o 13 605C, magnif. 9 ×; Fig. 2. - tangential — oblique section; Kotrčiná Lúčka locality, thin sec. n_o 13 605A, magnif. 9 ×; Fig. 3. - longitudinal section; Kotrčiná Lúčka locality, thin sec. n_o 13 605D, magnif. 7 ×.

Plate 4



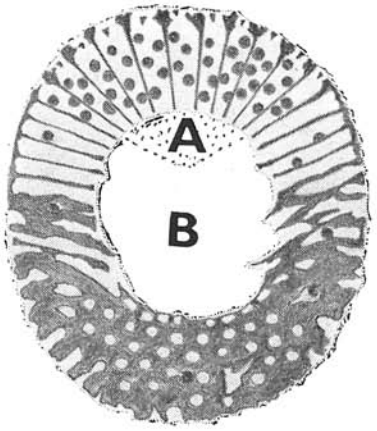


Fig. 2. Oblique section through the thallus *Triploporella marsicana* PRATURLON, 1964.
A. Hypothetical reconstruction.
B. Real oblique section; inner margin denticulation, alternative position of primary branches in neighbouring whorls, occasional occurrences of reproductive organs in hollow spaces of primary branches, the structure of reproductive organs without traces of subdivision, disappearance of the second order ramification: Vrtižer locality.

Only scarcely there were observed small spores situated in hollow spaces of primary branches in hinted lateral fixation on their walls.

The majority of the series of investigated sections show disappearance of secondary branches (cf. Praturlon, 1964) which obscures the main identifying mark of triploporellas and the samples acquire generic features of *Macroporella* (form *Neomacroporella cretacica* CRESCENTI, 1964 syn. *Triploporella marsicana* — PRATURLON, 1966, BASSOULLET et al. 1978). Another case are thalli with more spaceous axial cavity and implication of distal swelling of primary branches suggesting vesiculiferous type (Pl. 6, Fig. 5). These forms are close to the sub-species of *Triploporella marsicana* var. *adriatica* SOKAČ et NIKLER, 1975.

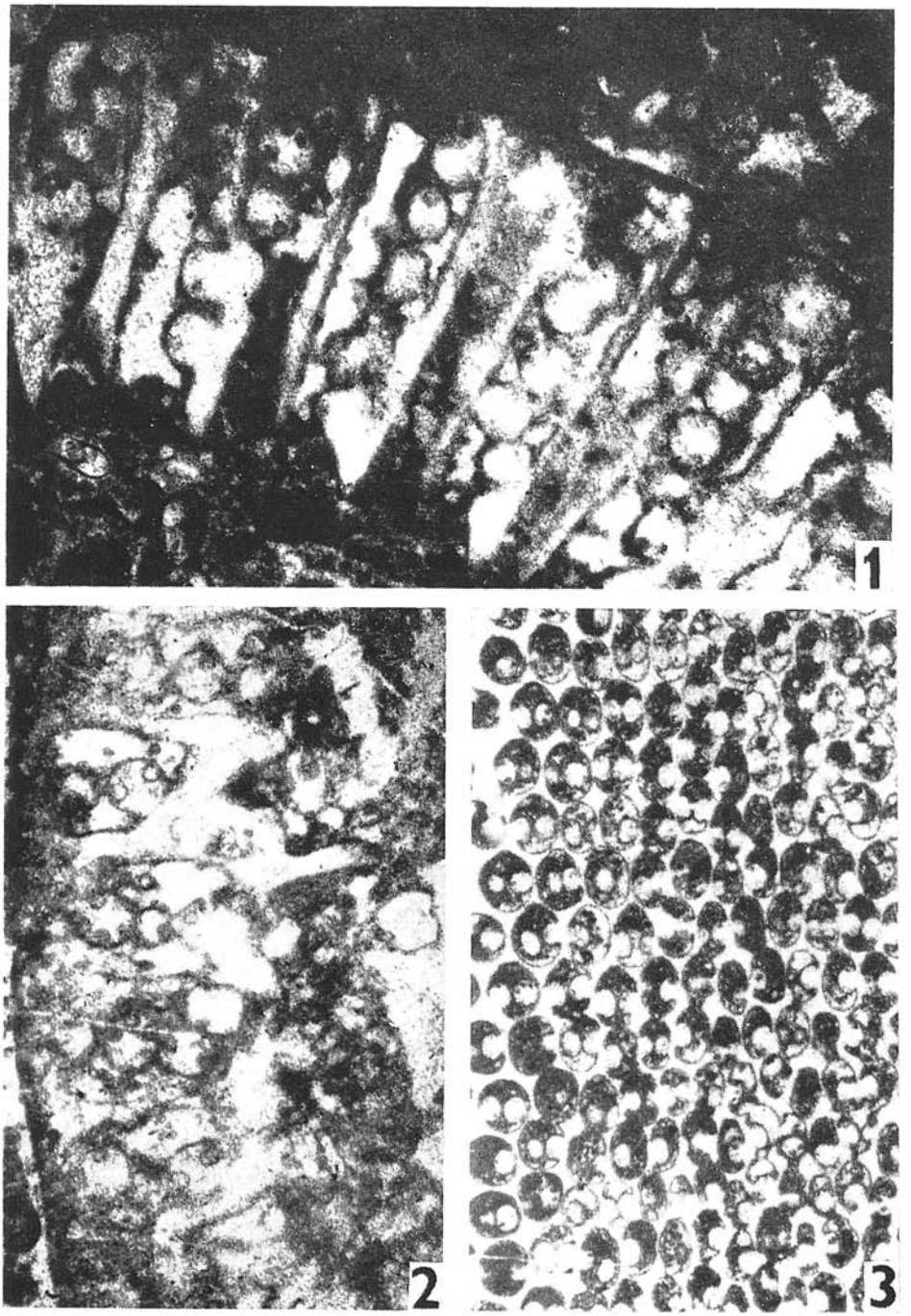
Remark: According to the type of reproductive organs Barattolo (1980) placed the species *Triploporella marsicana* PRATURLON with the species of the *Triploporella remesi* group. Our comparison of *Triploporella marsicana* with new demonstrations of topotypes of *Triploporella remesi* from Štramberk confirms identical nature of reproductive organs of both the species. Their reproductive organs are globular corpuscles not showing any visible traces of internal subdivision.

Plate 5

Figs. 1—3. *Triploporella praturloni* BARATTOLO, 1982, pebble from Upper Cretaceous conglomerates of the Klippen Belt, Barremian—Bedoulian.

Fig. 1. - detail of primary branches stuffed with spores of reproductive organs showing structures of divided cyst-containers, subtransversal section; Kotrčiná Lúčka locality, thin sec. n_o 13 605C, magnif. 38 ×.
Fig. 2. - detail of primary branches with cyst-containers in longitudinal section; Kotrčiná Lúčka locality, thin sec. n_o 13 605D, magnif. 38 ×.
Fig. 3.-detail of tangential section; Kotrčiná Lúčka locality, thin sec. n_o 13 605A, magnif. 20 ×.

Plate 5



Accompanying dasycladacean algae: *Salpingoporella muehlbergii* (LORENZ), *Salpingoporella verticilata* (SOKAČ et NIKLER), *Montiella? elitzae* (BAKALOVA), *Pseudoactinoporella fragilis* CONRAD, *Macroporella?* sp.

Type of microfacies: *Orbitolina*-rich packestones, algal — foraminiferal grainstones.

Biostratigraphic markers: *Palorbitolina lenticularis.*

Age: Upper Barremian — Bedoulian.

Occurrences: Vrtižer, Milochov (pebbles from Albian—Cenomanian conglomerates of the Klippen Belt).

Russoella radoiciciae BARATTOLO, 1983
(Text-fig. 3d; Pl. 8, Figs. 3—8)

Flattened lenticular bodies with cyst perforations at the margins. These cyst-bodies occur only isolated from thalli parent algae. Their shapes in equatorial sections are sub-circular to circular and the outer margin is perforated by some cavities (most frequently 3—4). Peripheral cavities are places of the original cyst localization. In tangential sections the bodies show eliptic shapes and two circular cavities placed along the major axis.

Remark: The examined cyst-bodies are presented by Barattolo (1983) under nomen nudum of *Russoella radoiciciae* and considered as conventional taxon (parataxon) of isolated reproductive organs of the genus *Triploporella* or *Zittelina.*

Accompanying dasycladacean algae: *Salpingoporella genevensis* (CONRAD), *Cylindroporella* cf. *barnesii* JOHNSON, fragments of *Triploporella? neocomiensis* RADOIČIĆ,*Griphoporella? augerica* CONRAD et PEYBERNÈS, *Heteroporella* aff. *lepina* PRATURLON.

Type of microfacies: algal hash wackestones.

Biostratigraphic markers: *Orbitolinopsis kiliani* / *Cuneolina camposaurii.*

Age: Barremian to Bedoulian.

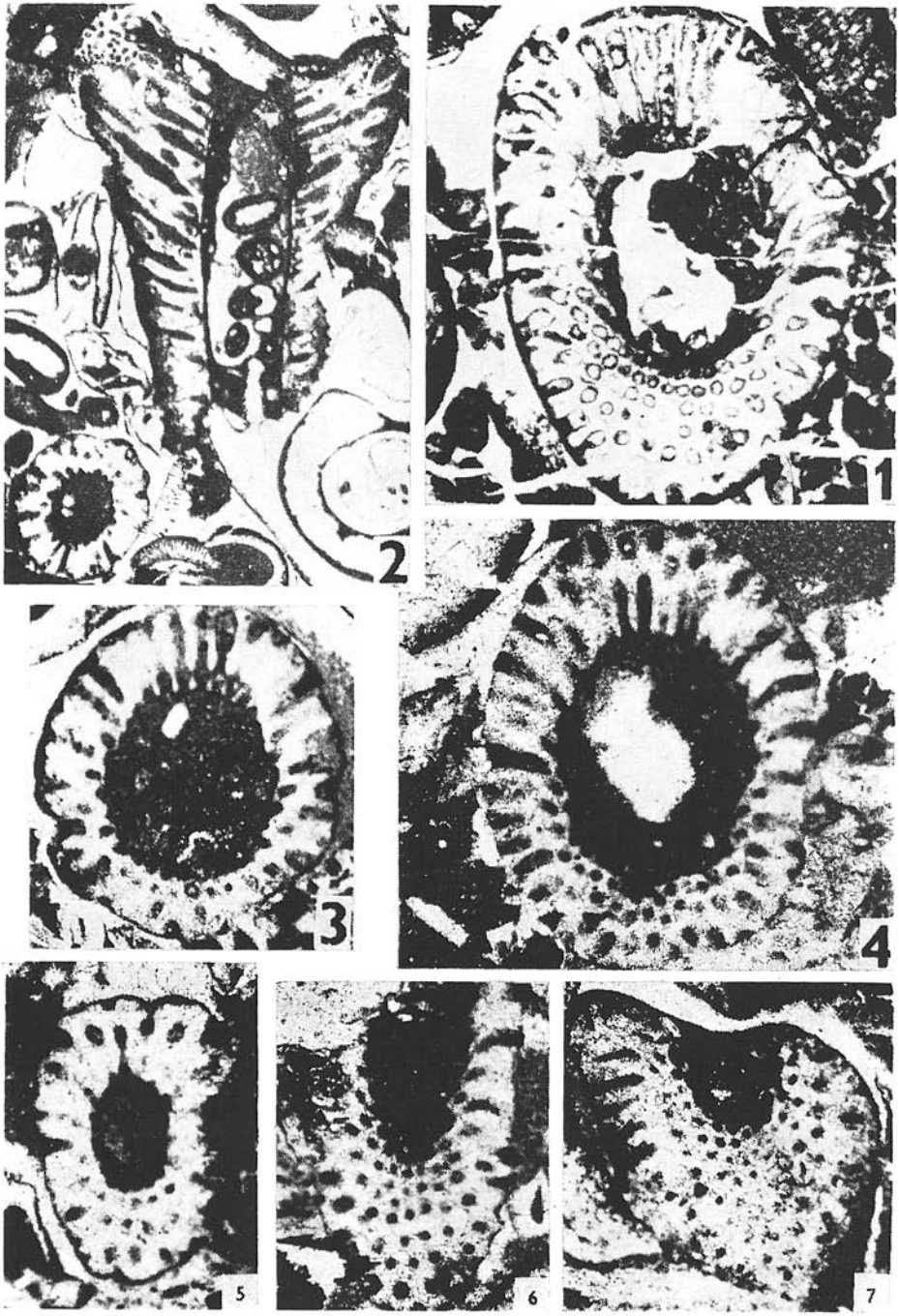
Plate 6

Fig. 1. - *Triploporella marsicana* PRATURLON, 1964, pebble from Upper Cretaceous conglomerate of the Klippen Belt, Barremian—Bedoulian, oblique section; Vrtižer locality, thin sec. n_o 4408, magnif. 18 ×.

Figs. 2—7. *Triploporella?* aff. *marsicana* var. *adriatica* SOKAČ et NIKLER, 1975, pebbles from Albian—Cenomanian conglomerates of the Klippen Belt, Barremian—Bedoulian, all from the Milochov locality.

Fig. 2. - oblique section together with *Pseudoactinoporella fragilis* CONRAD, thin sec. n_o 3640, magnif. 11 ×; Fig. 3. — oblique section, thin sec. n_o B-1229, magnif. 18 ×; Fig. 4. - oblique section, thin sec. n_o B-1227, magnif. 18 ×; Fig. 5. - oblique section, thin sec. n_o B-1232, magnif. 18 ×; Fig. 6. - tangential-oblique section, thin sec. n_o B-1231, magnif. 18 ×; Fig. 7. - tangential-oblique section, thin sec. n_o B-1230, magnif. 18 ×.

Plate 6



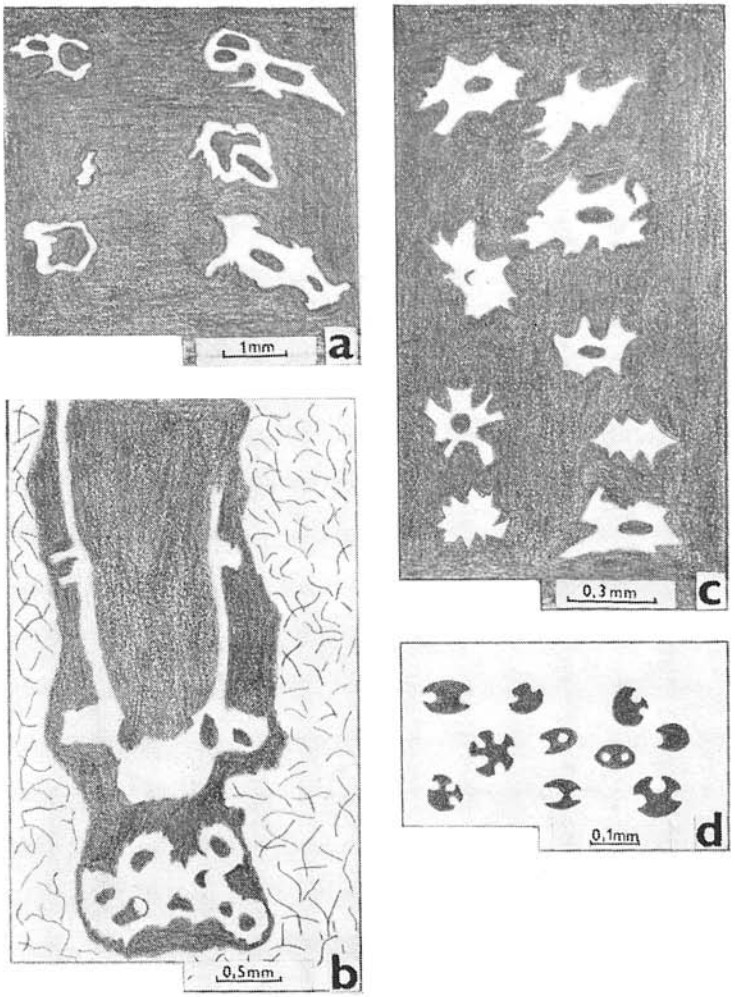


Fig. 3. — a — Syntype of the species *Triploporella? neocomiensis* illustrated by RADOIČIĆ (1963 in Bassoullet et al. 1978, Pl. 36, Fig. 2). Transversal sections through the tufts of secondary branches give a possibility to derive the way of their disintegration into star-like and dishevelled segments.

— 3b — Tangential-oblique section of the thallus of *Triploporella? neocomiensis* RADOIČIĆ, 1963. Cluster ramification of secondary branches appears in tangential cutting through the lower whorl. Milovice locality.

— 3c — Various type of star-like and dishevelled segments from the tufts of secondary branches of *Triploporella? neocomiensis* RADOIČIĆ, 1963. Považský Hrad-Castle locality.

— 3d — Corpuscles of *Russoella radoiciciae* BARATTOLO, 1983 with cystic perforations in equatorial and axial sections. Považský Hrad-Castle locality.

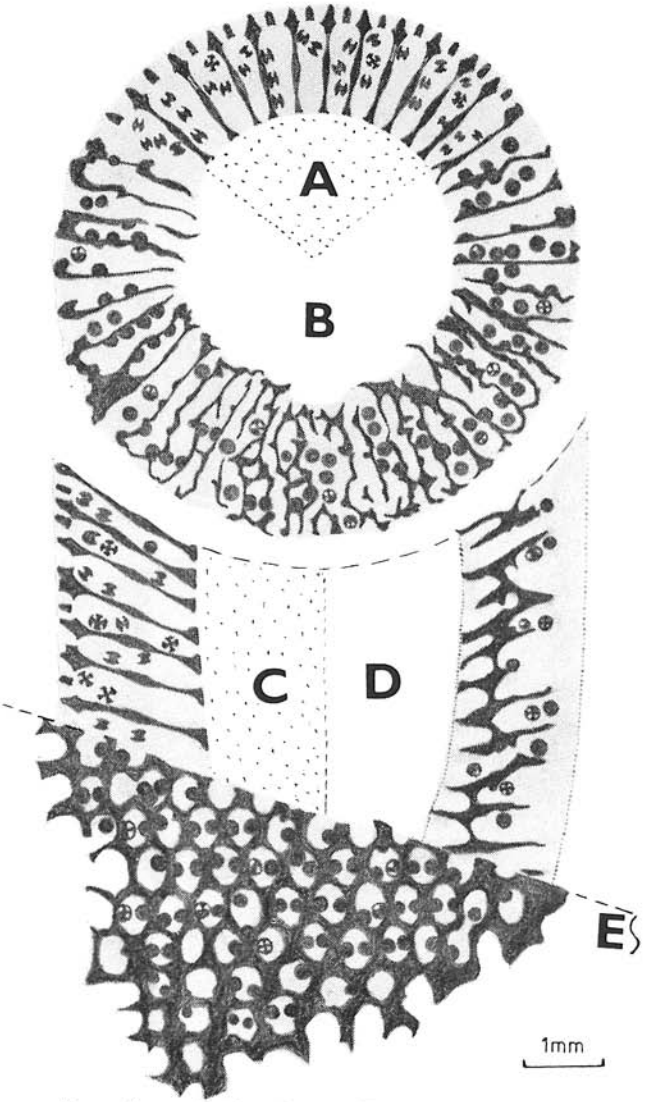
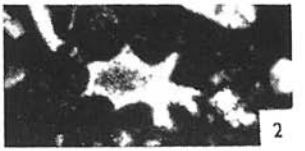
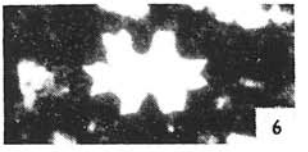
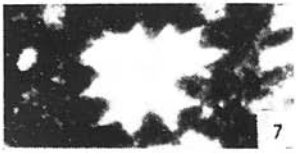


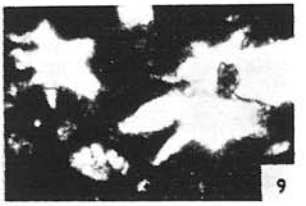
Fig. 4. Various sections through the thallus *Triploporella praturloni* BARATTOLO, 1982.
A) Hypothetical reconstruction of the whorly section.
B) Real whorly section; fine calcareous envelopes of primary branches, corrugation and corrosion of the primary branches walls, inner margin denticulation, fixation of reproductive organs in the lateral walls of primary branches, divided cyst-containers, partially identifiable second order of ramification.
C) Hypothetical reconstruction of longitudinal section.
D) Real longitudinal section; inclination of primary branches, prevailing equatorial sections of cyst-containers, calcareous envelopes of primary branches extremely eroded.
E) Real tangential section; alternative position of primary branches in neighbouring whorls, elliptic and laterally compressed primary branches, fixation of reproductive organs in the lateral walls of primary branches, cyst-containers.
Kotrčiná Lúčka locality.

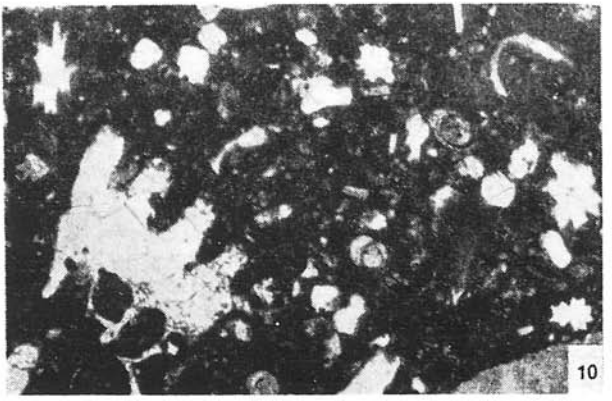
Plate 7











Occurrences: Považský Hrad-Castle (pebble from Cenomanian—Turonian conglomerates of the Klape Unit of the Klippen Belt).

Triploporellas from Paleocene limestones

Triploporella apenninica BARETTI, 1922, emend. BARATTOLO, 1982
(Text-fig. 5; Pl. 8, fig. 1, 1a)

There are Paleocene dasycladacean algae dealt with for which Bystrický (1976) established a new taxon *Dactylopora gusici.*

Stout cylindrical thallus with rounded termination. Verticilled primary branches are not set too densely and are alternating. They are orthogonal to the central stem and inclined upwards so that become completely vertical on the apical area. Primary branches are stout, straight and slightly thickening outwards; in the proximal parts of whorls they form contiguous branches due to lateral compression and sligh calcification. Secondary branches did not calcified. Reproductive organs formed by lenticular cyst-containers were observed only in the surrounding lime sediment (Pl. 8, Fig. 1b). Fruiting portion of primary branches may have originally been in their corrugated upper walls.

Remark: Bystrický (1976) established the species *Dactylopora gusici* sp. nov. on the basis of localization of sporangial cavities in upper surfaces of primary branches. This phenomenon was interpreted as an expression of spore dispersion among whorls from the point of view of the taxonomic nature of the genus *Dactylopora* LAMARCK, 1816. Barattolo involved the Western Carpathians samples of *Dactylopora gusici* BYSTRICKÝ into emended taxon of *Triploporella apenninica* BARETTI, 1922. Placing Baretti's species with the genus *Triploporella* has not been, however, explained unambiguously be-

Plate 7

Fig. 1. - *Triploporella? neocomiensis* RADOIČIĆ, 1963, pebble from conglomerates of the Ždánice-Hustopeče formation of the Ždánice unit — Outer Western Carpathians, Berriasian to Lower Valanginian, tangential — oblique section; Milovice locality, thin sec. n_0 40/85, magnif. 25 ×.
Fig. 1a - Segment from the tufts of secondary branches of *Triploporella? neocomiensis* RADOIČIĆ, 1963 occurred in the surroundings of the whole thallus.; dtto, magnif. 48 ×.
Figs. 2—9. Segments of the secondary branche tufts of *Triploporella? neocomiensis* RADOIČIĆ, 1963, pebble from Cenomanian—Turonian conglomerates of the Klippen Belt, Barremian to Bedoulian; all from the Považský Hrad-Castle locality.

Fig. 2. - thin sec. n_0 10 541, magnif. 48 ×; Fig. 3. - thin sec. n_0 10 554, magnif. 30 ×;
Fig. 4. - thin sec. n_0 10 391, magnif. 48 ×; Fig. 5. - thin sec. n_0 10 786, magnif. 48 ×;
Fig. 6. - thin sec. n_0 10 541, magnif. 52 ×; Fig. 7. - thin sec. n_0 10 540, magnif. 52 ×;
Fig. 8. - thin sec. n_0 10 554, magnif. 30 ×; Fig. 9. - thin sec. n_0 10 391, magnif. 52 ×;

Fig. 10. - Algal hash wackestone with segments of the secondary branche tufts of *Triploporella? neocomiensis* RADOIČIĆ, 1963, pebble from Cenomanian—Turonian conglomerates of the Klippen Belt, Barremian to Bedoulian; Považský Hrad-Castle locality, thin sec. n_0 10 554, magnif. 30 ×.

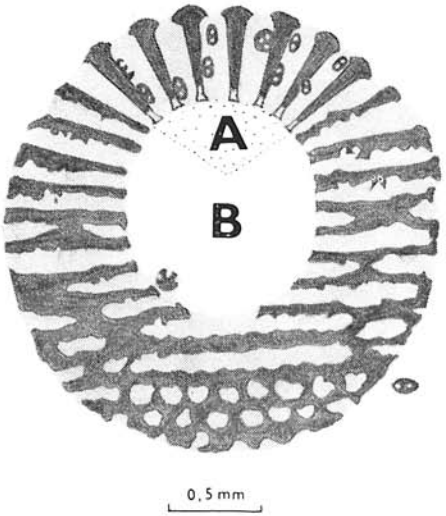


Fig. 5. Oblique section through the thallus *Triploporella apenninica* BARETTI, 1922 emend. BARATTOLO, 1982.
A) Hypothetical reconstruction.
B) Real oblique section (adapted according to Bystrický's illustration, 1976, Pl. 2, Fig. 1); thick walls of primary branches, corrugated upper planes of primary branches, contiguous branches in the section through the proximal hemisphere of the whorl near the axial cavity, lenticular cyst-containers outside of the thallus. Brezovica locality.

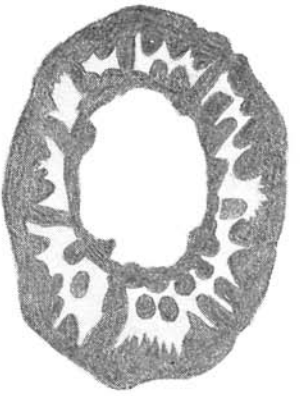


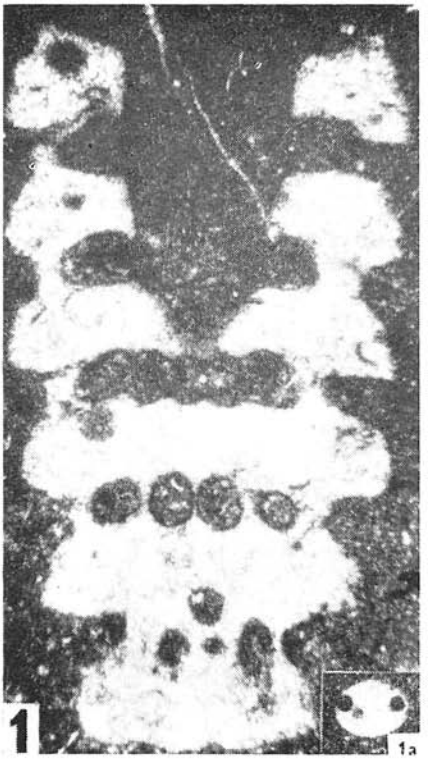
Fig. 6. Oblique section through the thallus *Triploporella*? cf. *uragielliformis* CONRAD et PEYBERNÈS, 1976. Pear-shaped primary branches, non-preserved insertion bases of the proximal parts of primary branches and the inner margin denticulation, unclear way of secondary ramification. Kotrčiná Lúčka locality.

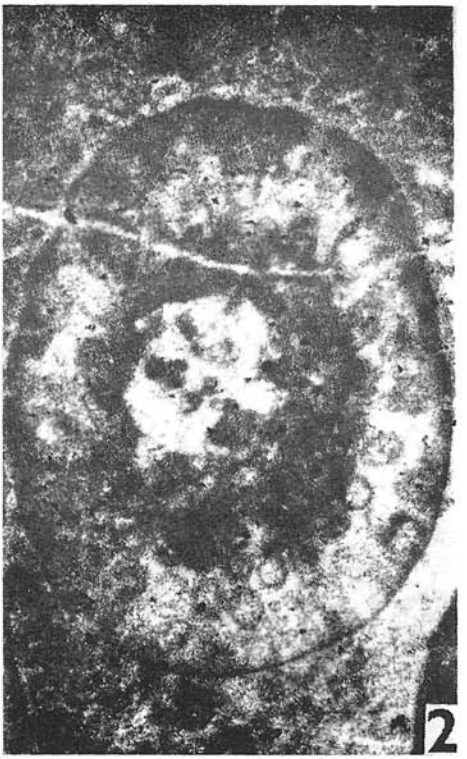
Plate 8

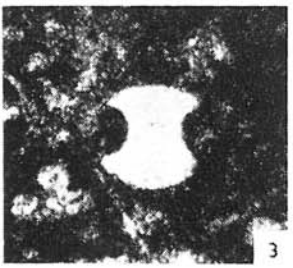
Fig. 1. - *Triploporella apenninica* BARETTI, 1922, pebble from conglomerates of the Chocholová-Beds, Paleogene of the Podhale flysch, Paleocene, tangential — oblique section; Brezovica locality, thin sec. n_0 4/15, magnif. 25 ×. Fig. 1a - lenticular cyst-containers occurred in the surroundings of the thallus of *Triploporella apenninica* BARETTI, 1922.; dtto, magnif. 52 ×. Fig. 2. - *Triploporella*? cf. *uragielliformis* CONRAD et PEYBERNÈS, 1976, pebble from Upper Cretaceous conglomerates of the Klippen Belt, Barremian—Bedoulian, oblique section; Kotrčiná Lúčka locality, thin sec. n_0 13 605B, magnif. 68 ×.
Figs. 3—8. *Russoella radoiciciae* BARATTOLO, 1983, pebble from Canomanian—Turonian conglomerates of the Klippen Belt, Barremian to Bedoulian; all from the Považský Hrad-Castle locality. Fig. 3. - axial section, thin sec. n_0 10 786, magnif. 96 ×; Fig. 4. - axial section, thin sec. n_0 10 541, magnif. 52 ×; Fig. 5. - axial section, thin sec. n_0 10 786, magnif. 96 ×; Fig. 6. - subequatorial section, thin sec. n_0 10 541, magnif. 96 ×; Fig. 7. - subequatorial section, thin sec. n_0 10 391, magnif. 96 ×; Fig. 8. - equatorial section, thin sec. n_0 10 391, magnif. 96 ×.

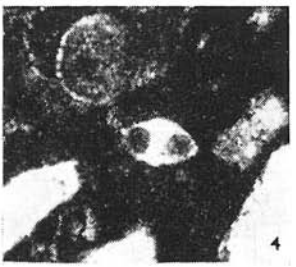
Photo by F. Martančík (Pl. 1, Pl. 2, Pl. 3, Pl. 4, Pl. 5, Pl. 7, Fig. 8)
Photo by L. Osvald (Pl. 6, Pl. 7, Figs. 2—10)
Photo by J. Soták (Pl. 7, Figs. 1, 1a, Pl. 8, Figs. 1, 1a, 3—8)

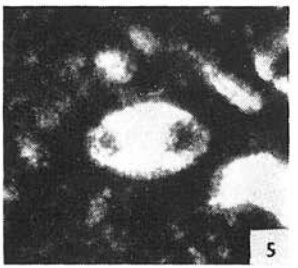
Plate 8

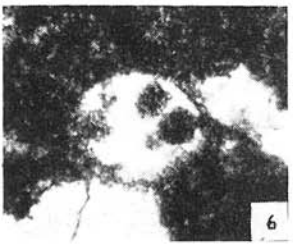


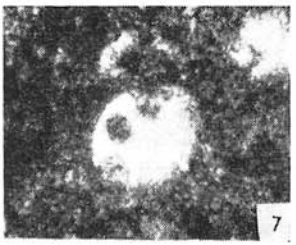


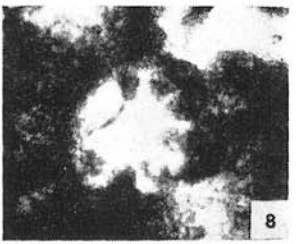












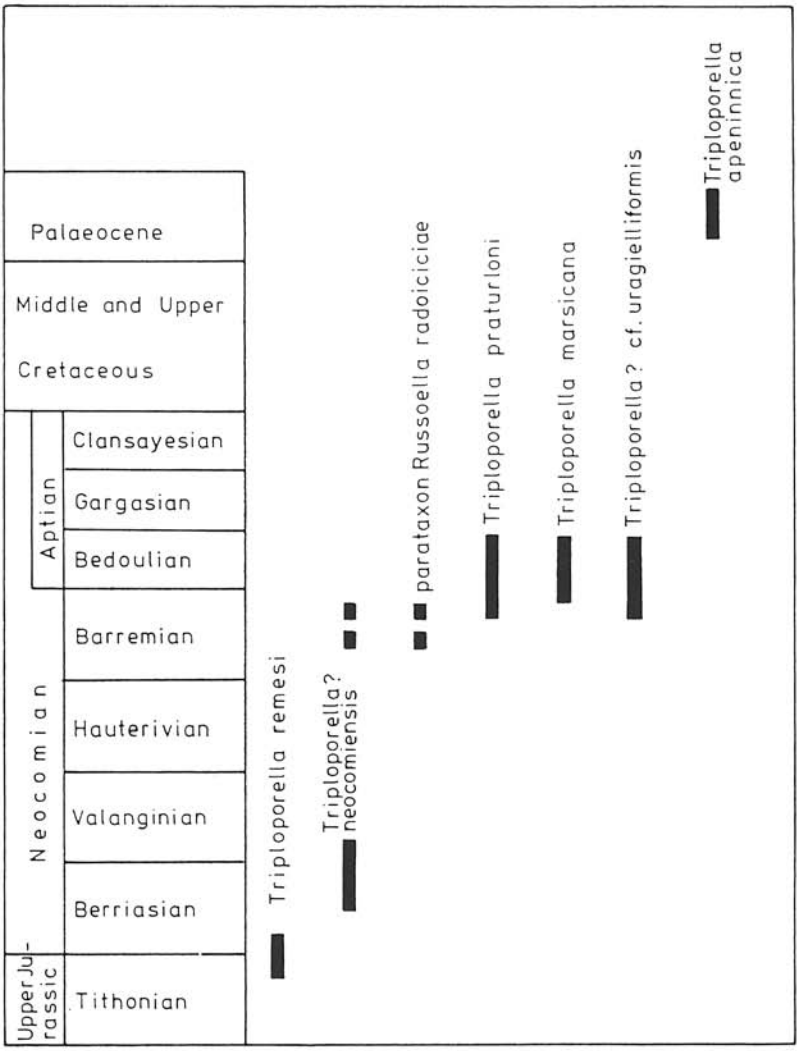


Fig. 7. Temporary distribution of particular representatives of the genus *Triploporella* STEINMANN in Uppermost Jurassic? to Paleocene of the Western Carpathians.

cause of obscurities around cladosporate or choristosporate position of the reproductive organs. Nevertheless, B a r a t t o l o supposes the position of cyst--containers partially also on the outside primary branches is like in the species *Triploporella decastroi* a result of their leakage through openings in the walls of primary branches within the process of liberalization of zoospores and gametes. Our examination of the original illustration of the holotype of *Dactylo-*

pora gusici BYSTRICKÝ (thin-section with holotype was not possible to be studied since we did not succeed to find where it deposited) and a modest set of paratypes consisting of only one complete section and several fragments did not prove the presence of cyst-containers in the walls of primary branches (strong sparitization of the skeletons). In these samples an obvious corrugation of the upper surfaces of primary branches can be seen which is considered a certain adaption of cladosporate position of reproductive organs of the genus *Triploporella* by the processes of their formation.

Accompanying dasycladacean algae: *Broeckella belgica* MORELLET et MORELLET, *Linoporella parva* DIENI, MASSARI et RADOIČIĆ, *Linoporella* sp., *Cymopolia* cf. *elongata* (DEFRANCE), *Cymopolia* cf. *edwarsi* MORELLET et MORELLET, *Dactylopora praturloni* BARATTOLO et DE CASTRO, *Dactylopora bystrickyi* DIENI, MASSARI et RADOIČIĆ, *Neomeris* sp., *Praturlonella* sp., *Frederica coniconvexa* DIENI, MASSARI et RADOIČIĆ etc.

Biostratigraphic markers: *Broeckella* biofacies.

Age: Paleocene.

Occurrences: (exotic conglomerates of Chocholová — Beds, Paleogene of the Orava bassin).

Conclusion

The article represents the inventory of dasycladacean flora of the genus *Triploporella* STEINMANN from Uppermost Jurassic? to Paleocene limestones of the Western Carpathians. In the descriptive part there are besides the morphostructural character of thalli evaluated also the nature of reproductive organs in singular taxa having been found in such shape and structural types as presented by Barattolo (1980, 1981, 1982 a, b, c, 1983).

On the whole there were described 6 taxa and 1 parataxon of the genus *Triploporella*. The valuable is namely gaining new topotypes of the species *Triploporella remesi* (STEINMANN) from the Štramberk limestones which has needed supplementary emendation from the standpoint of the type of reproductive organs. The reproductive organs of the Štramberk samples of *Triploporella remesi* have the shape of globular corpuscles without visible traces of internal subdivision and freely laid in fertile regions of primary branches.

It was considered contribution when *Triploporella? neocomiensis* RADOIČIĆ was detected in Lower Cretaceous occurrences of the Outer Flysch Carpathians, but first of all, when there was disclosed the dissociation mode of secondary branches of this species in the form of star-like and dishevelled segments having been found in algal hash wackestones from "Urgonian" clasts of the Klippen Belt. In association with these segments there are often occurring also the corpuscles of reproductive organs of the parataxon *Russoella radoiciciae* BARATTOLO. This co-occurrence may be genetically based and as such it could suggest so far questionable generic belonging of the taxon *Triploporella? neocomiensis*.

The group of "Urgonian" triploporellas is presented for the first time from the Western Carpathians. The remarkable is namely discovery of big clavi-

form thalli of the species *Triploporella praturloni* BARATTOLO with cystiform reproductive organs fixed in rows in the lateral walls of primary branches. The species *Triploporella marsicana* PRATURLON was observed mostly without clearly identifiable second stage of ramification (type *Neomacroporella)* or in the form of the sub-species *Triploporella* aff. *marsicana* var. *adriatica* SOKAČ et NIKLER. Reproductive organs of this species occur only scarcely in hollow spaces of primary branches with hints of fixation in their walls. Also microfossils of the conventional taxon *Russoella radoiciciae* BARATTOLO belong to this survey. They are flattened lenticular corpuscles with cystic perforation which are considered to represent isolated reproductive organs of the genus *Triploporella*. The species *Triploporella*? cf. *uragielliformis* CONRAD et PEYBERNÈS does not show convincing characteristics of generic belonging to triploporellas, mostly as for the unclear form of twofold ramification and that is the reason for us to accept it with reserve.

A certain relevance is attributed to re-evaluation of the Paleocene species *Dactylopora gusici* BYSTRICKÝ which were involved in the emended taxon *Triploporella apenninica* BARETTI by F. Barattolo (1982b). Localization of sporangial cavities in corrugated upper surfaces of primary branches is considered a certain adaption of cladosporous position of reproductive organs of the genus *Triploporella*, not of choristosporous one of the genus *Dactylopora* (sensu BARATTOLO, 1982b).

Facial features of all *Triploporella*-bearing limestones show to back-reef environment. *Triploporella*-occurrences are accompanied by rich flora of other dasycladacean algae.

The described species of *Triploporella* from Berriasian (Upper Tithonian?) to Paleocene limestones of the Western Carpathians remember those known from the southern areas of the Tethyan region. It is namely "Urgonian" group of triploporellas which appears to be close to those typical for Italy — Dalmatian sub-province of algal — foraminiferal paleobiogeography in Lower Cretaceous of the Mesogean (sensu Pelissié — Peybernès — Rey, 1982, cf. Peybernès — Conrad, 1979 etc.). The character of the described species representation is surprising to a certain degree in the sense that the Western Carpathians segment though having been shifted out to the north, the clasts of "Urgonian" limestones in the Klippen Belt bear *Triploporella* species that have been reasonable to be supposed not to go over the area of the south-Mesogean domain. Numerous data on their abundance in the Apennines and Dinarides were brought by Praturlon (1964, 1966), Radoičić (1970a), Campobasso et al. (1972), Sokač — Nikler (1973, 1975), Barattolo (1980, 1982a, 1983) etc. On the other hand, these species have not been noted yet from the more southern occurrences of "Urgonian" in Hungary (cf. Peybernès — Conrad, 1979), Balkan and except *Triploporella? uragielliformis* either from thoroughly investigated "Urgonian" in the regions of the western Mesogean province (new re-evaluation according to Barattolo's emendations should be however done at the discoveries of *Triploporella remesi* in the "Urgonian" of Bulgaria — BAKALOVA et KRISCHEV, 1974, *Triploporella* aff. *fraasi* in that of High Savoy — CONRAD, 1970 and *Triploporella fraasi* in the Barremian—Lower Aptian of the Hăşmaş Mts. in the Eastern Carpathians — DRAGASTAN, 1980). Similar problem is however also the occurrences of foraminifers *Archalveolina reicheli* (DE CASTRO) in the

pebble of Barremian limestone with *Orbitolinopsis buccifer* in the Klippen Belt conglomerates having been known only from the southern margin of Tethys, and that up to Aptian.

Secondary position of "Urgonian" limestones with triploporellas in Upper Cretaceous conglomerates of the Klippen Belt can mislead us to solve their biogeographic affinity to the species of southern provinces far-reaching longitudinal transport of clasts in that way how these interpretations appeared in connection with finding basinal Triassic facies, shallow-water Malm or ultrabasic rocks and high-pressure metamorphites in cordillera products of the northern regions of the Western Carpathians (Pieniny cordillera: Mišík — Mock — Sýkora, 1977; Mišík — Sýkora, 1981 etc.; Silesian cordillera: Soták, 1985, 1986, 1987). Sedimentological studies show, however, that this pebble material could not be transported several hundred kilometers; thus it is necessary to consider more or less local sources. Such conclusion is supported also by finds of triploporellas in a klippen shred of the Štramberk limestones and Paleocene clasts in the Podhale flysch where is elliminated the possibility of far-reaching transference from the south and in spite of this the species *Triploporella remesi* and namely *Triploporella apenninica* show morphogenesis tendency identical with that of the Apennines — Dinarides region (cf. Sokač — Nikler, 1967; Radoičić, 1970b; Barattolo, 1982b).

With respect to the local origin of pebble or klippen material with triploporellas in the Western Carpathians originating from intra-basinal cordilleras (Pieniny, Silesian, Baška and/or Orava ones) the mentioned bioprovincial affinities have to be solved first by migrate expansion of calcareous algal flora from the southern provinces of Mesogean or restrainedly by adaption of palinspastic distribution of the spaces.

Translated by M. Spišiaková

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