GIAMPIETRO BRAGA, KAMIL ZÁGORSĚK & MIKLÓS KÁZMER

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Abstract - GIAMPIETRO BRAGA, KAMIL ZÁGORSĚK & MIKLÓS KÁZMER - Comparison between Venetian and Western Carpathian late Eocene Bryozoan faunas.

From a critical examination of the previous papers about the upper Eocene Bryofaunas of the N.E.Italy (Venetia region) and Western Carpathian mountains (Slovakia and Hungary) it appears that there are 148 valid species (97 Cheilostomata and 51 Cyclostomata).

The remarkable lithostratigraphical and faunistical affinities of the two sedimentary basins are compared and emphasized, especially with regard to the Bryozoan associations.

The paleogeography and the relationships of these tethyan areas are briefly outlined.

Key words: Bryozoa, Tethys, Paleogeography.

PREVIOUS STUDIES

The early studies on the Bryozoans of Venetia were carried out by Reuss and concerned the Lonte Valley (REUSS,1848).

As a matter of fact, in such a paper Reuss made the material come from a «nicht naeher Bekannten Fundortes im Wiener Beckens» (a not well-known place somewhere in the Vienna basin). Such an undefinite locality was subsequently specified by Reuss himself (1874) as Lonte Valley or Onte Valley (Fortuna house) in the Eastern Lessini Mountains. At that time Reuss referred those outcrops to Lower Oligocene, but nowadays they can be surely dated as Upper Eocene, owing to their index fauna (Late Priabonian : level of Blue Marls with Bryozoans).

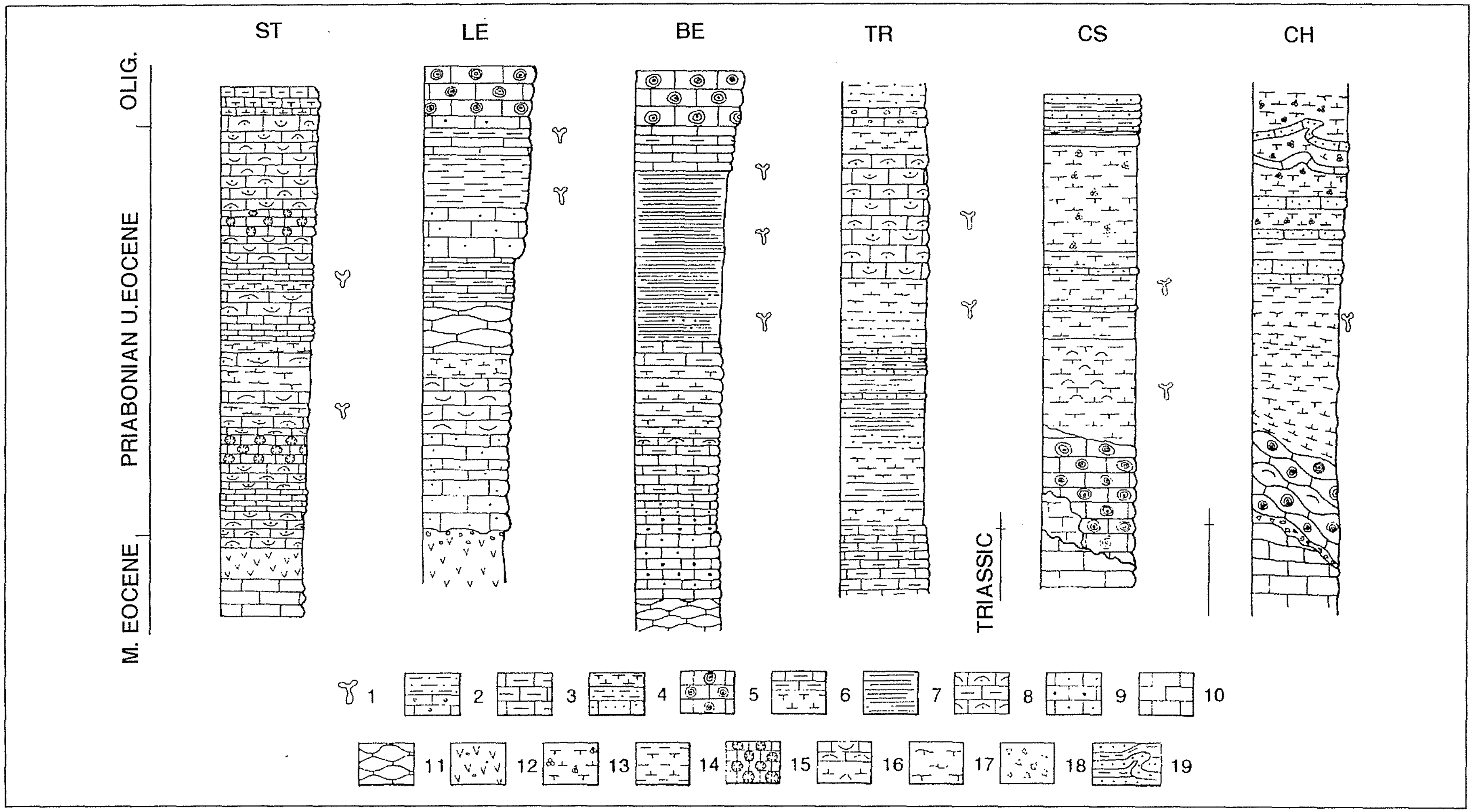

Fig. 1 - The simplifying lithostratigraphic columns (not in scale) of the Southern Alps and Carpathian basins. Respectively from the left to right hand : ST (Southern Trentino); LE (Lessini Mt.); BE (Berici Mt.); TR (W.Trevigiano hills); CS (W.Carpathian-Slovakia; CH (W.Carpathian-Hungary). Symbols: 1 = Bryozoan levels; 2 = siltites and conglomerates; 3 = marly limestones; 4 = marls, silty clay and fine sands; 5 algal limestones; 6 = marly limestones and marls; 7 = clay; 8 = biocalcarenites and marly limestones; 9 = calcarenites and calcirudites; 10 = limestones; 11 = nodular limestones; 12 = volcanics; 13 = Globigerina marls; 14 = silty marls; 15 = coral limestones; 16 = Discocyclina marls and limestones; 17 = reef limestones; 18 = breccias; 19 = flysch/turbidites

In his subsequent papers, Reuss (1868 and especially 1869) reported a paleontological study on Bryozoans and Corals from some localities of the Lessini Mountains, Berici Mountains and Vicenza fore Alps. Such localities are Montecchio Maggiore, Priabona, Granella, Castelgomberto, Lonte Valley, Crosara and Sangonini (Marostica-Vicenza hills).

If we exclude the insignificant work of Gottardi (1885) we mention the valuable paper of Waters about the Cheilostomatous Bryozoa of Vicentine and Southern Trentino (1891) and his subsequent note (1892) on Cyclostomatous. No more papers appear up to our days.

This long silence was broken by Accordi (1947) with a brief but interesting paper about the occurrence of specimens belonging to Conescharellinidae in Bryozoan marls near Verona (Lessini Mountains).

Since 1963 one of the Authors (Gp.B.) began studying the Bryozoan levels of Cenozoic of the Veneto and Southern Trentino and his researches are now in progress (see References).

The Bryozoa of west Carpathian area, especially from those belonging to Buda marls was studied by Pergens (1896). Recently in two short papers Dudich (1962 and 1971) dealt with these eocenic Bryozoans.

At present Zágoršek spend a great time of his field work to sample new outcrops on Carpathian area and some papers have been issued on this topic (see References).

LITHOSTRATIGRAPHIC OBSERVATIONS

The Paleogene of Venetia with beds rich in Bryozoan crops out in a wide area including Southern Trentino, Lessini and Berici Mountains and the piedmont hills (Western Trevigiano) between Brenta and Piave rivers(Fig. 1-column 1-4). This area was an important element in Tertiary time and paleogeographically and structurally belongs to the Southern Alps (fig. 2: left on the botton), characterized by shallow water sedimentation of carbonate, marls and clay rich in Corals, Fish, Algae, Molluscs, Macroforaminifera and, especially in Upper Eocene, in Bryozoa.

The Formation of Priabona Marls represents - with the Priabonian - the stratotype of Upper Eocene. Such a formation is characterized by marly limestones with lenses of algal biolithites and, on the top, by very thin foliated beds of soft marls rich in Bryozoans (BRAGA & BARBIN, 1989). Such marls are coeval with Brendola and Lonte Valley marls, which were studied in the past century by Reuss (1848, 1869).

This lithostratigraphic succession is rather uniform from west to east (Fig. 1, column 1-4), probably more clayey in the Berici and in the West Trevigiano hills.

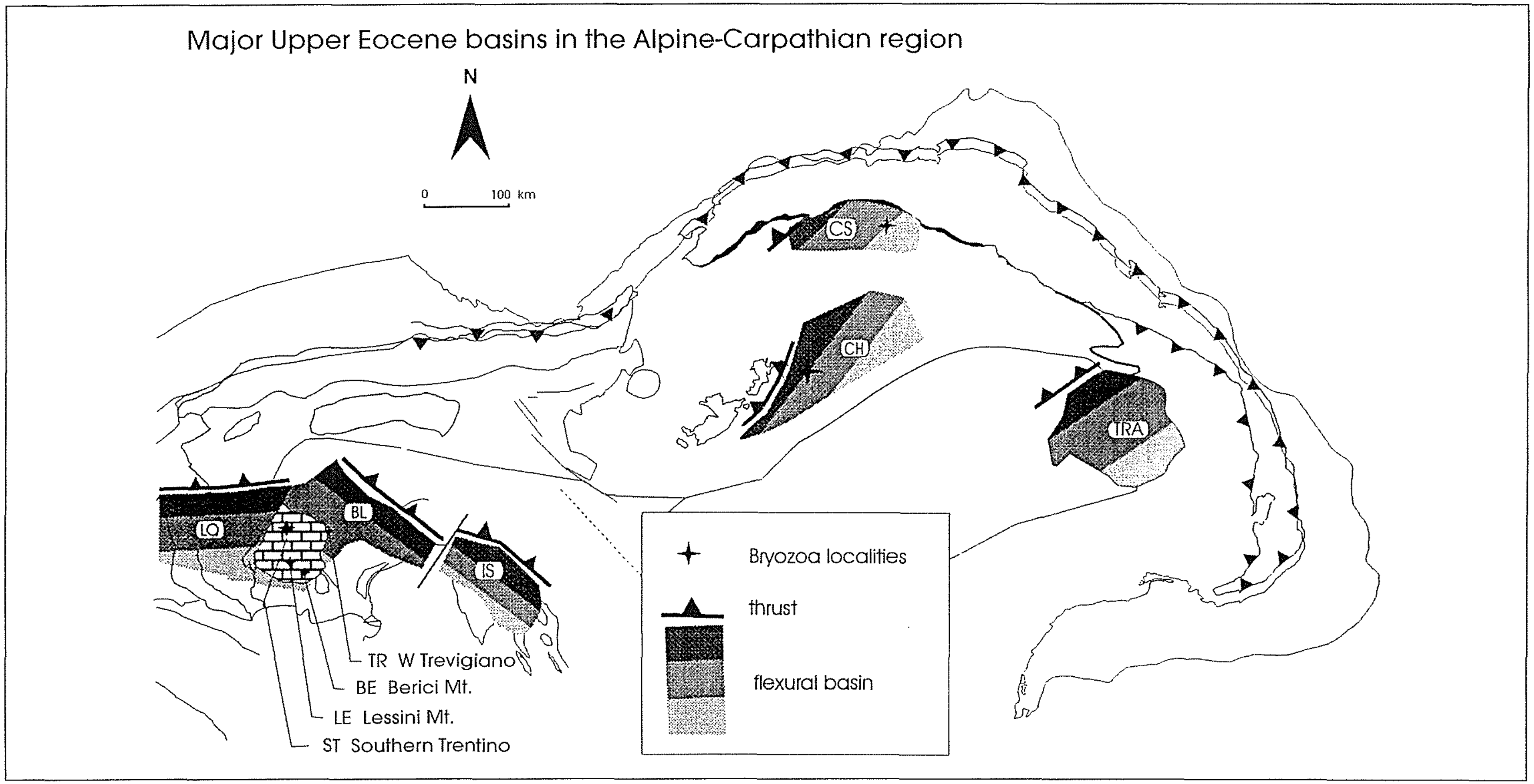

Fig. 2 - Major Upper Eocene basins in the Alpine-Carpathian region. The Belluno (BL) and Istria (IS) basins are foreland flexural basins of the Dinarides. The Lombardian basin (LO), the Hungarian Paleogene basin (CH), the Central Carpathian Paleogene basin (CS), and the Transylvanian basin (TRA) are retroarc flexural basins of the Alps and Carpathians, respectively. Other symbols : TR : W.Trevigiano; BE : Berici Mt.; LE : Lessini Mt.; TM : Southern Trentino.
Sources for the tectonic base map : Csontos *et al.* (1992), Dal Piaz *et al.* (1988). Sources for the Eocene basins: Lombardy: Bernoulli *et al.* (1988); Venetia and Belluno: Bosellini (1989), Luciani (1989), Doglioni & Bosellini (1987); Istria: Drobne (1977), Cavallin & Pirini Radrizzani (1983); Hungarian Paleogene basin : Tari *et al.* (1993); Central Carpathian Paleogene basin: Gross *et al.* (1984), Kovacs M. (pers. comm. 1994); Transylvanian basin : Ciulavu *et al.* (1994).

In all successions however the Bryozoan level is almost on top of the Priabonian and is an important key bed in studying the Upper Eocene sequences.

The Bryozoa marls show an extremely rich diversity(Tab. 1), with abundant representation of rigid-erect branching growth forms, indicative of relatively fast water flows well supplied with particulate food, especially microalgae.

According to sedimentological characteristics, faunal content, growth-form parameters, and inferences concerning the species in life, the depth range of the shelf would have been within the photic zone of the inner-outer interval, not more than 100 m (GORDON & BRAGA, 1994).

While the lithostratigraphic sequences in the Venetia are almost complete and pass continuously from the Mesozoic to Paleogene - there are only some hard grounds and local disconformity between the U.Cretaceous and Middle Eocene - in the Carpathian area the outcrops are affected by intense tectonic events and by an important phase of transgression.

The Upper Eocene sediments of the western Carpathians of Slovakia (Liptov and Rajec basins) can be divided into four Formations slightly different among them. All the sequences, transgressive on Triassic sediments, have algal limestones and heteropic coral reefs on the botton coming up to Discocyclinae, Bryozoa and Globigerinae marls on the top (Fig. 1, column 5), with an comprehensive character of «flysch» facies.

In the surrounding of Budapest (Buda hills) the Upper Eocene formations cover mostly Triassic Dachstein limestones. The Late Eocene transgression deposited thick basal conglomerate then limestones with *Nummulites fabianii* and Discocyclinae. It is followed by neritic Bryozoan limestones and marls, then by pelagic Globigerina marls (Buda Marls). The latter extends also up to the Oligocene.

The Buda Hills sequence indicates subsidence within the Bryozoan marls from the euphotic zone to significantly greater depths (ZÁGORSĚK,1993).

SOME OBSERVATIONS ON FAUNAL CONTENT

The Bryozoa horizon set on top of Priabonian sequences of the Venetia basins (Southern Alps) and is stratigraphically very close to all Bryozoan horizons occurring in the more comprehensive alpine-carpathian sedimentary basin, extending from N. E. Italy to Transylvania basin (Fig. 2). Specifically this paper deal with faunal comparisons among the Bryozoa occurring in the marls of Venetia, of Liptov and Rajec basins (Slovakia) and of the well known Buda marls. As above said all lithostratigraphic sequences (Fig. 1) are typical of an epicontinental sedimentation with not only Bryozoans but also Discocyclinae, Nummulits, Molluscs and other neritic faunas.

OCCURRENCE OF BRYOZOAN SPECIES IN VENETIA AND WESTERN CARPATHIAN MOUNTAINS

Tab. 1

Cyclostomata	ST	LE	B E	TR	CS	CH
Bitubigera biseriata (PHILIPPI), 1843				x		
«*Ceriopora*» *spongiosa* PHILIPPI, 1844	x					
Crisia elongata MILNE-EDWARDS, 1848	x	x	x	x	x	
Crisia haueri REUSS, 1848			x	x		
Crisia hoernesi REUSS, 1848	x	x	x	x	x	
Crisia subaequalis REUSS, 1869		x	x			
Decurella toarensis MONGEREAU & BRAGA, 1967		x	x			
Desmeplagioecia tenuis (REUSS), 1869		x	x	x		
Diastopora rotula REUSS, 1848						x
Exidmonea atlantica Auct.	x		x		x	
Exidmonea giebeli STOLICZKA, 1862		x	x		x	x
Exidmonea concava (REUSS), 1869	x	x	x	x		x
Exidmonea crisiiforme ZÁGORŠĚK , 1992					x	
Exidmonea hoernesi (STOLICZKA), 1862					x	
Exidmonea villaltae (REGUANT), 1861					x	
Exochoecia compressa (REUSS), 1848		x	x		x	
Fascigera dimidiata (REUSS), 1848	x	x		x	x	
Filisparsa cuvillieri DEBOURLE, 1974					x	
Filisparsa fallax CANU & BASSLER, 1920			x			
Filisparsa orakeiensis STOLICZKA, 1864			x			
Heteropora subreticulata REUSS, 1869		x	x		x	
Heteroporella deformis (REUSS), 1848					x	x
Hornera asperula REUSS, 1869	x	x	x		x	
Hornera concatenata REUSS, 1869	x	x	x	x	x	
Hornera d'Achiardi REUSS, 1869		x				
Hornera frond. f. frondiculata MONGEREAU		x	x	x	x	x
Hornera seriatopora REUSS, 1848					x	
Hornera simplicissima BRAGA & BARBIN, 1988			x			
Hornera subannulata PHILIPPI, 1843				x	x	
Hornera sulcosa REUSS, 1866	x					
Hornera verrucosa REUSS, 1866		x	x			
Lichenopora beyrichi REUSS, 1851	x			x	x	x
Lichenopora coronula (REUSS), 1848					x	
Lichenopora goldfussi REUSS, 1864	x					
Lichenopora grignonenis M.-EDWARDS, 1838	x			x	x	x
Lichenopora interrupta REUSS, 1869		x		x		
Lichenopora radiata SAVIGNY-AUDOUIN, 1834	x			x		x
Mecynoecia iranensis (FURON & BALAV), 1959					x	
Mecynoecia proboscidea (M.-EDWARDS), 1838	x	x	x	x	x	x
Mecynoecia pulchella (REUSS), 1848	x	x	x	x		x
Nematifera reticuloides CANU & BASSLER, 1926					x	
Nematifera susannae ZÁGORŠĚK , 1922					x	x
Oncousoecia biloba (REUSS), 1848	x	x	x	x		
Platonea pluma (REUSS), 1848		x	x		x	
Pleuronea pertusa (REUSS), 1848	x					
Pleuronea reticulata (REUSS), 1869		x	x			
Radiopora (Domopora) *pileolus* REUSS, 1869	x					x
Reteporidea coronopus CANU & BASSLER, 1922	x			x	x	x
Reteporidea sparsa (REUSS), 1864	x			x		
Tervia serrata (REUSS), 1869	x	x	x			x
Tubulipora foliacea REUSS, 1848	x			x		
Ybselosoecia typica (MANZONI), 1878		x				
Adeonella minor (REUSS), 1869	x	x	x	x	x	x

Continued

Cheilostomata	ST	LE	B E	TR	CS	CH
Adeonellopsis porina (Roemer), 1863		x		x	x	x
Adeonellopsis subteres (Roemer), 1863		x	x		x	x
Alderina subtilimargo (Reuss), 1864	x	x		x	x	x
Anornithopora polygona Voigt, 1971					x	
Bactridium hagenowi Reuss, 1848		x	x			x
Batopora multiradiata Reuss, 1869	x	x	x	x	x	x
Batopora rosula (Reuss), 1848	x	x	x	x	x	
Batopora stoliczkai Reuss, 1867		x				
Biflustra savartii texturata (Reuss), 1848	x	x	x			
Buffonelloides rhomboidalis Canu & Bassler, 1920						x
Caberoides continua (Waters), 1891	x	x	x			
Calpensia gracilis (Münster), 1826			x			
Calpensia hexagona Zágoršek , 1994					x	x
Calpensia nobilis (Esper), 1796			x			
Calpensia polysticha (Reuss), 1848		x	x		x	x
Cellaria reussi (d'Orbigny), 1851	x	x	x		x	
«Cellepora» circumcincta (Reuss), 1869		x				
«Cellepora» conglomerata (Goldfuss), 1821			x			x
«Cellepora» diplostoma (Reuss), 1848		x	x			
«Cellepora» globularis (Bronn), 1837	x	x	x			x
«Cellepora» pertusa (Smitt), 1867		x				
Chaperia spinella Zágoršek , 1994					x	x
Chilidoniopsis tenerrima (Reuss), 1869	x	x	x			x
Conopeum hookeri (Haime), 1850						x
Crassimarginatella macrostoma (Reuss), 1848	x	x	x		x	
Cribrilaria chelys (Koschinsky), 1885		x				
Cribrilaria haueri (Reuss), 1848		x	x		x	x
Cribrilaria radiata (Moll), 1803	x	x	x	x	x	x
Cyclicopora laticella Canu & Bassler, 1920						x
Ditaxipora pannonensis Braga, 1980	x	x				
Ditaxiporina septentrionalis (Waters), 1891	x	x	x			
Escharina phymatopora (Reuss), 1869		x	x		x	x
Escharoides aliferus (Reuss), 1869		x	x		x	x
Escharoides coccineus (Abildgaard), 1806	x	x	x	x	x	x
Escharoides crenilabis (Reuss), 1848						x
Escharoides labiosa (Reuss), 1869		x				
Fedora bidentata (Reuss), 1869	x	x	x		x	
Gigantopora duplicata (Reuss), 1848		x	x	x	x	x
Hemicyclopora parajuncta Canu & Bassler, 1917					x	
Hippomenella bragai Zágoršek , 1994					x	
Hippomenella transversora Canu & Bassler, 1920					x	
Hippopleurifera schreibersi (Reuss), 1848		x	x		x	
Hippoporina angistoma (Reuss), 1848			x			
Hippoporina arrecta (Reuss), 1848						x
Hippoporina exarata (Reuss), 1848		x				x
Hippoporina lyratostoma (Reuss), 1866	x	x			x	x
Hippoporina punctifera Canu, 1907					x	
Hippoporina sparsifora (Reuss), 1869		x	x		x	x
Hippoporina stenosticha (Reuss), 1869		x				
Houzeauina parallela (Reuss), 1869		x	x			x
Kionidella excelsa Koschinsky, 1885		x	x	x	x	x
Lacerna larva (Reuss), 1848		x				
Lacrimula perfecta (Accordi), 1947	x	x	x	x	x	x
Lunulites quadrata (Reuss), 1848	x	x	x	x	x	
Margaretta ceroides (Ellis & Soll.) 1876	x	x	x	x	x	x
Margaretta filiformis Canu & Bassler, 1929			x			
Margaretta turgida (Tewari & Srivast.), 1967					x	

Continued

Cheilostomata	ST	LE	B E	TR	CS	CH
Membraniporella ulrichi Canu & Bassler, 1920						x
Meniscopora syringopora (Reuss), 1848		x	x		x	x
Metrarabdotos moniliferum (Milne-Edw.), 1836					x	
Monoporella grotriani (Stoliczka), 1862				x		
Mucronella patens Canu & Bessler, 1920					x	
Nellia tenella Lamarck, 1816		x	x	x		
Onychocella subpyriformis (d'Archiac), 1846	x	x	x	x	x	x
Orbitulipora petiolus Lonsdale, 1850	x		x			
Perigastrella granulata Zágoršek , 1994					x	
Perigastrella oscitans Canu & Bassler, 1920						x
Perigastrella serrulata (Reuss), 1848						x
Phylactellipora tubiceps (Reuss), 1866				x		
Porella denticulata (Stoliczka), 1864			x			
Poricellaria complicata (Reuss), 1869				x		
Porina coronata (Reuss), 1848	x	x	x	x	x	x
Porina duplicata (Reuss), 1869		x			x	
Porina labrosa (Reuss), 1848	x	x	x		x	
Ramphonotus appendiculata (Reuss), 1848			x	x		
Ramphonotus monopora (Reuss), 1869		x			x	x
Reteporella tamaninii Braga, 1980	x					
Reussia regularis (Reuss), 1866	x	x	x	x	x	x
Rhamphostomella brendolensis Waters, 1891		x	x	x		
Rosseliana rosselii (Adouin), 1826		x	x		x	
Schizoporella bisulca (Reuss), 1869		x	x			
Schizoporella nodulifera (Reuss), 1869		x	x			x
Schizoporella scrobiculata (Reuss), 1848		x			x	x
Scrupocellaria brendolensis Waters, 1891		x	x	x	x	
Scrupocellaria gracilis Reuss, 1869	x	x	x	x		x
Scrupocellaria montecchiensis Waters, 1891		x	x			
Sertella simplex (Busk), 1859		x	x		x	x
Sertella tuberculata (Reuss), 1869	x	x	x		x	x
Smittina cervicornis (Pallas), 1766					x	x
Smittina concinna (Busk), 1854					x	
Smittistoma mortisaga (Stoliczka), 1862				x		
Sparsiporina elegans (Reuss), 1848	x	x	x	x	x	
Stamenocella midwayanica Canu & Bassler, 1917		x	x			
Steginoporella firma (Reuss), 1868		x				
Steginoporella haidingeri (Reuss), 1848	x	x	x		x	x
Steginoporella montenati Dav. & Pouyet, 1972						x
Stenosipora protecta (Koschinsky), 1885	x	x			x	
Stenosipora reussi Stoliczka, 1862	x	x	x			x
Tubucella gibbosa Canu & Bessler, 1920						x
Tubucella papillosa (Reuss), 1848	x	x	x	x	x	x
Vibracella pachyderma (Reuss), 1848						x
Vibracella trapezoidea (Reuss), 1848	x	x	x	x	x	x
Vincularia fragilis Defrance, 1820		x	x			
Vincularia subsymmetrica (Canu), 1907		x				

Legenda: ST = Southern Trentino (Monte Baldo, Brentonico, Val di Gresta); LE = Lessini Mt. (Priabona, Val di Lonte, Montecchio Maggiore, Bressana, Boro-Granella); BE = Berici Mt. (Brendola, Monteccio di Costozza, Toara); TR = W. Trevigiano (Possagno); CS = W. Carpathian Mt. (Liptov, and Raje basin - Slovakia; Hybica, Partizanska Lupca, Vychodna and Rajeche, Teplice); CH = W. Carpathian Mt. Hungary (Buda, hills: Matyashegy).

In the Table 1 are listed all the species belonging to different areas. From an updated taxonomic revision, made with the close supervision of two of the Authors (Gp.B. & K.Z.), it appears that there are 148 valid species (97 Cheilostomata and 51 Cyclostomata). In former times was made a similar study on comparison among the Bryofaunas of the N.E.Italy, Hungary and Transylvania (Ghiurca & Mongereau,1981), and the whole number of the species appears higher than our figure. A careful reading of this list shows a lot of synonymic species, especially owing to preliminary revision of Reuss' material stored in the Natur Historische Museum Wien (Braga, 1991).

The affinities among the Bryofaunas of Venetia sequences are very remarkable, but it is significant also between the Southalpine and Carparthian basins.

To confirm these considerations we compare all Upper Eocene faunas using the Kojumdgieva similarity test. The similarity coefficient K is calculated as follow : K =(Ca% + Cb%)/2 in which Ca% = C/A x 100 and Cb% = C/B x 100 where A = number of species from locality a, B = number of species from locality b and C = number of species common between a and b.

	ST	LE	B E	TR	CS	CH
ST	—	59.7	53.7	58.9	50.8	47.3
LE	59.7	—	80.0	53.2	56.7	55.4
BE	53.7	80.0	—	51.9	54.6	51.0
TR	58.9	53.2	51.8	—	49.2	42.2
CS	50.8	56.7	54.6	49.2	—	54.7
CH	47.3	55.4	51.0	42.2	54.7	—

Tab. 2 - Comparison of Bryozoan Priabonian faunas between Veneto Region (N.E.Italy) and Western Carpathian (Slovakia and Hungary), using the Kojumdgieva similarity test.

In the table 2 we can see the resulting figures that are very significant (more than 50). Only the values which compare the faraway basins are lower but still high (one K value between 30 to 50 is good).

The Eocene Paleogeography relations

Between the Southern Alps and Hungary : there was direct marine connections between them (Kázmer & Kovacs,1985).

Between Hungary and the 'Central Carpathian Paleogene in Slovakia : the latter was a «flysch» basin; although there was more or less permanent marine connection between the two basins, these were not as straightforward than towards the Southern Alps. A kind of mountain chain, or rather a range of islands separated the Hungarian and the Slovakian Paleogene basins. Probably there were narrow passages between the islands (figs 2 and 3).

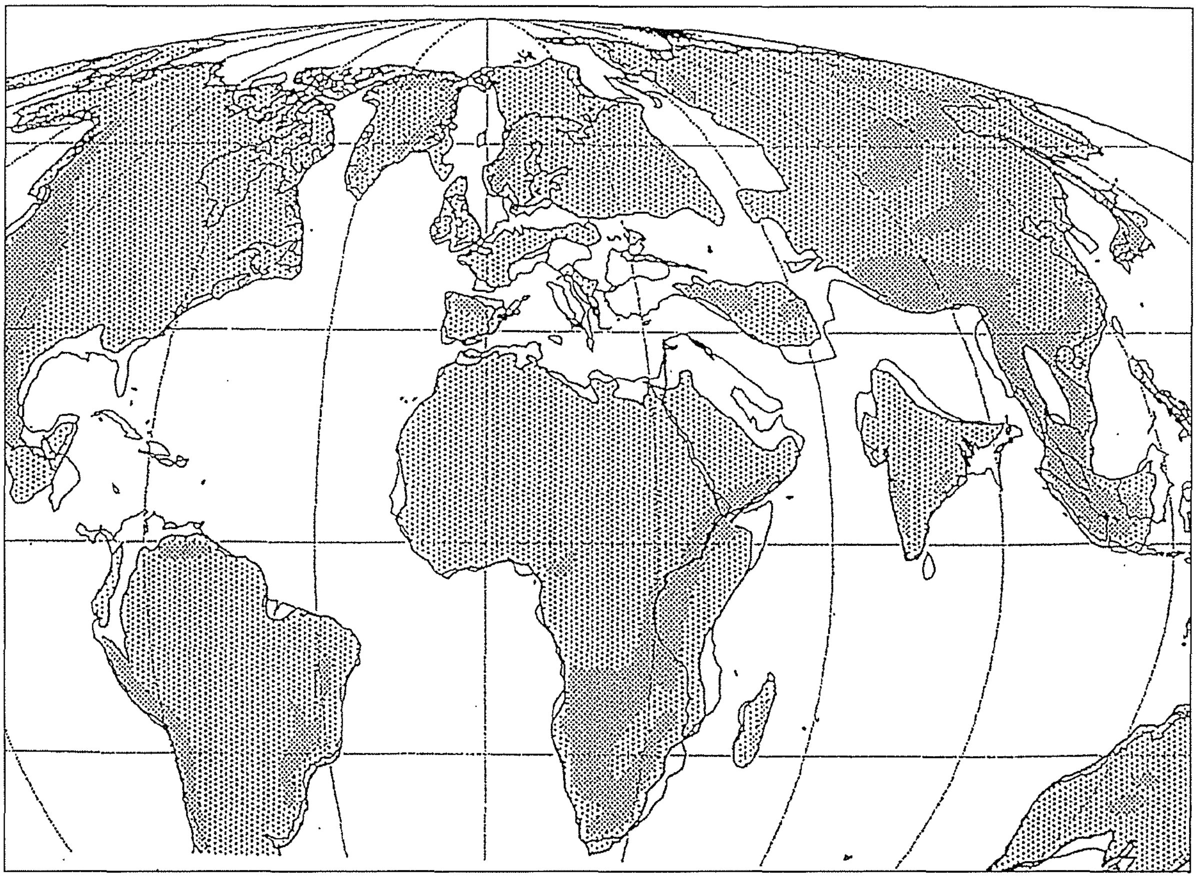

Fig. 3 - The tethyan coastlines in the Priabonian epoch (37 Ma). From A.G.Smith,D.G.Smith and B.M.Funnel (1994) - Atlas of Mesozoic and Cenozoic coastlines, Cambridge University Press.

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