

ZÁPADNÉ KARPATY

SÉRIA

paleontológia 4

GEOLOGICKÝ ÚSTAV DIONÝZA ŠTÚRA, BRATISLAVA 1979

Západné Karpaty
séria
paleontológia 4

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Mária Kochanová

Die Bivalven des Jura der Vršatec-Klippe

4 Taf. (I–IV), 1 Text–Abb., slovakisches Resümee

Abstract. The paper deals with the macrofauna of Bivalvia, which was found in the klippen of Vršatec in the Váh valley. From the stratigraphical point of view there should be mentioned quite a rich association from the pink crinoidal limestones Bathonian – Lower Callovian? in age, with *Bositra buchii* (Roemer), *Propeamussium* (*Parvamussium*) *pumilum* (Lamarck), *Chlamys* (*Chlamys*) *ambigua* (Münster), *Eopecten tegulatus* (Morris and Lycett), *Spondylopecten subspinosus* (Schlotheim) and a new species *Ctenostreon vrsateciensis*, as well as the species from the white, Oxfordian bioherm limestones with *Chlamys* (*Chl.*) *subarticulata* (Orbigny), *Chlamys* (*Chl.*) aff. *nattheimensis* (Loriol), *Spondylopecten cardinatus* (Quenstedt) and *Plagiostoma* aff. *mutabilis* (Arkell).

Bei den eingehenden sedimentologischen, mikrofaziellen und biostratigraphischen Untersuchungen der jurassischen Sedimente der Czorsztyner – Serie auf der Vršatec-Klippe im Waagtale konnte auch ein reichliches Material von Brachiopoden, Bivalven, Korallen und Aptychen gesammelt werden. In dieser Arbeit wird die biostratigraphische Bearbeitung der Bivalven aus diesem Gebiet vorgelegt.

Die Fundstellen der Vršatec-Klippe

Einheitshalber benützen wir dieselbe numerische Bezeichnung der Bivalven – Fundstellen und grobe lithofazielle Charakteristik der Gesteine, die auch M. Mišík in der Arbeit „Sedimentologische und mikrofazielle Studien des Jura der Vršatec-Klippe“ (im Druck) verwendet hat. Es handelt sich um sieben Lokalitäten, auf welchen die Bivalven in Vergesellschaftung mit Brachiopoden oder Korallen vorkommen.

Die Fundstellen 7 und 17 befinden sich im violettrosafarbigem feinkörnigen Kalkstein vom Alter Bath – ?Kallovien.

Auf der Lokalität 22 tritt weisser Biohermkalk mit Korallen und Kalkschwämmen des Oxfordiens auf.

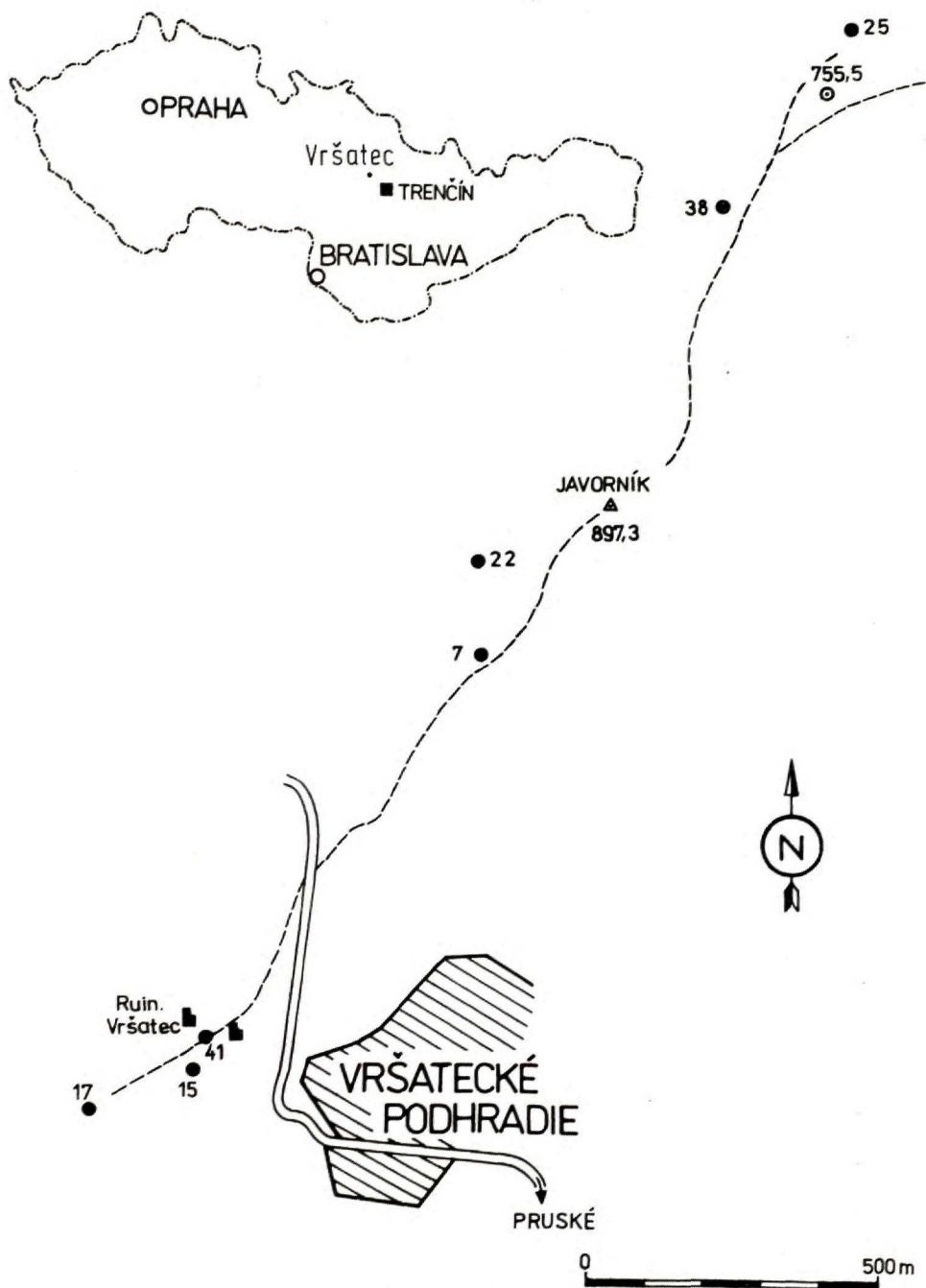


Abb. 1. Fundstellen von Bivalven der Vršatec-Klippe.

Die Fundstellen 25, 38, 41 kommen im rosafarbenen und grauen biohermnahen oft brekziösen Kalke des Kallovien – Oxfordiens vor.

Lokalität 15 befindet sich in der Schichtfolge von weissem, creme- und rosafarbigem Kalke des Tithons.

Der Erhaltungszustand der Bivalven von Vršatec lässt manches übrig zu wünschen. Mehrere Exemplare sind nur als beschädigte oder unvollständige Valven ohne obere Schalenschicht, oder mit verwitterter Oberfläche erhalten geblieben.

In der Arbeit werden die folgenden Abkürzungen benützt:

H – Höhe, L – Länge, SchW – Scheitelwinkel, Ls – Länge des Schlossrandes, RV – rechte Valve, LV – linke Valve.

Auf dieser Stelle sei verbindlichst gedankt Herren Prof. Dr. M. Mišík, Dr. M. Siblík und Dr. M. Sýkora für das Bivalven-Material.

Systematische Beschreibung

Pterioida – Pectinacea

Posidoniidae Frech, 1909

Bositra de Gregorio, 1886

Bositra buchii (Roemer, 1836)

Taf. II, Fig. 6

1836 *Posidonia Buchii* Nob. – F. A. Roemer, p. 81, tab. 4, fig. 8.

1852 *Posidonia ornat*i; sp. n. – F. A. Quenstedt, tab. 61, fig. 13.

1956 *Posidonomia alpina* Gras – M. Książkiewicz, p. 184, tab. 20, fig. 10, 11.

1965 *Bositra buchii* (Roemer) – L. R. Cox, p. 50, tab. 6, fig. 1 (cum syn.)

Material: Eine linke Valve mit durch Gestein bedeckter Wirbelregion und ein Bruchstück der rechten Valve. Beiden fehlt die obere Schalenschicht.

Masse: H – cca 8 mm, L – 10 mm

Beschreibung: Kleine Klappen von querovalen Umriss sind in der Hinterregion horizontal gestreckt und erweitert. Der gespitzte Wirbel ist etwas exzentrisch und vor der Schalenmitte gelegen. Die Oberfläche ist mit konzentrischen Streifen bedeckt.

Bemerkungen: Auf Grund des unvollständigen Erhaltungszustandes der vorliegenden Exemplare ist der gerade Schlossrand nicht bemerkbar. Durch die konzentrische Skulptur, welche in der Wirbelregion gröber, bei dem äusseren Umfang feiner aber dichter wird, sowie auch durch die Gesamtform sind sie mit dem bei L. Guillaum (1928, Taf. 10 Fig. 8) unter dem Namen *Posidonia alpina* abgebildeten Individuum identisch. Mit diesem Namen wurden bisher alle aus den Westkarpaten stammende Exemplare bezeichnet.

Stratigraphische und geographische Verbreitung: Toarcien bis oberes

Kallovien von Deutschland, Frankreich, Polen, der Südalpen, des Balkan, von Georgien, des Kaukasus, von Ostafrika, Madagaskar, Ostindien und Südamerika.

Vorkommen: Fundstelle 17 – violettrosafarbiger Krinoidenkalk des Bath – ? Kalloviens.

Sonstige Vorkommen in den Westkarpaten. Dogger: Kostelec, Kleine Karpaten, Rote Magura, Zvolen-Bergland, Humenné-Gebirge und Inovec-Gebirge.

Oxytomidae Ichikawa, 1958

Oxytoma Meek, 1864,

Oxytoma (Oxytoma) inequivalvis (Sowerby, 1819)

Taf. I, II, Fig. 4

1819 *Avicula inequivalvis*.; sp. n. – J. Sowerby, p. 78, tab. 244, fig. 2.

1901 *Avicula (Oxytoma) inaequivalvis* Sowerby – L. Waagen, p. 1, tab. 1, fig. 12, 13.

1940 *Oxytoma inequivalve* (J. Sowerby) – L. R. Cox, p. 47 – 48, tab. 5, fig. 7.

Material: Acht unvollständige oder verwitterte Steinkerne der linken Valve ohne Vorderohr.

Masse: H – 5,5 mm, L – 6 mm, H – 12 mm, L – ?, H – 20 mm, L – ?

Bemerkungen: Individuen die zum Formenkreis der *Oxytoma inequivalvis* gehören, sind durch grosse Variabilität in der Aufwölbung der linken Klappe, in der Form des Hinterohres und seiner Absonderung von dem Schalenkörper, sowie auch im Gesamtcharakter der Oberflächenskulptur gekennzeichnet. Dazu tritt noch der Umstand, dass die stratigraphische Reichweite dieser Art sich vom Rhaet bis Unterkreide erstreckt.

Verschiedene Autoren haben zu den erwähnten Gegebenheiten verschiedene Stellungnahmen eingenommen und versuchten diese Unterschiede durch einen beigefügten Varietätsnamen auszudrücken. Nach Meinung von L. Waagen (1902, S. 13 – 24) gibt es 5 Varietäten von *Oxytoma inequivalvis*, von welchen die Mehrzahl in zwei oder auch drei verschiedenen oft voneinander entfernten stratigraphischen Stufen vorkommt. Ähnlicherweise erachtet Varietäten im Rahmen der Art *Oxytoma inequivalvis* auch S. Gillet (1924). Ihrer Ansicht nach können manche dieser Varietäten in denselben stratigraphischen Stufen vorkommen, sie gibt aber zu, dass einige doch für die bestimmte Stufen kennzeichnend sind. L. R. Cox (1940, S. 99) vertritt die Meinung, dass Formen, die sich in der Skulptur oder anderen charakteristischen Merkmalen unterscheiden und sind mit bestimmten Altersstufen verknüpft, sollen auch als selbstständige Arten betrachtet werden.

Was die beschriebenen Exemplare betrifft, sie stellen überwiegend gewölbte, zu den Seitenrändern steil abfallende Formen mit einem von dem Schalenkörper deutlich abgesetztem Hinterohr vor. Es ist ziemlich schmal, am Rande ausgebuchtet,

in eine Spitze auslaufend und auf der Oberfläche mit Radiallinien bedeckt. In der ziemlich verwischten Skulptur des Schalenkörpers, kann man feststellen, dass die Sekundärrippen den Charakter der primären haben. Ihre Intercostalfurchen sind mit haarfeinen Radiallinien ausgefüllt, von denen die mittlere etwas stärker ist. Sie stimmen mit der Art *Oxytoma (Oxytoma) muensteri* (Godfuss) überein, wie sie bei K. Ichikawa (1957, Taf. 24, Fig. 5, 6) abgebildet wurde. Diese Art wird aber von L. R. Cox (1940, S. 96 und 1969, S. N 344) als Synonymum von *Oxytoma (O.) inequivalvis* (Sow.) betrachtet.

Stratigraphische und geographische Verbreitung: Jura von England, Deutschland, Österreich, der Schweiz, von Italien, Schweden, Somalien, Tanganiika und Georgien.

Vorkommen: Fundstellen 7 und 17 – violettrosafarbiger Krinoidenkalk des Bath – ? Kalloviens.

Sonstige Vorkommen in den Westkarpaten. Unterlias bis Dogger: Kleine Karpaten, Inovec-Gebirge, Strážov-Gebirge Grosse Fatra und Humenné-Gebirge.

Meleagrinnella Whitefield, 1885

Meleagrinnella cf. *echinata* (Smith, 1817)

1817 *Avicula echinata* – Smith, P. 67 (non vidi; fide Cox, 1940).

1888 *Pseudomonotis echinata* Smith sp. – O. Schlippe, p. 138 – 139.

1940 *Echinotis echinata* (W. Smith) – L. R. Cox, p. 92 – 96, tab. 6, fig. 2 – 7 (cum syn.).

1965 *Meleagrinnella echinata* (Smith) – L. R. Cox, p. 48.

Material: Zwei linke Valven ohne obere Schalenschicht.

Masse: H – 5 mm, L – 5 mm, H – 8 mm, L – 8 mm.

Bemerkungen: Die Vertreter der Art *Meleagrinnella echinata* zeichnen sich durch eine gewisse Variabilität aus, und zwar im Umriss, in der Wölbung der Valven und in der Oberflächenskulptur. Die Exemplare aus dem Material von Vršatec sind schiefoval, beträchtlich gewölbt, ihr Hinterrand steil abfallend. Der kräftige etwas exzentrische Wirbel ist über die Schlosslinie geneigt, die zum Grossteil vom oberen Rande des Hinterohres gebildet wird. In der Wirbelregion können mit der Hilfe einer Lupe schwache Spuren von etwas 17 aus dem Wirbel ausgehenden Radialrippen beobachtet werden. In einigen Intercostalfurchen ist noch eine schwache Schaltrippe erkennbar. Die konzentrischen Elemente der Skulptur, wie Anwachslienien und Schuppen auf der Radialrippen, können nicht beobachtet werden. Wo die obere Schalenschicht fehlt, verschwindet jede Spur von der Skulptur und die Schalenoberfläche wird glatt.

Die beschriebenen Formen sehen der zitierten Abbildung No 7 von L. R. Cox sehr ähnlich.

Stratigraphische und geographische Verbreitung: Bajocien – Kalkovien von England, Frankreich, Deutschland, der Schweiz, Sowjetunion, von Polen, Zentralasien, Ostafrika und Neu-Seeland.

Vorkommen: Fundstelle 17 – violettrosafarbiger Krinoidenkalk des Bath – ? Kalkoviens.

Pectinidae Rafinesque, 1815

Propeamussium (*Parvamussium*) Sacco, 1897

Propeamussium (*Parvamussium*) *pumilum* (Lamarck, 1819)

Taf. I, Fig 10, 11

1819 *Pecten pumilus* Lamarck, p. 183 (non vidi; fide C. Dechaseaux).

1936 *Variamussium pumilus* Lamarck – C. Dechaseaux, p. 65, (cum syn.)

1956 *Variamussium pumilum* (Lam.) – K. Książkiewicz, p. 170, tab. 19, fig. 6.

Material: Sieben rechte und sieben linke unvollständige Valven.

Masse: LV H – 9 mm, L – 9 mm, H – 8 mm, L – 8 mm,

H – 7,5 mm, L – 6,5 mm

RV H – 8 mm, L – 7 mm.

Beschreibung: Die Schalen sind klein, die Mittelregion der linken ist mehr gewölbt als der rechten. Die Ohren sind ungleich, das vordere grösser. Die Skulptur der beiden Valven ist unterschiedlich. Auf der linken Schale ist sie durch radiale, nicht regelmässig alternierende Primär- und eingeschaltete Sekundärrippen, die nicht an Wirbel herangehen, vertreten. Beim Hinterrande sind die linken Valven etwas vertieft. Die Radialrippen in diesem Teil sind dichter und gleichmässiger. Die Anwachsstreifen sind schwach und kaum sichtbar. Die Oberfläche der rechten Schalen ist glatt, vereinzelt mit Spuren von dichten konzentrischen Anwachslinien. Als wichtigstes kennzeichnendes Merkmal dieser Art treten 11 innere flache, gleichmässig verteilte Radialrippen vor, welche nicht bis zum Unterrand reichen.

Bemerkungen: Die vorliegenden, oben beschriebenen Exemplare besitzen alle Kennzeichen der Art, die lange unter dem Namen *Variamussium pumilum* (Lam.) bekannt wurde. Nach neuen im Treatise (1969, SN350) angeführten taxonomischen Angaben, gehört *Variamussium* als Untergattung *Parvamussium* der Gattung *Propeamussium* an.

Stratigraphische und geographische Verbreitung: Toarcien bis Bathonien von Deutschland, Frankreich, Belgien, England und Polen.

Vorkommen: Fundstelle 17 – violettrosafarbiger Krinoidenkalk des Bath – ? Kalkoviens.

Sonstige Vorkommen in den Westkarpaten. Bath: Rote Magura.

Camptonectes Agassiz in Meek, 1864

Camptonectes (*Camptonectes*) cf. *lens* (Sowerby, 1821)

Taf. I, Fig. 5

1821 *Pecten lens*.; sp. n. – J. Sowerby, p. 3, tab. 205, fig. 2, 3.

1936 *Camptonectes lens* Sowerby – C. Dechaseaux, p. 30, tab. 4, fig. 9, 11, 14 (cum syn.).

Material: Sechs rechte Valven ohne Hinterohr und obere Schalenschicht und ein Fragment mit der oberen Schalenschicht.

Masse: H – 26 mm, L – 23 mm, H – 15 mm, L – 13 mm.

Beschreibung: In der Gesamtform der Schalen und des rechten Vorderohres sind sie mit den Vertretern der Gattung *Chlamys* identisch. Mit der Ausnahme eines kleinen Schalenteiles mit feinen konzentrischen Anwachslineien ist die Schalenoberfläche glatt.

Bemerkungen: Die exakte artliche Bestimmung der uns zur Verfügung stehenden Individuen wurde dadurch erschwert, dass ausser der oben erwähnten, keine verlässliche kennzeichnende Merkmale vorhanden sind. Keiner der Exemplare besitzt die typische sehr feine fächerartig verteilte Radialskulptur. Nur auf dem Fragment mit der erhaltenen Schalenoberfläche tritt bei der Anwendung einer Lupe eine dichte Punktierung zum Vorschein. In der Gestalt und glatten Oberfläche stimmen unsere Exemplare mit der zitierten Abbildung von C. Dechaseaux (Fig. 9) überein. Nach ihren Angaben, im Falle dass die obere Schalenschicht fehlt, besteht die Oberflächenskulptur nur aus konzentrischen Streifen.

Stratigraphische und geographische Verbreitung: Aalenien bis Oxfordien von England, Frankreich, Deutschland, Polen und Georgien.

Vorkommen: Fundstelle 17 – violettrosafarbiger Krinoidenkalk des Bath – ?Kalloviens.

Chlamys Röding, 1798

Chlamys (*Chlamys*) *ambigua* (Münster, 1834)

Taf. II, Fig. 2, 3, 5

1834 *Pecten ambiguus* Münster – G. v. Münster in Goldfuss, p. 46, tab. 90, fig. 5a, b.

1936 *Chlamys ambiguus* Münster – C. Dechaseaux, p. 14, tab. 2, fig. 2, tab. 3, fig. 1 (cum syn.).

Material: Grösstenteils unvollständige Steinkerne von sieben rechten und acht linken Valven.

Masse: LV H – 26 mm, L – 22,5 mm, SchW – 86°

H – 15,5 mm, L – 13 mm, SchW – 83°

RV H – 23,5 mm, L – 19,5 mm, SchW – 86°

Beschreibung: Bei der überwiegend kleinen, im mittleren Teil gewölbten Schalen übertrifft die Höhe die Länge. Die Ohren sind ungleich, das Vorderohr ist grösser und auf der rechten Valve mit einem Byssusausschnitt versehen. Die Schalenoberfläche ist mit Radialrippen bedeckt, welche auf der rechten Klappe paarweise angeordnet sind und ihre Gesamtzahl ist etwa 30. Die Rippenzahl der linken Valve bewegt sich um 24, wobei 5 bis 6 etwas schwächer sind. Durch dichte Anwachsstreifen sind auf den Rippen Schuppen hervorgerufen.

Bemerkungen: Die beschriebenen Exemplare sind mit der zitierten Abbildung Münster's identisch, die Schuppen auf den Radialrippen können nur auf den erhaltenen Fragmenten der oberen Schalenschicht der rechten Klappen beobachtet werden. Die übrigen Rippen sind glatt.

Stratigraphische und geographische Verbreitung: Aalenien bis Kallovién von Deutschland, Belgien, Frankreich und England.

Vorkommen: Fundstellen 7 und 17 – violettrosafarbiger Krinoidenkalk des Bath – ?Kalloviens.

Sonstige Vorkommen in den Westkarpaten. Dogger: Humenné-Gebirge.

Chlamys (Chlamys) subarticulata (d'Orbigny, 1850)

Taf. III, Fig. 3

1850 *Pecten subarticulatus*, d'Orb. – A. d'Orbigny, p. 22.

1892 *Pecten subarticulatus*, d'Orbigny – P. de Loriol, p. 303–304, tab. 32, fig. 16 – 17.

1936 *Chlamys subarticulatus* d'Orbigny – C. Dechaseaux, p. 21 – 22, tab. 3, fig. 5, 6 (cum syn.).

Material: Zwei beim Unterrande beschädigte rechte Valven mit fragmentarisch erhaltenem Vorderohr und ohne obere Schalenschicht, und ein Schalenbruchstück.

Masse: H – 48 mm, L – 42 mm, SchW – 85 °

H – 38 mm, L – ?, SchW – 85 °

Beschreibung: Die Valven werden von einem geraden hinteren, etwas vertieften vorderen und abgerundeten unteren Rande begrenzt. Die Schalenwölbung ist geringfügig, und der Wirbel liegt in der Schalenmitte. Die Ohren sind verhältnismässig gross, besonders das vordere Byssusohr. Die Oberflächenskulptur besteht aus etwa 20 aus dem Wirbel ausgehenden Radialrippen. Zum Unterrand werden sie breiter, und wenn die obere Schalenschicht fehlt, werden sie gerundet. Im Falle dass diese erhalten ist, sind sie dachförmig. Die Rippen und die Interkostalfurchen sind gleich breit und unter der Lupe sind sowohl auf den Rippen als auch in den Zwischenräumen Spuren von dichten Anwachslamellen bemerkbar. Auf den Ohren fehlt die Skulptur mit Ausnahme des unteren Teiles des Vorderohres beim grösseren der beschriebenen Individuen, wo sie aus senkrechten Lamellen besteht.

Bemerkungen: Die vorliegenden Exemplare stimmen mit der zitierten Abbildung von P. Loriol überein, nur die Schuppen auf den Rippen, auf welchen die obere Schalenschicht fehlt, sind nicht mehr bemerkbar.

Stratigraphische und geographische Verbreitung: Oxfordien in Frankreich.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Chlamys (Chlamys) cf. dewalqueijurensis (Riche, 1893)

Taf. I, II, Fig. 7

1893 *Pecten (Chlamys) Dewalquei* var. *Jurensis* – A. Riche, p. 97, tab. 1, fig. 17 – 18.

1904 *Pecten (Chlamys) Jurensis* – A. Riche, p. 182 – 183, tab. 8, fig. 2 (non vidi; fide C. Dechaseaux).

1936 *Chlamys Dewalquei* var. *Jurensis* Riche – C. Dechaseaux, p. 16, tab. 2, fig. 3.

Material: Zwei unvollständige linke Valven ohne obere Schalenschicht.

Beschreibung: Imfolge des ungünstigen Erhaltungszustandes können weder die Dimensionen noch der Umriss der Schalen angegeben werden. Sie sind in der Mittelregion gewölbt und das Vorderohr scheint gross zu sein. Die Oberfläche ist mit 27 Radialrippen bedeckt, deren Mehrzahl bis an den Wirbel herangeht. Die anderen, die in den Zwischenräumen eingeschaltet sind, beginnen im gewissen Abstand vom Wirbel. Die Ohren sind mit markanten Radialrippen und sie kreuzenden Lamellen verziert.

Bemerkungen: Im Vergleich mit der Art *Chlamys (Ch.) dewalqueijurensis*, der die beschriebenen Individuen sehr nahe stehen, unterscheiden sich unsere Formen durch feinere und schuppenlose Radialrippen. Sehr wahrscheinlich ist diese Differenz der fehlenden oberen Schalenschicht zuzuschreiben.

Stratigraphische und geographische Verbreitung: Aalenien bis Bath von Deutschland und Frankreich.

Vorkommen: Fundstelle 7 – violettrosafarbiger Krinoidenkalk des Bath – ?Kalluviens.

Chlamys (Chlamys) cf. subtextoria (Münster in Goldfuss, 1833)

Tab. III, Fig. 5

1833 *Pecten subtextorius* Münster – A. Goldfuss, p. 48, tab. 90, fig. 11.

1936 *Chlamys subtextorius* Goldfuss – C. Dechaseaux, p. 19 – 20, tab. 3, fig. 2 (cum syn.).

1965 *Chlamys subtextoria* (Münster) – L. R. Cox, p. 55 – 56, tab. 7, fig. 8 (cum syn.).

Material: Eine im vorderen Teil beschädigte rechte Valve ohne Wirbel und Ohren und mit ziemlich verwitterter Schalenoberfläche.

Beschreibung: Der Schalenriss scheint die Form eines in die Höhe gestreckten Dreiecks zu besitzen. Die Schale ist flach und auf der Oberfläche mit radialen, stellenweise paarig angeordneten Rippen bedeckt. Ihre Gesamtzahl ist etwa 36. Sie

sind schmal aber ausgeprägt und durch tiefe, schmalere Zwischenräume voneinander getrennt. Wo die obere Schalenschicht durch die Verwitterung weniger beschädigt ist, können auf den Rippen dichte Schuppen und in den Zwischenfurchen konzentrische Lamellen beobachtet werden.

Bemerkungen: Die Exemplare vom Vršatec erinnern an die Art *Chlamys* (*Ch.*) *etiveyensis* (Loriol). Als Unterscheidungsmerkmal treten bei ihnen schmalere Radialrippen und in den Intercostalfurchen Anwachslineen vor. Nach den Angaben von C. Dechaseaux (1936, S. 19) sollen solche Formen eher als *Chlamys* (*Ch.*) *subtextoria* betrachtet werden.

Stratigraphische und geographische Verbreitung: Kallovien bis Oxfordien von Deutschland, Frankreich und Tanganika.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Chlamys (*Chlamys*) aff. *nattheimensis* (Loriol, 1894)

Taf. III, Fig. 6

1894 *Pecten* cfr. *nattheimensis*, P. de Loriol. – P. de Loriol, p. 52–53, tab. 6, fig. 4–6.

1931 *Chlamys* (*Chlamys*) *nattheimensis* (de Loriol). – W. J. Arkell, p. 104–107, tab. 10, fig. 6–8.

1936 *Chlamys Nattheimensis* de Loriol. – C. Dechaseaux, p. 22–23, tab. 3, fig. 7 (cum syn.).

Material: Eine beschädigte linke Valve ohne das Hinterohr, stellenweise mit stark verwitterter Oberfläche.

Masse: H – 71 mm, L – 763 mm.

Beschreibung: Die ziemlich grosse, nicht übermässig gewölbte Schale mit breitem halbkreisförmigem Unterrande hat ein deutlich abgesetztes Hinterohr. Die Oberflächenskulptur besteht aus etwa 25 radialen vom Wirbel ausgehenden und die ganze Oberfläche gleichmässig bedeckenden Rippen. Sie sind hoch, abgerundet mit tiefen Zwischenfurchen, welche im unteren Schalendrittel doppelt so breit sind wie die Rippen. In einiger dieser Furchen befindet sich je eine schwächere Einschaltrippe, besonders im vorderen Teil. Die konzentrische Skulptur besteht aus den Anwachsstreifen, welche auf den Rippen in regelmässigen Abständen deutliche Schuppen bilden. In den Intercostalfurchen kommen sie in der Form von zum Palealrand gekrümmten Anwachslineen vor. Die Ohrenskulptur fehlt völlig.

Bemerkungen: Inwieweit es nach der Abbildung beurteilt werden kann, gleicht das beschriebene Exemplar der zitierten Abbildung J. Arkell's, nur es scheint insbesondere beim Unterrande breiter zu sein.

Stratigraphische und geographische Verbreitung: Kallovien bis Oxfordien von Frankreich, England, Deutschland und Georgien.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Chlamys (Aequipecten) Fischer, 1886

Chlamys (Aequipecten) sp. (ex *Gr. minerva* Orbigny, 1850)

Taf. III, Fig. 4

Material: Eine linke Valve mit nur im oberen Teil erhaltener oberer Schalenschicht.

Masse: H – 7 mm, L – 7 mm.

Beschreibung: Die kleine Schale mit leicht konkaven Seitenrändern und gerundetem Unterrand ist in der Mittelregion gewölbt und ihr zentral liegender Wirbel ragt nicht über die Schlosslinie heraus. Diese ist im Verhältnis zu den Dimensionen der Schale lang und wird vom Oberrande der Ohren gebildet. Die Oberflächenskulptur ist erst unter der Lupe bemerkbar. Sie besteht aus feinen, dichten bis zum Wirbel reichenden Radialrippen, welche durch schmale linienartige Intercostalfurchen getrennt sind. Sieben dieser Rippen sind stärker, über andere hervorragend. Wie erwähnt, die ganze Oberfläche ist mit Radialrippen bedeckt, mit Ausnahme des Hinterrandes, wo sich eine mit dichten, feinen Querlinien verzierte „Area“ erkennen lässt. Einige Radialrippen befinden sich auch auf dem Hinterohr.

Bemerkungen: Das beschriebene Individuum ist in der Gesamtform, Skulptur und den Massen der Art *Chlamys (Aequipecten) minerva* (Orbigny) meist ähnlich. Der Hauptunterschied besteht in der Rippenzahl. Beim Exemplar von Vršatec sind es kaum 50, dagegen bei *Chlamys (Ae.) minerva* zählt man 60 – 65 Radialrippen. Dazu kommt noch der Mangel an konzentrische Skulptur, die auf den hervortretenden Rippen bei *Ch. (Ae.) minerva* schuppenartige Bildungen verursacht. Auf die Aufstellung einer neuen Art wurde auf Grund eines nicht befriedigenden Erhaltungszustandes verzichtet.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Spondylopecten Roeder, 1882

Spondylopecten cardinatus (Quenstedt, 1858)

Taf. IV, Fig. 1 – 3

1858 *Pecten cardinatus*; sp. n. – F. Quenstedt, p. 627–628, tab. 78, fig. 1.

1926 *Spondylopecten cardinatus* Quenstedt – K. Staechse, p. 110.

Material: Zehn linke und fünf rechte unvollständige Valven, welchen grösstenteils die obere Schalenschicht fehlt. Ausnahmsweise sind Fragmente der Ohren erhalten.

Beschreibung: Beide Schalen sind symmetrisch, ziemlich stark gewölbt, fast kugelförmig. Beiderseits des Wirbels befinden sich deutlich abgesetzte Ohren, das

vordere scheint mit einem Byssusausschnitt versehen zu sein. Am Hinterrande ist eine quer verzierte „Area“ vorhanden. Die Schalenoberfläche ist mit etwa 45 dichten, gleichmässig verteilten Radialrippen bedeckt, welche durch schmale Inter-costalfurchen getrennt sind. Da die obere Schalenschicht überwiegend verwittert ist oder fehlt, kommt die konzentrische Skulptur nur auf einem kleinen Bruchstück zum Vorschein. Sie ist unter einem Vergrösserungsglas als kleine Zähnchen auf den Rippen wahrnehmbar.

Bemerkungen : Die vorliegenden Exemplare sind mit Ausnahme der fehlenden konzentrischen Skulptur, völlig mit der zitierten Abbildung von F. Quenstedt identisch. In der Form ähneln sie auch der Art *Spondylopecten globosus* (Quenstedt), die aber in der Oberflächenskulptur eine grössere Zahl der Radialrippen, und zwar etwa 60 besitzt.

Stratigraphische und geographische Verbreitung ; Oxfordien bis Kimmeridgien von Deutschland, und der Böhmisches Masse (Šternberk).

Vorkommen. Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Spondylopecten subspinosus (Schlotheim, 1820)

Taf. I, Fig. 6, 8

1820 *Pectinites subspinosus*. ; sp. n. – E. F. Schlotheim, p. 223 – 224.

1926 *Spondylopecten subspinosus* Schlotheim – K. Staechse, p. 107–108, tab. 4, fig. 9.

1952 *Chlamys (Plesiopecten) subspinosus* (Schlotheim). – L. R. Cox, p. 18–19, tab. 1, fig. 9–12 (cum syn.).

Material : Zwei rechte Klappen, bei einer ist der Unterrand beschädigt. Beiden fehlen die Ohren und die obere Schalenschicht. Die Oberfläche der grösseren Valve ist ziemlich verwittert.

Masse : H – 12 mm, L – 13 mm, H – 10 mm, L – 10 mm.

Beschreibung : Kleine symmetrische Schalen von fächerartiger Form, leicht gewölbt mit einer schmalen „Area“ bei den beiden Seitenrändern. Die Oberfläche ist mit 11–14 gleichmässig verteilten Radialrippen verziert. Die V förmigen Zwischenräume sind annähernd von gleicher Breite wie die Rippen. Auf einigen Rippen sind Spuren von Dornen bemerkbar. In den Inter-costalfurchen ist die konzentrische Skulptur nicht erhalten geblieben.

Bemerkungen : Die Meinungen der Autoren auf die Zahl der Radialrippen bei *Spondylopecten subspinosus* sind unterschiedlich. Während C. Dechaseaux (1936, S. 66), zum Beispiel, 12 Rippen als kennzeichnendes Merkmal dieser Art betrachtet, behaupten L. R. Cox und K. Staechse (1. c.), dass sie von 11 bis 13 schwanken können.

Das eine der beschriebenen Individuen mit 11 Rippen wurde also dieser Kategorie gehören. Das andere, welches 14 Radialrippen besitzt, von denen die erste etwas

schwächer ist, sollte nicht mehr in diese Art eingeordnet werden. Mit Ausnahme der Rippenzahl stimmen aber beide Exemplare von Vršatec völlig überein. Ein Nachteil ist, dass die Ohren, die eventuell ein weiteres Kennzeichen bieten könnten, in beiden Fällen fehlen. Aus den oben erwähnten Gründen betrachten wir vorläufig auch das Individuum mit 14 Radialrippen als *Spondylopecten subspinosus*.

Stratigraphische und geographische Verbreitung: Unterdogger bis Obermalm von Deutschland, Frankreich, England, der Schweiz, des Kaukasus, am Sinai, von Indien und der Böhmisches Masse (Šternberk).

Vorkommen: Fundstelle 17 – violettrosafarbiger Krinoidenkalk des Bath – ?Kalloviens.

Spondylopecten sp. 1

Taf. IV, Fig. 8

Material: Eine unvollständige rechte Valve ohne Wirbel und Hinterohr. Die obere Schalenschicht ist nur bei den beiden Seitenrändern fragmentarisch erhalten.

Masse: H – ?20 mm, L – 23 mm.

Beschreibung: Die Schale mit überwiegender Länge ist in dem mittleren Teil leicht gewölbt und fällt allmählich zu den Rändern ab, so dass sie flacher erscheint als sie tatsächlich ist. Sie ist mit 21 gleichmässig verteilten Radialrippen bedeckt, welche auf der oberen Schalenschicht breit und durch schmale Zwischenräume getrennt sind. Im Falle, dass diese fehlt, werden die Rippen höher und schmaler und die Interkostalfurchen breiter. In der Hinterregion befindet sich eine schmale mit Zuwachsstreifen verzierte „Area“. Zwei Rippen beim Vorderrande tragen Spuren von schwachen Schuppen.

Bemerkungen: Das Exemplar von Vršatec erinnert sehr an die Art *Chlamys* (*Aequipecten*) *palinurus* (Orbigny), wie sie von Cossmann (1924, Taf. 5, Fig. 6) abgebildet wurde und welche J. C. Fischer (1954, S. 18) in die Synonymik der Art *Spondylopecten grossouvrei* (Cossmann) mit der stratigraphischen Reichweite Bajocien – Kalloviens, eingezogen hat. Der Erhaltungszustand des beschriebenen Individuums ermöglicht nicht eine verlässliche Identifizierung dieser Arten.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Spondylopecten sp. 2

Taf. IV, Fig. 4

Material: Eine rechte und eine linke Valve, beide ohne Ohren und obere Schalenschicht. Der vordere Teil und die Wirbelregion sind mit dem Gestein bedeckt.

Beschreibung: Beide Klappen sind in dem mittleren Teil kugelförmig aufge-

wölbt und ihre Wirbel sind stark über die Schlosslinie geneigt. Auf der Oberfläche sind 18 Radialrippen vorhanden, welche durch gleich breite oder etwas breitere Zwischenräume getrennt werden. Ob die Zahl der Rippen vollständig ist, kann nicht festgestellt werden, weil den beiden Valven ein von der Seitenränder fehlt. Auf der kleineren Klappe ist eine hintere „Area“ ohne Radialskulptur vorhanden. Die konzentrische Skulptur hat keine Spur auf den Rippen hinterlassen. Nach dem Erhaltungszustand der Individuen wurde nur ihre gattungsmässige Bestimmung möglich.

Vorkommen : Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Eopecten Douvillé, 1897

Eopecten tegulatus (Morris et Lycett 1853)

Taf. II, Fig. 1

1853 *Hinnites tegulatus*; sp. n. – J. Morris et J. Lycett, p. 14, tab. 2, fig. 3, 3a.

1913 *Avicula jason* d'Orb. – A. Thevenin, p. 161–162, tab. 28, fig. 17–19.

1926 *Velopeten jason* d'Orbigny – K. Staechse, p. 121–122, tab. 5, fig. 3.

1952 *Eopecten tegulatus* (Morris and Lycett) – L. R. Cox, p. 29–31, tab. 3, fig. 5–7 (cum syn.).

1964 *Eopecten tegulatus* (Morris et Lycett) – J. C. Fischer, p. 19–20, text. fig. 5 a – e.

Material: Zwei im verschiedenen Ausmasse beschädigte linke Valven ohne obere Schalenschicht oder mit verwitterter Oberfläche.

Masse: H – 27 mm, L – 26 mm.

Beschreibung: Die Schalen erinnern im ihren gesamten Aussehen sehr an die *Pecten*-Arten. Sie sind in der Wirbelregion mehr oder weniger gewölbt und ihre spitze Wirbel ist zur Schlosslinie geneigt. Das grössere Vorderohr ist als gesenkte Fortsetzung des Schalenkörpers ausgebildet. Das kleinere Hinterohr ist selbstständig, nur als Fragment erhalten. Die ziemlich verwischte Oberflächenskulptur besteht aus zahlreichen Radialrippen, zwischen welchen stärkere primäre und schwächere eingeschaltete sekundäre und tertiäre Rippen unterscheiden werden können. Sie alternieren miteinander und nehmen mit der Entfernung vom Wirbel an der Zahl zu. Einige Rippen treten besonders auf einem der Exemplare stärker hervor. Von der konzentrischen Skulptur sind nur kleine Körner auf dem Vorderohr eines der Individuen erhalten geblieben. Das Hinterohr ist glatt.

Bemerkungen: Die beschriebenen Exemplare, besonders das weniger gewölbte, sind mit der zitierten Abbildung von A. Thevenin fast identisch. Der Unterschied besteht nur darin, dass die Individuen von Vršatec etwas grösser sind und in der Skulptur einzelne Primärrippen mehr hervortreten.

Stratigraphische und geographische Verbreitung: Bajocien bis Uteroxford von England, Deutschland, Frankreich, Polen, Indien und der Schweiz.

Vorkommen: Fundstelle 7-violetrosafarbiger Krinoidenkalk des Bath – ?Kalluviens.

Terquemiidae Cox, 1964

?*Placunopsis* Moriss et Lycett, 1953

?*Placunopsis davaiacensis* Lissajous, 1923

Taf. I, Fig. 9

1923 *Placunopsis davaiacensis* M. Lissajous. – M. Lissajous, p. 150, tab. 29, fig. 19.

Material: Eine beim Unter- und Hinterrande beschädigte linke Valve.

Beschreibung: Auf Grund des ungünstigen Erhaltungszustandes ist der Umriss der Schale unklar. Es kann eine Übereinstimmung zwischen dem beschriebenen Individuum und Abbildung wie auch Beschreibung des Autors der Art festgestellt werden. Das wichtigste kennzeichnende Merkmal, die Skulptur, besteht aus feinen, dichten Anwachslineien, zwischen welchen einige als stärkere über andere hervorragen. Radiale Elemente sind in der Skulptur überhaupt nicht vertreten, was das unterscheidende Kennzeichen gegenüber der Art *Placunopsis oblonga* Laube bildet.

Stratigraphische und geographische Verbreitung: Bath von Frankreich.

Vorkommen: Fundstelle 17 – violettrosafarbiger Krinoidenkalk des Bath – ?Kalloviens.

?*Placunopsis* aff. *tatrica* Zittel, 1870

Taf. IV, Fig. 6

1870 *Placunopsis Tatrica* Zitt. – K. Zittel, p. 124, tab. 36, fig. 24, 25.

1883 *Placunopsis tatrica*, Zittel, – G. Boehm, p. 652 – 653, tab. 70, fig. 12, 13.

Material: Eine linke Valve ohne obere Schalenschicht.

Masse: H – 11,5 mm, L – 11,5 mm.

Beschreibung: Kleine Valve von kreisförmigem Umriss mit zugespitztem, schwach exzentrischem Wirbel. Er ist über die Schlosslinie geneigt, ohne sie zu überragen. Die Schalenoberfläche ist mit etwas unregelmässig verteilten, starken konzentrischen Runzeln verziert.

Bemerkungen: Zum Unterschied von der vom Autor gegebenen Beschreibung der Art ist die linke Klappe des Exemplars von Vrštatec weniger gewölbt. Ähnlicherweise sind die haarfeinen Radiallinien als Komponente der Oberflächen-skulptur nicht vorhanden, was aber möglicherweise dem Fehlen der oberen Schalenschicht zuzuschreiben ist.

Stratigraphische und geographische Verbreitung: Tithon der Westkarpaten (Štramberk und Rogožnik).

Vorkommen: Fundstelle 15-rosafarbiger Kalpionellenkalk des Tithons.

?Placunopsis cf. jurensis (Roemer, 1836)

1836 *Placuna jurensis* Nob. – F. Roemer, p. 66, tab. 16, fig. 4.

1853 *Placunopsis Jurensis*, Roem. Sp. – J. Morris et J. Lycett, p. 6, tab. 1, fig. 8.

Material: Eine linke Valve, derer Oberrand in dem Gestein steckt, und eine in der Hinter- und Unterregion unvollständige rechte Valve.

Masse: H – 5 mm, L – ?.

Beschreibung: Die kleine linke Schale von halbkreisförmigem Umriss ist in der Mittelregion gewölbt. Die Oberfläche ist mit feinen, nur unter der Lupe zum Vorschein tretenden Radialrippen und Zuwachslinien bedeckt, von denen einige mehr ausgeprägt sind. Die rechte, nur in der Wirbelregion gewölbte Klappe wird im ganzen flacher. Der Schlossrand ist ziemlich lang und der köpfchenartige Wirbel ist näher dem Vorderrande gelegen. Die haarfeine radiale Skulptur wird nur bei dem Unterrande ausgeprägter. Einige Anwachsstreifen sind in der Form von Runzeln entwickelt.

Bemerkungen: Die linke Klappe des beschriebenen Exemplars hat grosse Ähnlichkeit mit der Abbildung von I. Lahusen (1883, Taf. I, Fig. 12), nur ist sie etwas kleiner.

Stratigraphische und geographische Verbreitung: Bath – Oxfordien von Deutschland und England.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Limacea

Limidae Rafinesque, 1815

Ctenostreon Eichwald, 1862

Ctenostreon vrsateciensis sp. n.

Taf. I, Fig. 3

Holotypus: Exemplar auf der Taf. I, Fig. 3, Inv. Nr. BP-1, Slg. von GÚDŠ Bratislava.

Derivatio nominis: Nach der geographischen Bezeichnung der Vršatec-Klippe.

Stratum typicum: Violetrosafarbiger Krinoidenkalk des Bath – Kalloviens?

Locus typicus: Vršatec-Klippe, Fundstelle 17 (Östlich von der Burgruine).

Diagnose: Die etwas schiefe leicht gewölbte Valve mit spitzem Wirbel und einem grösseren Hinter- und kleineren Vorderohr. Von den 9 hohen gleichmässig verteilten und durch breite Zwischenräume getrennten Radialrippen ist die erste viel schwächer. Durch konzentrische Lamellen werden auf diesen in bestimmten Abständen Knotten hervorgerufen. Die Skulptur der Ohren besteht aus senkrechten Lamellen.

Material: Eine linke Valve mit beschädigtem Vorderohr.

Masse: H – 31 mm, L – 22 mm, Ls – 14 mm.

Beschreibung: Die leicht und gleichmässig gewölbte, etwas schiefe Schale ist von ovalem Umriss. Sie wird durch den längeren Vorder-, kürzeren Hinter- und gerundeten Unterrand begrenzt. Der schmale prosogyre und nach vorne gerückte Wirbel ragt über die Schlosslinie leicht heraus. Die beiden Ohren, von welchen das vordere kleiner ist, sind als gesenkte Fortsetzungen des Schalenkörpers beiderseits des Wirbels gestaltet. Ihr Oberrand bildet die ziemlich lange gerade Schlosslinie. Die Oberflächenskulptur besteht aus 9 Radialrippen, von welchen die erste beim Vorderrand viel schwächer ist. Am Wirbel sind sie schmal, zum Unterrande werden sie breiter. Sie sind ziemlich hoch, gleichmässig verteilt und werden durch Zwischenräume, die besonders im unteren Schalenteil breit sind, getrennt. Von der konzentrischen Skulptur sind in den Intercostalfurchen Spuren von Lamellen wahrnehmbar, welche an den Kreuzungen mit Radialrippen Knotten hervorrufen. Sie setzen als dichte senkrechte Lamellen auch auf die Ohren fort.

Bemerkungen: Das beschriebene Individuum von Vršatec stimmt in der Rippenzahl mit der Art *Ctenostreon rudis* (Sowerby, 1821, Taf. 214) überein. Diese Art kommt in der Literatur öfters unter dem Namen ihres Synonyms *Ctenostreon luciensis* Orbigny vor, wie sie von M. Thevenin (1913, Taf. 28, Fig. 7, 8) abgebildet wurde. Die neu beschriebene Art unterscheidet sich von den erwähnten Arten wesentlich in der Gesamtform, Schalenwölbung und Form der Rippen.

Vorkommen: Fundstelle 17 – violettrosafarbiger Krinoidenkalk des Bath – ?Kalloviens.

Ctenostreon cf. *alsaticum* (Rollier, 1915)

Taf. IV, Fig. 7

1915 *Ctenostreon Alsaticum*, sp. nov. – L. Rollier, p. 486–488, tab. 32, fig. 1, 1a.

1936 *Ctenostreon alsaticum* Rollier – C. Dechaseaux, p. 44.

Material: Eine unvollständige, ziemlich verwitterte, und in der Wirbelregion beschädigte linke Valve ohne obere Schalenschicht.

Masse: H – 86 mm, L – ?

Beschreibung: Die grosse Schale, derer Gesamtform nicht festgestellt werden kann, ist in der Mittelregion ziemlich gewölbt. Der beschädigte Wirbel scheint stumpf zu sein. Das erhaltene Vorderohr ist im Vergleich zu den Schalen-Dimensionen klein. Aus der Skulptur der Schalenoberfläche sind nur 10 grobe, hervorragende, gerundete und gleichmässig verteilte Radialrippen vorhanden. Die Zwischenräume sind besonders in der Unterregion breiter als die Rippen. Es kann nicht festgestellt werden, ob das rauhe Aussehen der Rippen durch die Dornen oder grobe Schuppen hervorgerufen wurde, weil die konzentrische Skulptur völlig fehlt.

Bemerkungen: Das vorliegende Exemplar erinnert in seinen Massen und sofern die obere Schalenschicht nicht vorhanden ist, auch im Charakter der Skulptur, an die Art *Ctenostreon proboscideum* (Sowerby). Nach der grösseren Schalenwölbung passt es eher zur Art *Ctenostreon alsaticum*.

Stratigraphische und geographische Verbreitung: Oxfordien von Frankreich.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Plagiostoma J. Sowerby, 1814

Plagiostoma aff. *mutabilis* (Arkell, 1926)

Taf. III. Fig. 1, 2

1926 *Lima (Plagiostoma) mutabilis* Arkell, – W. J. Arkell, p. 210, Tab. 20, fig. 1 – 3 (non vidi; fide Arkell 1931).

1931 *Lima (Plagiostoma) mutabilis* Arkell, – W. J. Arkell, p. 130–132, tab. 12, fig. 4, 5, tab. 14, fig. 4 (cum syn.).

Material: Fünf linke und sechs rechte unvollständige Valven und mehrere Schalenfragmente mit vereinzelt kleinen Bruchstücken der oberen Schalenschicht.

Masse: LV H – 56 mm, L – 56 mm

RV H – 33 mm, L – 36 mm.

Beschreibung: Die Umgrenzung der im mittleren Teil stark gewölbten, etwas schiefen Schalen, wird durch einen kürzeren Hinter-, längeren Vorder- und breit abgerundeten Unterrand gebildet. Der Wirbel ist stumpf und über die Schlosslinie geneigt. Am Vorderrande befindet sich eine Kante, unter welcher eine tief eingesenkte Lunula vorhanden ist. Die Ohren sind klein, das vordere nur von der Seite der Lunula wahrnehmbar. Soweit nach den erhaltenen Bruchstücken der oberen Schalenschicht beurteilt werden kann, gehören die beschriebenen Individuen den Formen an, welche eine radiale Skulptur nur in der Vorder- und Hinterregion besitzen. Der übrige Teil der Oberfläche ist glatt. Die radiale Skulptur ist durch flache Rippen mit schmalen linienartigen Intercostalfurchen, ohne jede Spur von Grübchen, vertreten.

Bemerkungen: Die Exemplare von unserem Material weisen eine auffällige Ähnlichkeit mit der Art *Plagiostoma mutabilis* auf, nur erreichen sie bei fernem nicht ihre Dimensionen. Ausserdem, was die Beschreibung und Abbildung dieser Art betrifft, ist die Anwesenheit der tiefen Lunula nicht klar.

Stratigraphische und geographische Verbreitung: Oxfordien von England und Georgien.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Plagiostoma sp.

Taf. IV, Fig. 3

Material: Eine in der Wirbelregion und dem Vorderteil unvollständige rechte Valve ohne Ohren und obere Schalenschicht.

Bemerkungen: Die uns zur Verfügung stehende Klappe lässt eine Höhe von 4 cm, den gewölbten mittleren Teil und die gleichmässig mit Radialrippen bedeckte Oberfläche feststellen. Diese erreichen auf der unvollständig erhaltenen Schale die Zahl 40. In dem unteren Hinterteil sind auf den Rippen schwache Spuren von ziemlich dichten Anwachsstreifen sichtbar. In der Gesamtform und Radialskulptur erinnert unser Exemplar an die Arten des Oxfordiens, wie *Plagiostoma tumida* (Roemer, 1836) und *Plagiostoma renevieri* (Etallon, 1862). Um dieses Individuum mit einigen der erwähnten Arten zu identifizieren, fehlen uns die kennzeichnenden Angaben von der Form und Skulptur der Lunula, von der Zahl der Radialrippen und ihrer Verlauf vom Wirbel zum Unterrande und von der konzentrischen Skulptur.

Vorkommen: Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Plagiostoma sp. 1

Taf. II, Fig. 8

Material: Eine im unteren Teil des Vorderrandes beschädigte rechte Valve mit fragmentarischem Hinterohr, ohne obere Schalenschicht und mit Gestein bedecktem Vorderteil.

Beschreibung: In den Massen der etwas schiefen Schale die Länge überwiegt die Höhe. Der mittlere Teil ist in oberem Schalendrittel ziemlich gewölbt, steiler zu den beiden Seitenrändern als zum Unterrande abfallend. Die Form der Lunula, sowie auch die Anwesenheit des vorderen und Grösse des hinteren Ohres kann nicht festgestellt werden. Mit der fehlenden oberen Schalenschicht ist auch die Skulptur verloren gegangen. Die Schalenoberfläche ist glatt, sie trägt nur Spuren von Anwachsstreifen. Die Art-Bestimmung der beschriebenen Form war nicht möglich.

Vorkommen: Fundstelle 7 – violettrosafarbiger Krinoidenkalk des Bath – ?Kalloviens.

Plagiostoma sp. 2

Taf. I, Fig. 1

Material: Eine in der Wirbelregion beschädigte und beim Vorderrande mit Gestein bedeckte linke Valve ohne obere Schalenschicht.

Masse: H — 33 mm, L — 38 mm.

Beschreibung: Die schiefe Schale mit überwiegender Länge ist besonders im

Nr. der Fundstelle Lithofazies Arten u. Zahl. der Individuen	15 u	7 o	17	22 /	25	38 △	41	Rhät	Unt. Lias	Toarcien	Aalenien	Bajocien	Bath	Kallovien	Oxfordien	Kimmeridgien	Tithon
<i>Modiolus</i> sp.						1											
<i>Bositra buchii</i> (Roem.)			2														
<i>Oxytoma inequalvis</i> (Sow.)		4	4														
<i>Oxytoma</i> sp.				2		1											
<i>Meleagrinella</i> cf. <i>echinata</i> (Smith)			2														
<i>Meleagrinella</i> sp.						2											
<i>Entolium</i> sp.		1															
<i>Propeamussium</i> (<i>Parvamussium</i>) <i>pumilum</i> (Lam.)			14														
<i>Camptonectes</i> (<i>Camptonectes</i>) cf. <i>lens</i> (Sow.)			7														
<i>Chlamys</i> (<i>Chlamys</i>) <i>ambigua</i> (Münst.)		12	3														
<i>Chlamys</i> (<i>Chlamys</i>) <i>subarticulata</i> (Orb.)				3													
<i>Chlamys</i> (<i>Chlamys</i>) cf. <i>dewalqueijurensis</i> (Riche)		2															
<i>Chlamys</i> (<i>Chlamys</i>) cf. <i>subtextoria</i> (Münst.)				1													
<i>Chlamys</i> (<i>Chlamys</i>) aff. <i>nattheimensis</i> (Lor.)				1													
<i>Chlamys</i> (<i>Chlamys</i>) sp.			1		5	2	2										
<i>Chlamys</i> (<i>Chlamys</i>) sp. 1			2														
<i>Chlamys</i> (<i>Chlamys</i>) sp. 2			1														
<i>Chlamys</i> (<i>Aequipecten</i>) sp. (ex gr. <i>minerva</i> Orb.)				1													
<i>Spondylopecten cardinatus</i> (Quenst.)				15													
<i>Spondylopecten subspinosus</i> (Schloth.)			2														
<i>Spondylopecten</i> sp.						1	1										
<i>Spondylopecten</i> sp. 1				1													
<i>Spondylopecten</i> sp. 2				2													
<i>Eopecten tegulatus</i> (Morr. et Lyc.)		2															
<i>Eopecten</i> sp.				1													
<i>Plicatula</i> sp.			1														
? <i>Plicatula</i> sp. 1				3													
? <i>Placunopsis davaiaensis</i> Liss.			1														

Nr. der Fundstelle Lithofazies Arten u. Zahl. der Individuen	15 U	7 O	17	22 /	25	38 △	41	Rhät	Unt. Lias	Toarcien	Aalenien	Bajocien	Bath	Kallovien	Oxfordien	Kimmeridgien	Tithon
? <i>Placunopsis</i> aff. <i>tatrica</i> Zitt.	1																
? <i>Placunopsis</i> cf. <i>jurensis</i> (Roem.)				2													
<i>Ctenostreon vrsateciensis</i> sp. n.			1														
<i>Ctenostreon</i> cf. <i>alsaticum</i> (Roll.)				1													
<i>Plagiostoma</i> aff. <i>mutabilis</i> (Arkell)				11													
<i>Plagiostoma</i> sp.				1	1												
<i>Plagiostoma</i> sp. 1		1															
<i>Plagiostoma</i> sp. 2			1														
<i>Plagiostoma</i> sp. 3			1														
<i>Plagiostoma</i> sp. 4		1															
<i>Pseudolimea</i> sp.				1													
? <i>Lopha</i> sp.				3													
<i>Trochus</i> sp.		1															
<i>Monticlairella triloboides</i> (Qenst.)					60												
? <i>Monticlairella</i> aff. <i>triloboides</i> (Qenst.)						21											
? <i>Lacunosella</i> sp.				1													
„ <i>Rhynchonella</i> “ aff. <i>ehningensis</i> (Qenst.)	13		8														
„ <i>Rhynchonella</i> “ aff. <i>triplicosa</i> (Qenst.)	5																
<i>Acanthothiris spinosa</i> (Lin.)	3																
? <i>Acanthothiris</i> sp.			1														
<i>Capillirhynchia</i> (?) <i>triplicosa</i> <i>furcillata</i> (Qenst.)	9																
<i>Dundrythiris retrocarinata</i> (Rothpl.)			21														
<i>Zeilleria polonica</i> Roll.	11		3														

U = weisser, creme- und rosafarbiger Kalpionellenkalk

O = violettrosafarbiger feinkörniger bis schlammiger Krinoidenkalk

△ = rosafarbiger und grauer biohermnahe oft brekziöser Kalk

/ = weisser Biohermkalk mit Korallen und Kalkschwämmen

oberen Schalendrittel stark gewölbt. Beim Hinter- und Unterrand ist sie gerundet, beim vorderen etwas schief. Ihr Vorderohr, sowie auch die Lunula sind vom Gestein bedeckt und deshalb nicht bemerkbar. Die Skulptur ist nur als Spuren von Radialrippen erhalten geblieben. In der Wirbelregion und dem vorderen Schalenteil sind sie beinahe ganz verwischt, anderswo kommen sie als schmale gleichmässig verteilte, durch ebenso breite Intercostalfurchen getrennte Radialrippen zum Vorschein. Die konzentrische Skulptur mit Ausnahme des Vorderohres fehlt völlig.

Bemerkungen: In der Gesamtform, Oberflächenskulptur des Schalenkörpers und des Hinterohres ähnelt das vorliegende Exemplar der Art *Plagiostoma alticosta* (Chapuis et Dewalque, 1853). Zum Unterschied ist es kleiner und besitzt mehr als 46 Radialrippen.

Vorkommen: Fundstelle 17 — violettrosafarbiger Krinoidenkalk des Bath — ? Kalloviens.

Plagiostoma sp. 3

Taf. I, Fig. 2

Material: Ein Bruchstück der rechten Valve überwiegend mit verwitterter Schalenoberfläche.

Beschreibung: Obzwar die Dimensionen der Schale wegen ihres ungünstigen Erhaltungszustandes nicht angegeben werden können, ist es klar, dass es sich um ein kleines Individuum handelt. Auf der Oberfläche der ovalen, etwas schiefen, beinahe flachen Schale ist unter der Lupe die radiale und konzentrische Skulptur bemerkbar. Diese besteht aus flachen, einfachen, dichten Radialrippen und Zwischenfurchen, in welchen sich kleine nadelstichähnliche Punkte befinden. Parallel zum Unterrande verläuft eine ausgeprägte konzentrische Vertiefung. Zur näheren Bestimmung fehlen die weiteren Merkmale.

Vorkommen: Fundstelle 17 – violettrosafarbiger Krinoidenkalk des Bath – ?Kalloviens.

Pseudolimea Arkell in Douglas et Arkell, 1932

Pseudolimea sp.

Taf. IV, Fig. 5

Material: Drei unvollständige rechte Valven ohne Ohren und obere Schalenschicht.

Masse: H – 5 mm, L – ?, H – 12 mm, L – ?.

Beschreibung: Ein wenig schiefe Schalen mit ovalem oder halbkreisförmigem Umriss. Auf der Oberlache sind sie von etwa 20 gleichmässig verteilten Radialrip-

pen bedeckt, welche durch ebenso breite Interconstalfurchen getrennt sind. Einschalttrippen oder deren Spuren sind in den Zwischenfurchen nicht erhalten geblieben, so dass keine entsprechende kennzeichnende Merkmale für eine Artbestimmung vorhanden sind. Was die Schalenform und die Rippen, wie auch deren Zahl betrifft, entsprechen sie der Art *Pseudolimea duplicata* (Sowerby, 1827), mit der von L. R. Cox (1964, S. 64) angegebenen stratigraphischen Reichweite Toarcien bis Oberoxfordien.

Vorkommen : Fundstelle 22 – weisser Biohermkalk des Oxfordiens.

Schlussbemerkungen

Die sieben Fundstellen von der Umgebung der Burgruine Vršatec-Klippe haben interessante makrofaunistische Vergesellschaftungen geliefert, welche zur Feststellung oder Präzisierung der stratigraphischen Position der Schichten bedeutend beigetragen haben.

So in der Lithofazies des violettrosafarbigten feinkörnigen bis schlammigen Krinoidenkalk befinden sich zwei Lokalitäten und zwar 7 und 17.

Die Vergesellschaftung der Bivalven der Fundstelle 7 besteht aus den folgenden Arten: *Oxytoma* (O.) *inequivalvis* (Sowerby), *Camptonectes* (C.) cf. *lens* (Sowerby), *Chlamys* (Chl.) *ambigua* (Münster), *Chlamys* (Chl.) *dewalquiejurensis* (Riche), *Eopecten tegulatus* (Morris et Lycett), *Plagiostoma* sp. 1, *Plagiostoma* sp. 4 und als einziger Vertreter der Gastropoden *Trochus* sp.

Eine artenreiche Asoziation stammt von dem Fundort 17 durch die Arten *Bositra buchii* (Roemer), *Oxytoma* (O.) *inequivalvis* (Sowerby), *Meleagrinella*, cf. *echinata* (Smith), *Propeamussium* (*Parvamussium*) *pumilum* (Lamarck), *Chlamys* (Chl.) *ambigua* (Münster), *Chlamys* (Chl.) sp., *Spondylopecten subspinosus* (Schlotheim), *Eopecten* sp., *Plicatula* sp., ?*Placunopsis davaiaensis* Lissajous, *Ctenostreon vrsateciensis* sp. n., *Plagiostoma* sp. 2 und *Plagiostoma* sp. 3 vertreten.

Auf Grund der Vergesellschaftungen von Bivalven und Brachiopoden beider dieser Fundstellen können die erwähnten Schichtfolgen als Bath – ?Kallovien betrachtet werden.

Die Lithofazies des weissen Biohermkalkes mit Korallen und Kalkschwämmen enthält eine reiche Fauna von Bivalven, welche auf der Lokalität 22 gesammelt wurden. Ihre exakte Bestimmung wurde öfters durch ihren ungünstigen Erhaltungszustand verhindert. Sie konnten bei der stratigraphischen Auswertung nicht benützt werden, sie bieten doch ein einigermaßen abgerundetes Bild über die Bivalvenfauna dieser Lithofazies. Die Angehörigen dieser Vergesellschaftung sind Arten *Oxytoma* (O.) sp., *Chlamys* (Chl.) *subarticulata* (Orbigny), *Chlamys* (Chl.) cf. *subtextoria* (Münster), *Chlamys* (Chl.) aff. *nattheimensis* (Loriol), *Chlamys* (Chl.) sp., *Chlamys* (Chl.) sp. 2, *Chlamys* (*Aequipecten*) sp. (ex Gr. *minerva* Orbigny),

Spondylopecten cardinatus (Quenstedt), ?*Plicatula* sp., ?*Placunopsis* cf. *jurensis* (Roemer), *Ctenostreon* cf. *alsaticum* (Rollier), *Plagiostoma* aff. *mutabibis* (Arkell), *Plagiostoma* sp., *Pseudolimea* sp. und ?*Lopha* sp.

Diese Assoziation weist in ihrer Gesamtheit auf das Oxfordien hin. Dies wurde auch auf Grund von Dr. E. Moryczowa in Krakow bearbeiteten Korallen (im Druck) bestätigt. Diese Lithofazies des weissen Biohermkalk von Oxford-Alter hat M. Mišík in seiner Arbeit (im Druck) als „Vršatec-Kalk“ bezeichnet.

Die Lithofazies vom rosafarbigem und grauen biohermnahen, oft brekziösen Kalke mit seltenen Korallen von den Fundorten 25, 38 und 41, hat eine sehr ungünstig erhaltene Bivalvenfauna geliefert. Sie konnten nur als *Modiolus* sp., *Oxytoma* sp., *Meleagrinea* sp. *Chlamys* (Chl.) sp., *Spondylopecten* sp. und *Plagiostoma* sp. bestimmt werden. Was ihren stratigraphischen Wert betrifft, können sie nicht in Betracht gezogen werden. Nachdem keine stratigraphisch bedeutende Organismen in dieser Lithofazies vorhanden sind, wurden diese Schichten als Kallovien-Oxfordien nur auf Grund ihrer Position im Liegenden der obenerwähnten weissen Biohermkalke bezeichnet.

Die Lithofazies des weissen, creme- und rosafarbigem Calpionellenkalkes des Tithons hat nur einziges Exemplar der Art ?*Placunopsis* aff. *tatrica* Zittel geliefert und zwar aus dem rosafarbigem Kalkstein. Diese Art ist für das Tithon kennzeichnend.

Alle oben angeführten Arten sind in einer Tabelle zusammengefasst, in welche auch begleitende, von M. Siblík bestimmte Brachiopodenarten eingeschlossen wurden. Ihre Bearbeitung wird in der Arbeit „Brachiopoden des Vršatec Burgruine“ vorgelegt.

Übersetzt von Autorin.

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Tafelerklärungen I–IV

Tafel I

Fig. 1 *Plagiostoma* sp. 2 – Fundstelle 17 – x 1

- Fig. 2 *Plagiostoma* sp. 3 – Fundstelle 17 – x 2
 Fig. 3 *Ctenostreon vrstateciensis* sp. n. – Fundstelle 17 – x1
 Fig. 4 *Oxytoma* (O.) *inequivalvis* (Sowerby) – Fundstelle 17 – x 1
 Fig. 5 *Camptonectes* (C.) cf. *lens* (Sowerby) – Fundstelle 17 – x 1
 Fig. 6 *Spondylopecten subspinosus* (Schlotheim) – Fundstelle 17 – x 1
 Fig. 7 *Chlamys* (Chl.) cf. *dewalqueijurensis* (Riche) – Fundstelle 7 – x 1
 Fig. 8 *Spondylopecten subspinosus* (Schlotheim) – Fundstelle 17 – x 1
 Fig. 9 ?*Placunopsis davaiacensis* Lissajous – Fundstelle 17 – x 2
 Fig. 10, 11 *Propeamussium* (*Parvamussium*) *pumilum* (Lamarck) – Fundstelle 17 – x 3

Tafel II

- Fig. 1 *Eopecten tegulatus* (Morris et Lycett) – Fundstelle 7 – x 1
 Fig. 2, 3 *Chlamys* (Chl.) *ambigua* (Münster) – Fundstelle 7 – x 1
 Fig. 4 *Oxytoma* (O.) *inequivalvis* (Sowerby) – Fundstelle 7 – x 1
 Fig. 5 *Chlamys* (Chl.) *ambigua* (Münster) – Fundstelle 7 – x 1
 Fig. 6 *Bositra buchii* (Roemer) – Fundstelle 17 – x 2
 Fig. 7 *Chlamys* (Chl.) cf. *dewalqueijurensis* (Riche) – Fundstelle 7 – x 1
 Fig. 8 *Plagiostoma* sp. 1 – Fundstelle 7 – x 1

Tafel III

- Fig. 1, 2 *Plagiostoma* aff. *mutabilis* (Arkell) – Fundstelle 22 – x 1
 Fig. 3 *Chlamys* (Chl.) *subarticulata* (Orbigny) – Fundstelle 22 – x 1
 Fig. 4 *Chlamys* (*Aequipecten*) sp. (ex gr. *minerva* Orbigny) – Fundstelle 22 – x 3
 Fig. 5 *Chlamys* (Chl.) cf. *subtextoria* (Münster) – Fundstelle 22 – x 3
 Fig. 6 *Chlamys* (Chl.) aff. *nattheimensis* (Loriol) – Fundstelle 22 – x 1

Tafel IV

- Fig. 1 – 3 *Spondylopecten cardinatus* (Quenstedt) – Fundstelle 22 – x 1
 Fig. 4 *Spondylopecten* sp. 2 – Fundstelle 22 x 1
 Fig. 5 *Pseudolimea* sp. – Fundstelle 22 – x 1
 Fig. 6 ?*Placunopsis* aff. *tatrica* Zittel – Fundstelle 15 – x 1
 Fig. 7 *Spondylopecten* sp. – Fundstelle 22 – x 1
 Fig. 8 *Ctenostreon* cf. *alsaticum* (Rollier) – Fundstelle 22 – x 1
 Fig. 9 *Plagiostoma* sp. – Fundstelle 22 – x 1

Foto: L. Oswald

Mária Kochanová

Jurské lastúrniky bradla vršateckého hradu

Zhrnutie nemeckého textu

Pri podrobných sedimentologických, mikrofaciálnych a biostratigrafických štúdiách v jurských sedimentoch czorstzýnskej série v oblasti zrúcanín na bradle Vršatec bol získaný aj bohatý makrofaunistický materiál brachiopódov, lastúrníkov, koralov a aptychov.

V tejto práci predkladáme biostratigrafické spracovanie lastúrníkov tejto oblasti. Nadväzujeme v nej na prácu M. Mišíka „Sedimentologické a mikrofaciálne štúdiá jury bradla vršateckého hradu“, 1977, a kvôli jednotnosti používame rovnaké číselné označenie lokalít a stručnú litofaciálnu charakteristiku študovaných súvrství. Lastúrníky, sprevádzané výskytom brachiopódov alebo koralov pochádzajú zo

siedmich lokalít a prispeli k stanoveniu alebo spresneniu stratigrafického postavenia súvrství tejto oblasti.

Tak v súvrství fialovoružových, drobno krinoidových až kalových nevrstevnatých vápencov sa nachádzajú dve lokality, a to č. 7 a č. 17.

Spoločenstvo lastúrníkov na lokalite č. 7 vytvárajú druhy: *Oxytoma (O.) inequivalvis* (Sowerby), *Camptonectes (C.) cf. lens* (Sowerby), *Chlamys (Chl.) ambigua* (Münster), *Chlamys (Chl.) cf. dewalqueijurensis* (Riche), *Eopecten tegulatus* (Morris et Lycett), *Plagiostoma* sp. 1, *Plagiostoma* sp. 4 a jediný zástupca ulitníkov *Trochus* sp.

Druhove bohatšie je spoločenstvo lokality č. 17, ktorému patria: *Bositra buchii* (Roemer), *Oxytoma (O.) inequivalvis* (Sowerby), *Meleagrinnella cf. echinata* (Smith), *Propeamussium (Parvamussium) pumilum* (Lamarck), *Chlamys (Chl.) ambigua* (Münster), *Chlamys (Chl.)* sp., *Spondylopecten subspinosus* (Schlotheim), *Eopecten* sp., *Plicatula* sp., *Placunopsis davaiaensis* Lissajous, *Ctenostreon vrsateciensis* sp. n., *Plagiostoma* sp. 2 a *Plagiostoma* sp. 3.

Na základe uvedených spoločenstiev, ako i sprievodných brachiopódov patrí toto súvrstvie bathu – ?kellowayu.

Ako ďalšie súvrstvie, ktoré poskytlo makrofaunu lastúrníkov, sú biele biohermné vápence s koralmi a vápnitými hubkami.

Na lokalite č. 22 patria tejto asociácii druhy: *Oxytoma (O.)* sp., *Chlamys (Chl.) subarticulata* (Orbigny), *Chlamys (Chl.) cf. subtextoria* (Münster), *Chlamys (Chl.) aff. nattheimensis* (Loriol), *Chlamys (Chl.)* sp., *Chlamys (Chl.)* sp. 2, *Chlamys (Aequipecten)* sp. (ex. gr. *minerva* Orbigny), *Spondylopecten cardinatus* (Quenstedt) ?*Plicatula* sp., ?*Placunopsis cf. jurensis* (Roemer), *Ctenostreon cf. alsaticum* (Rollier), *Plagiostoma aff. mutabilis* (Arkell), *Plagiostoma* sp., *Pseudolimea* sp. a ?*Lopha* sp.

Nevýhodou tohoto spoločenstva je v mnohých prípadoch zlý stav zachovania jedincov, čo znemožnilo ich presné určenie. Asociácia ako celok i jednotlivé druhy však poukazujú na oxford. Potvrďujú to aj koral, spracované v Krakove E. Moryczowou (práca v tlači). Pre litofáciu bielych biohermných vápencov s koralmi a vápnitými hubkami oxfordského veku zavádza M. Mišík (l. c.) pomenovanie „vršatecké vápence”.

Z litofácie ružových a sivých pribiohermných vápencov, často brekciovitých so zriedkavými koralmi z lokalít 25, 38 a 41 pochádza: *Modiolus* sp., *Oxytoma* sp., *Meleagrinnella* sp., *Chlamys* sp., *Spondylopecten* sp. a *Plagiostoma* sp. Pre stanovenie stratigrafickej pozície súvrstvia nie sú smerodajné. Stanovená bola na základe ich postavenia v podloží vyššie uvedených biohermných vápencov ako kelloway – oxford.

V súvrství bielych, krémových a ružových kalpionelových vápencov titónskeho veku pochádza z lokality č. 15 z ružových vápencov jediný druh lastúrníkov ? *Placunopsis aff. tetrica* Zittel.

Kvôli získaniu uceleného obrazu o lastúrníkoch jury z Vršatca zhrnuli sme ich spolu s brachiopódmi do spoločnej pripojenej tabuľky. Spracovanie brachiopódov prináša práca M. Siblíka "Brachiopódy Bradla vršateckého hradu" (v tomto zborníku).

Miloš Siblík

Brachiopods of the Vršatec Castle Klippen (Bajocian — ?Berriasian) near Ilava (Slovakia)

6 Plates (V–X), 9 Text-figures, Czech summary

Abstract. The author deals with the fauna of brachiopods from the Czorsztyn unit of Vršatec (NW of the town Ilava). The brachiopods derive from 14 outcrops ranging stratigraphically from the Bajocian to (?) the Berriasian. Surprisingly, 4 Oxfordian species have been found in the filling of neptunian dykes.

Introduction

In my paper I deal with the fauna of brachiopods from the Sub-Pieniny klippen of the Vršatec castle near Ilava. Here I want to offer my heartiest thanks to Prof. Dr. Milan Mišík of Bratislava who kindly let me know about comparatively plentiful brachiopods in Vršatec area. I carried out most field work in the years 1974 and 1975, partially in cooperation with Prof. Dr. M. Mišík and Dr. M. Sýkora (both from the Faculty of Natural History at Comenius university in Bratislava).

The study of brachiopods was closely connected with detailed sedimentological and biostratigraphical researches carried out by M. Mišík (in print). This is why I shall not treat geology in detail here. In localization and detailed description of the rocks characteristic of the sites I shall refer to the above mentioned publication as well. The brachiopod fauna of the Vršatec Castle klippen comprises the following species:

Bajocian to ?Bathonian – grey sandy limestones: *Acanthothiris spinosa* (Linn.) and *Acanthothiris* cf. *costata* Orb. (loc. 2); reddish crinoidal limestones: *Monsardithyris ventricosa* (Zieten) (loc. 26);

Bathonian to Lower Callovian – reddish muddy or organodetrital muddy limestones: *Acanthothiris spinosa* (Linn.), *Capillirhynchia* (?) *triplicosa furcillata* (Quenst.) and „*Rhynchonella*” aff. *triplicosa* (Quenst.) (loc. 7), „*Rhynchonella*” aff. *ehningensis* (Quenst.) and „*Zeilleria*” *polonica* Rollier (loc. 7 and 17; from these localities comes plentiful fauna of bivalves, treated by M. Kochanová; in print), *Dundrythyris retrocarinata* (Rothpl.) and ?*Acanthothiris* sp. (loc. 17), *Antiptychina* aff. *bivallata* (Eud.–Desl.) (loc. 28);

Oxfordian – reddish muddy limestones (filling of fissures): *Septocrurella sanctaeclarae* (Roem.), *Monticlarella striocincta* (Quenst.), *Lacunosella* aff. *monsalsvensis* (Gill.) and *Nucleata rupicola* (Zittel) (loc. 1); light-coloured bioherm and peribioherm limestones: ? *Lacunosella* sp. (loc. 22–plentiful accompanying fauna of bivalves), *Monticlarella triloboides* (Quenst.) (loc. 25), ? *Monticlarella* aff. *triloboides* (Quenst.) (loc. 38);

Kimmeridgian (?) – red nodular limestones: *Nucleata rupicola* (Zittel) (loc. 9); Tithonian – beige and pink muddy limestones: *Nucleata bouei* (Zejsz.), *Camerothyris wahlenbergi* (Zejsz.) and *Lacunosella moutoniformis* (Jac.-Fall.) (loc. 6), *Pygope diphya* (Col.) (loc. 6 and 36);

Berriasian (?) – red crinoidal limestones: *Camerothyris wahlenbergi* (Zejsz.) (loc. 23), ? *Pygites diphoides* (d'Orb.) and *Lacunosella* aff. *moutoniformis* (Jac.-Fall.) (loc. 23 and 47), „*Rhynchonella*” *agassizi* (Zejsz.) (loc. 47).

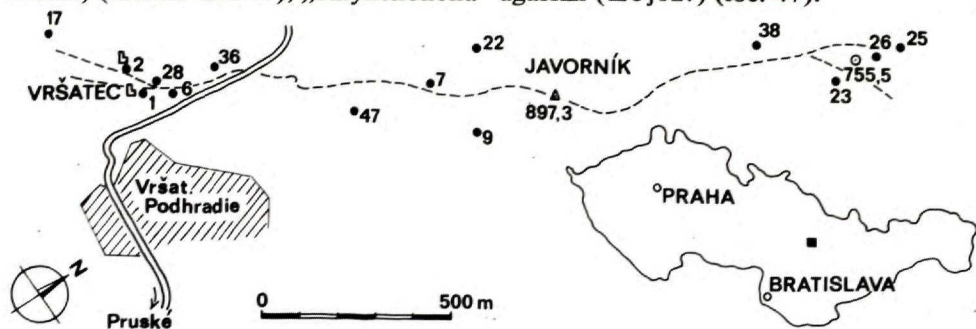


Fig. 1 Location of the brachiopod localities in the Vršatec area. Adapted after M. Mišík (in print).

The brachiopods studied are not favourably preserved for the study of their internal structure because they are fragmentary and the insides of shells are recrystallized at most localities. Only in the Oxfordian and Tithonian muddy limestones the material was better preserved. Interestingly, comparatively plentiful brachiopods of Oxfordian age were found in fissures filling (Spaltenfüllung) around ruins of the castle Vršatec (loc. 1). There the brachiopods were the only faunal component (except one fragmentary *Aptychus*). There is, however, a striking fact: other rocks of Vršatec with analogous petrography, referred to as Oxfordian have not rendered any brachiopods. According to J. Wendt (1971), who studied the origin and fauna of fissures in many other localities of Mediterranean Jurassic, the autochthonous portion of the fauna is rather limited and does even not contain brachiopods. In J. Wendt's opinion the brachiopods represent either an allochthonous component or a component transported over a short distance, and it is difficult to refer the fauna to the components respectively. The question has not been answered by our fauna so far, although there are comparatively well preserved brachiopods in fissure fillings from Vršatec and the explanation based on autochthonity of the local brachiopod fauna would seem to be the simplest one.

Systematical description of brachiopod fauna

Rhynchonellida Kuhn, 1949

Dimerellacea Buckman, 1918

Norellidae Ager, 1959

Monticlarellinae Childs, 1969

Monticlarella Wiśniewska, 1932

Monticlarella striocincta (Quenstedt, 1852)

Pl. V, Fig. 5; Text-figs. 2-4

1852 *Terebratula striocincta* -F. A. Quenstedt, p. 455, Pl. 36, Fig. 24.

1858 *Terebratula striocincta* -F. A. Quenstedt, p. 634, Pl. 78, Fig. 12.

1867 *Terebratula striocincta* -F. A. Quenstedt, p. 543, Pl. 46, Fig. 24.

1871 *Terebratula striocincta* -F. A. Quenstedt, p. 131, Pl. 40, Fig. 15-19.

1885 *Terebratula striocincta* -F. A. Quenstedt, p. 694, Pl. 53, Fig. 57.

1932 *Monticlarella striocincta* (Quenstedt) -M. Wiśniewska, p. 58, Pl. 6, Fig. 12.

1932 *Monticlarella Rollieri* sp.n. -M. Wiśniewska, p. 59, Pl. 6, Fig. 10-11.

1969 *Monticlarella striocincta* (Quenstedt) -A. Childs, p. 21, Pl. 1, Fig. 1-3, Text-fig. 9 (cum syn.).

Material: 16 more-or-less damaged internal moulds with rests of shell and one ventral valve. Dimensions of well preserved specimens: $12,8 \times 10,5 \times 7,4$ mm; $10,9 \times 10,3 \times 6,6$ mm (figured); $9,7 \times 8,9 \times 5,6$ mm; $9,1 \times 7,8 \times 5,9$ mm.

Description: Rounded trigonal shells are pronouncedly ventribiconvex. Lateral and anterior commissures are predominantly rectimarginate, exceptionally slightly sulcate or uniplicate. Small, sharply pointed beak of pedicle valve has not been preserved on most specimens. On the valves are 12 to 18 minute, rounded ribs, occasionally of variable thickness, conspicuous, in the anterior third to half of valves. Posterior parts of valves are striate or almost smooth.

Internal structure: Delthyrial cavity of subquadrate cross section is confined by almost parallel dental lamellae. Their length is variable and as a rule they disappear prior to complete development of teeth on the sections. The teeth are oblique, without an indication of crenulation. There is a close contact between teeth and dental sockets. The denticula are well developed. No pedicle collar was found.

The hinge plates of variable thickness are almost horizontal or slightly inclined toward the dorsal valve. The hinge plates are mutually connected without touching the bottom of the dorsal valve (Text-fig. 3): exceptionally they touch the dorsal valve near the umbo to form an indication of a septalium (Text-fig. 2). The euseptoid is short and low, yet distinct. The dental sockets are broad, deep, without crenulation. In most cases the inner socket ridges are better developed than outer socket ridges, there are, however, also reverse cases. Crural bases are situated on the dorsal side of the hinge plates. Some specimens have comparatively deep dorsal muscle scars. The crura are of arcuifer type.

Remarks: Our specimens correspond to figures and description presented by

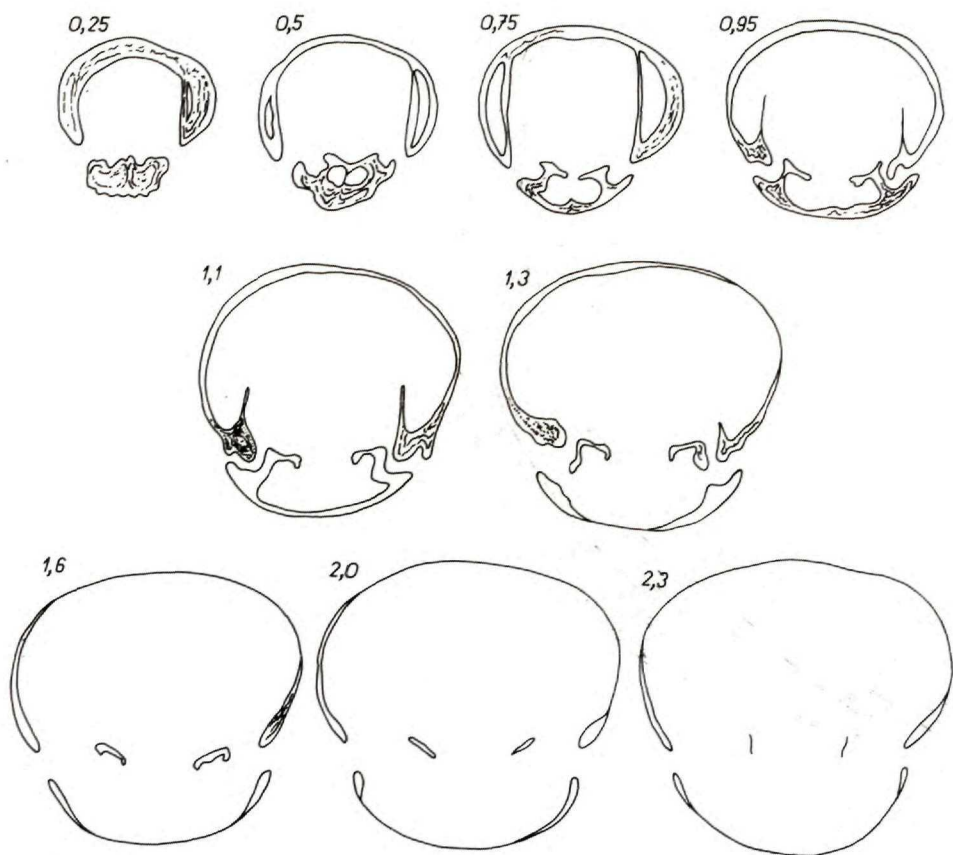


Fig. 2 *Monticlairella striocincta* (Quenst.). A series of transverse sections through the shell. Original length of specimen 9,9 mm. Locality 1, filling of fissure C. Magnif. x 7 approx.

M. Wiśniewska (1932) and A. Childs (1969). Within the genus they are well distinguishable by the character of their sculpture, anterior commissure of valves and by much higher pedicle valve. Fine striae in the troughs between the ribs at the anterior margin of the shell have not been found in our specimens. It is most likely due to imperfectly preserved material: the superficial layer of the original shell was either removed or smoothed. A. Childs (1969, p. 24) gave a similar explanation for the species *M. triloboides*. I regard the species *M. rollieri* defined by M. Wiśniewska (1932) as synonymous with the species described here, since slight differences in the ornamentation mentioned by the authoress of the original description are not sufficient for definition of a new taxon. It is, after all, well visible on the figure by M. Wiśniewska (1932, Pl. 6, Fig. 10–11). In cross sections through the internal structure of the species *M. czenstochaviensis* (Roem.) and *M. strioplicata* (Quenst.) illustrated by M. Wiśniewska (1932, Text-fig. 17–18),

there is in the umbonal part of the dorsal valve an articulate cardinal plate visible. Such plate is missing in our specimens as well as in sections through shells of some species of the genus *Monticlairella*, presented by A. Childs (1969, Text-fig. 8–11) and T. N. Smirnova (1973, Text-fig. 4 at the right, 6–7).

Stratigraphical range: according to A. Childs (1969) Oxfordian-Kimmeridgian (zone *transversarium* to *mutabilis*).

Occurrence: Vršatec – loc. 1, filling of the fissures C (16 specimens) and E (1 specimen). The species was recorded in Poland and in the Jura mountain range in Germany and in France.

Monticlairella triloboides (Quenstedt, 1852)

Pl. VI, Fig. 2–3; Text-fig. 5

- 1852 *Terebratula triloboides* - F. A. Quenstedt, p. 455, Pl. 36, Fig. 29.
1858 *Terebratula triloboides* - F. A. Quenstedt, p. 634, Pl. 78, Fig. 13.
1867 *Terebratula triloboides* - F. A. Quenstedt, p. 543, Pl. 46, Fig. 29.
1871 *Terebratula triloboides* - F. A. Quenstedt, p. 129, Pl. 40, Fig. 6–13, 22, 34.
1878 *Rhynchonella triloboides*, Quenstedt-P. Lorient, p. 188, Pl. 23, Fig. 41–45.
1885 *Terebratula triloboides* - F. A. Quenstedt, p. 694, Pl. 53, Fig. 58.
1932 *Monticlairella triloboides* (Quenstedt) - M. Wiśniewska, p. 62, Pl. 6, Fig. 8–9.
1969 *Monticlairella triloboides* (Quenstedt) - A. Childs, p. 23, Pl. 1, Fig. 5–7, Text-fig. 10.
1971 *Monticlairella triloboides* (Quenstedt) - M. Wiśniewska-Żelichowska, p. 20, Pl. 12, Fig. 6–7.

Material: 49 partially fragmentary internal moulds, 6 pedicle and 5 dorsal valves. Dimensions of some better preserved specimens: 8,5×8,3×4,0 mm; 8,2×8,4×5,6 mm; 7,3×6,8×4,6 mm (Pl. VI, Fig. 3); 7,0×7,0×4,6 mm (Pl. VI, Fig. 2).

Description: Most shells are small, regularly biconvex or slightly dorsibiconvex. Plication of anterior commissure of valves is not high, yet conspicuous. Beak of the ventral valve is broad, slightly incurved, pointed. The pedicle opening is small, hypothyrid(?). Rounded ribs reach up to valve umbos (in average 12–18 per valve, 4–6 of which are most frequently on the low fold of the dorsal valve). Internal structure comprises the principal characters typical of the genus *Monticlairella* and does not differ substantially from the internal structure of the species *M. striocincta* (Quenst.).

Remarks: Our specimens lack the intercostal striation which is common in the species described. They display fibrous surface indicative of the absence of the top layer of the original shell (A. Childs, 1969, p. 24 and remarks on the species *M. striocincta* (Quenst.) in this paper). Ribs of some specimens studied resemble rather those of the species *M. strioplicata* (Quenst.) (thicker and more rounded ribs in lesser number in the fold of the dorsal valve), in our specimens are ribs developed on the whole surface of valves.

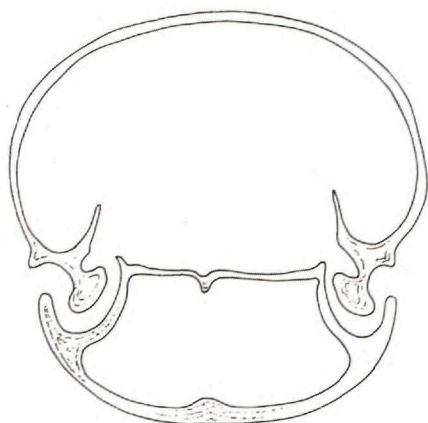


Fig. 3 *Monticlarella striocincta* (Quenst.). Transverse section through another specimen with fused, subhorizontal hinge plates. Loc. as for Text-fig. 2. Magnified.

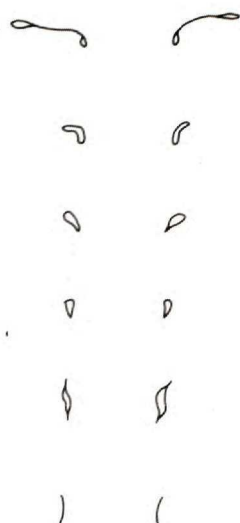


Fig. 4 *Monticlarella striocincta* (Quenst.). Development of crura in the transverse sections of another specimen. Loc. as for Text-fig. 2. Magnified.

Stratigraphical range: According to A. Childs (1969) it is Oxfordian to Lower Volhynian (zones *transversarium* to *Gravesia*). Most finds are from the gamma Malmian according to Quenstedt.

Occurrence: Vršatec – light – coloured peribioherm limestones, loc. 25 (60 specimens). At the locality 38 other 21 nontypical specimens were found, designated here as *M. aff. triloboides* (Quenst.). The species is mentioned from Poland, France and Germany.

Rhynchonellacea Gray, 1848

Wellerellidae Licharev, 1956

Lacunosellinae Smirnova, 1963

Lacunosella Wiśniewska, 1932

Lacunosella moutoniformis (Jacob-Fallot, 1913)

Pl. VII, Fig. 4; Text-fig. 6

1913 *Rhynchonella cherenensis* var. *Moutoniformis* Jacobet Fallot-Ch. Jacob-P. Fallot, p. 37, Pl. 4, Fig. 13–16.

Material: 52 two-valved specimens, 4 pedicle and 9 dorsal valves, variously damaged. The original shell material is partly preserved and attains considerable thickness, especially in the umbonal region. Dimension of some specimens: 15,4×15,2×14,8 mm; 14,3×18,0×14,8 mm; 13,8×14,5×12,0 mm; 13,5×14,3×11,4 mm (figured); 13,0×11,2×12,5 mm.

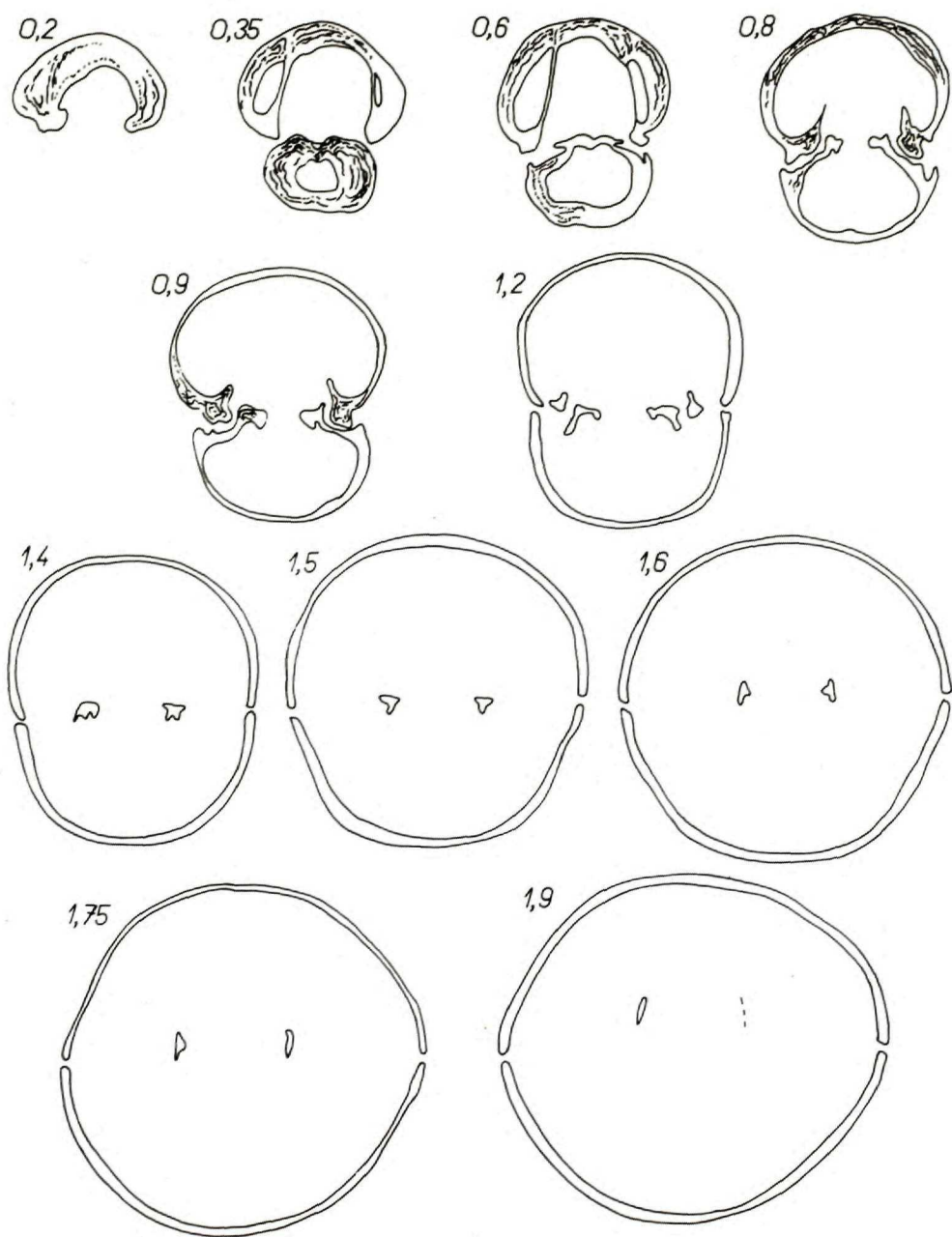


Fig. 5 *Monticlairella triloboides* (Quenst.). Transverse sections through the shell. Original length of specimen 8,2 mm. Locality 25. All $\times 8$ approx.

Description: The valves are smooth, distinctly dorsibiconvex. The anterior commissure of valves forms a rounded – to sharpened plication. The sulcus of the pedicle valve is well-developed. The beak of the pedicle valve is massive and broad, without distinct beak-ridges. Internal structure is characterized by considerable development of secondary mass. The dental lamellae are not distinctly developed so that the lateral umbonal cavities are only indistinctly separated from the subquadrate delthyrial cavity. The pedicle collar is developed. The teeth are vertical and without crenulation. The denticula are strong. Septalium not developed. The hinge plates form with each other an angle near to 90° close to the valve umbo, however, elsewhere are of more or less horizontal position. The dental sockets are broad and quite deep, always conspicuously crenulated. The crura are attached to the dorsal side of hinge plates and are of typical falcifer type.

On the contrary to Ch. Jacob and P. Fallot (1913) I think that despite the great variability of this and other externally similar species or subspecies the separation of „*moutoniformis*” from the species *Rhynchonella cherennensis* is reasonable, specimens of which are distinctly ribbed. Almost equal variability as our material display some similar species as e. g. „*Rhynchonella*” *moutoniana* (d'Orb., 1847), „*Rh.*” *deciens* (d'Orb., 1947) and „*Rh.*” *spoliata* (Suess, 1858). These species, however, differ from the specimens of Vršatec in even twofold size and in development of short ribs or distinct capillae at the anterior margin of valve.

Stratigraphic range: Tithonian to Lower Hauterivian.

Occurrence: Vršatec – light – coloured muddy limestones, loc. 6; France.

Lacunosella aff. *moutoniformis* (Jacob-Fallot, 1913)

Pl. VII, Fig. 2

Material: 4 damaged two-valved specimens, then 14 dorsal and 4 pedicle valves with remnants of original shells. Dimensions of figured (somewhat compressed) specimen: $? 15,5 \times ? 14,0 \times ? 14,4$ mm.

Remarks: The specimens observed differ from the species *L. moutoniformis* (Jacob-Fallot) in the following: pointed fold of dorsal valve in the form of medial rib, distinct as far as the umbo of valve. On both sides of it there is one shorter rib, distinct only in the posterior valve half. The pedicle valve has a broad sulcus, conspicuous as far as the beak and bordered on both sides by a keel-shaped rib. This may be still accompanied by a shorter lateral rib. The beak of pedicle valve is higher and stronger.

Occurrence: Vršatec – red crinoidal limestones at loc. 23 (one specimen) and loc. 47 (21 specimens).

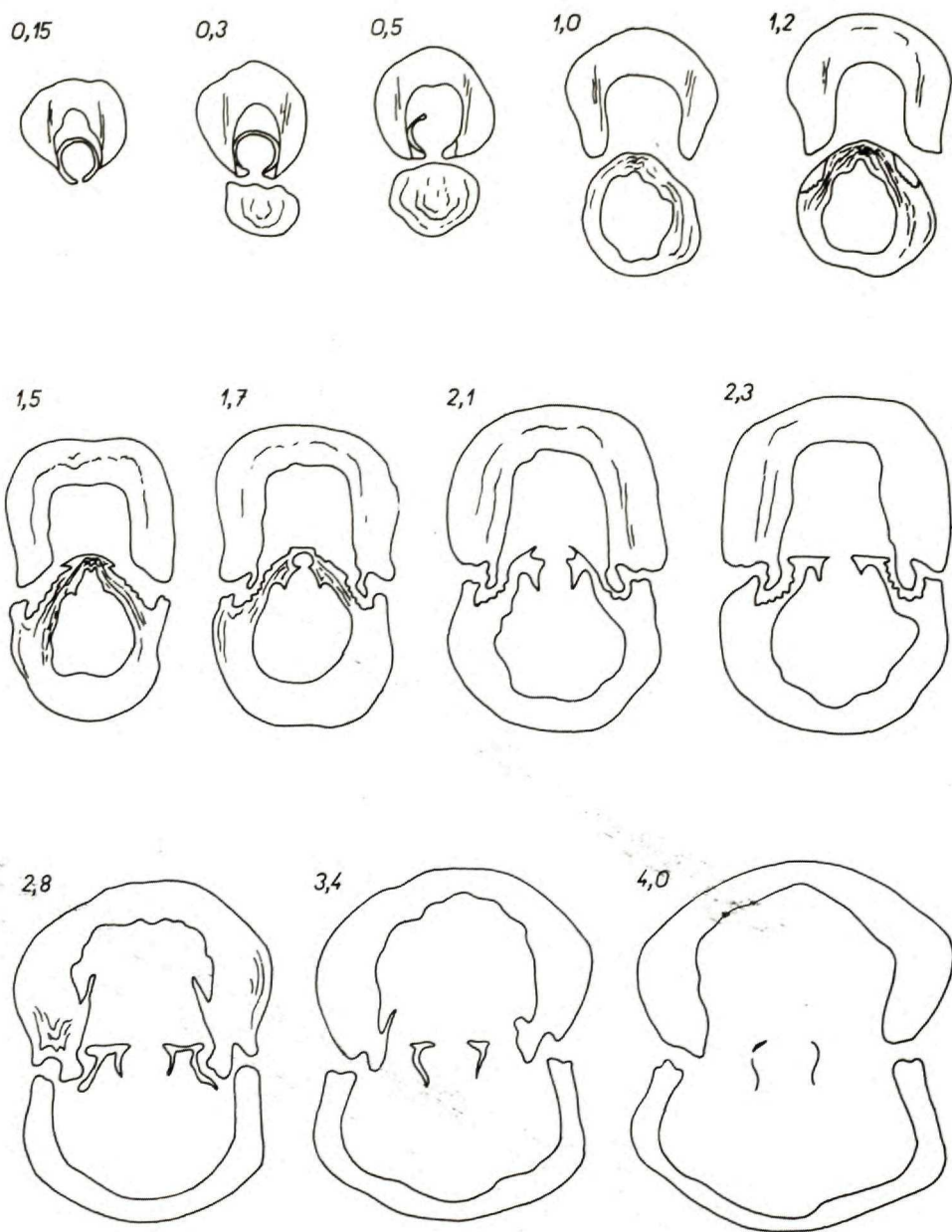


Fig. 6 *Lacunosella moutoniformis* (Jac.-Fall.). A series of transverse sections through the shell. Crura disappeared at 4,3 mm from the posterior end. Original length of specimen 15,2 mm. Locality 6. All $\times 4$ approx.

Lacunosella Wiśniewska, 1932

Lacunosella aff. *monsalsvensis* (Gilliéron, 1873)

aff. 1876 *Rhynchonella Monsalsvensis*, Gilliéron-E. Favre, p. 67, Pl. 7, Fig. 6-7.

Material: 2 damaged specimens of dimensions ? 19,0 × ? 19,0 × 10,5 mm and 15,4 × ? × 9,1 mm.

Description: The valves are smooth, slightly dorsibiconvex. The dorsal valve is continuously inflated without forming a distinct fold. The sulcus of pedicle valve is shallow, of trigonal shape. The commissure of valves suddenly projects in dorsal direction and forms a not high but well delimitable wide linguiform extension. On the anterior and lateral commissures 2-3 slight indentations are visible, which appear as indications of small ribs at the anterior margin of valves. The beak of pedicle valve is high and incurved, without distinct beak ridges.

Remarks: Our specimens differ from the species *L. monsalsvensis* (Gill.) in lesser development of valve ornamentation, ribs as well as concentric growth lines. The synonymy of this species most probably also includes the close *Lacunosella fastigata* (Gilliéron, 1873), essentially differing in the narrower and higher, sharply trigonal plication only.

Stratigraphic range: The species *L. monsalsvensis* (Gill., 1873) is known from the Oxfordian.

Occurrence: Vršatec – in filling of fissure C at loc. 1.

? *Lacunosella* sp.

Material: 1 fragment of dorsal valve.

Remarks: Only the left side of valve and the high central part, corresponding to the fold is preserved. In size and valve shape, also in the character of ribs (7 strong ribs in the fold) the specimen resembles very much the genus *Lacunosella* Wiśniewska.

Occurrence: Vršatec – light-coloured biohermal limestones at loc. 22 (Oxfordian – ? Kimmeridgian).

Rhynchonellidae Gray, 1848

Rhynchonellinae Gray, 1848

Rhynchonella Fischer 1809; s. l.

„*Rhynchonella*” *agassizi* (Zejszner, 1846)

1846 *Terebratula Agassizii* Z. -L. Zejszner, p. 26, Pl. 2, Fig. 21-5.

1870 *Rhynchonella Agassizi* Zeuschn. sp. -K. A. Zittel, p. 148, Pl. 14, Fig. 34-7.

1913 *Rhynchonella Agassizi* Zeuschner-Ch. Jacob-P. Fallot, p. 16, Pl. 1, Fig. 15.

Material: One damaged specimen, dimensions $8,9 \times ? \times 5,2$ mm.

Description: Smooth shell of subtrigonal outline, stretched to width. The dorsal valve is flat and without fold whilst the pedicle valve is more convex, higher, with indistinct medial sulcus. The commissure of valves is straight laterally whilst in the anterior part it forms a low, broad plication. The beak of pedicle valve is small and slightly incurved. On each valve there are distinct two concentric lines, corresponding to growth periods of valve.

Remarks: Our specimen agrees entirely with original illustration in Zejszner's work (1846). Indication of weak ribs at the anterior margin of shell, visible e.g. in the illustration by K. A. Zittel (1870, especially Fig. 34 in Pl. 14) is missing in our specimen.

Stratigraphic range: Tithonian-Berriasian.

Occurrence: Vršatec – red crinoidal limestones at loc. 47. D. Andrusov (1945) mentioned this species from the localities Mikušovce and Skalka near Streženice. More finds are known from Poland.

„*Rhynchonella*” aff. *ehningensis* (Quenstedt, 1857)

Pl. VI, Fig. 1; Text-fig. 7.

aff. 1857 *Terebratula Ehningensis*-F. A. Quenstedt, p. 497, Pl. 66, Fig. 33.

Material: 14 mostly fragmentary moulds of specimens, 4 moulds of pedicle and 3 of dorsal valves. Dimensions of better preserved specimens: $34,4 \times 43,2 \times 30,5$ mm; $?26,0 \times 39,6 \times 22,8$ mm (figured); $24,3 \times 38,0 \times 19,9$ mm; $12,5 \times 16,6 \times 7,9$ mm.

Description: Shells of greater dimensions and oval outline, stretched to width, distinctly dorsibiconvex. The plication of the anterior margin of shell is high, rising sharply from the commissure level. The fold of dorsal valve is well developed and conspicuous in the anterior valve half (similarly also the sulcus of pedicle valve). The sharp strong ribs extend to the umbos of valves. The number of ribs in adult specimens varies round 18 to 20 on valve, 4–6 of them are on the fold of dorsal valve.

Internal structure of pedicle valve is characterized by the presence of pedicle collar, subparallel or ventrally convergent dental lamellae and strongly developed teeth and denticula. In the dorsal valve septalium is not developed. The hinge plates are more or less horizontal with crural bases at their inner ends. The dental sockets are broad and deep, distinctly crenulated. Their outer ridges are more perfectly developed than the inner socket ridges. The dorsal septum is long but, except the area close to the umbo of the valve, low. The dorsal muscle scars field is well visible in cross sections. The total character of crura has not been found out.

Remarks: Our specimens are externally very close to Quenstedt's species „*Terebratula Ehningensis*”, which became the type-species of the genus *Robus-*

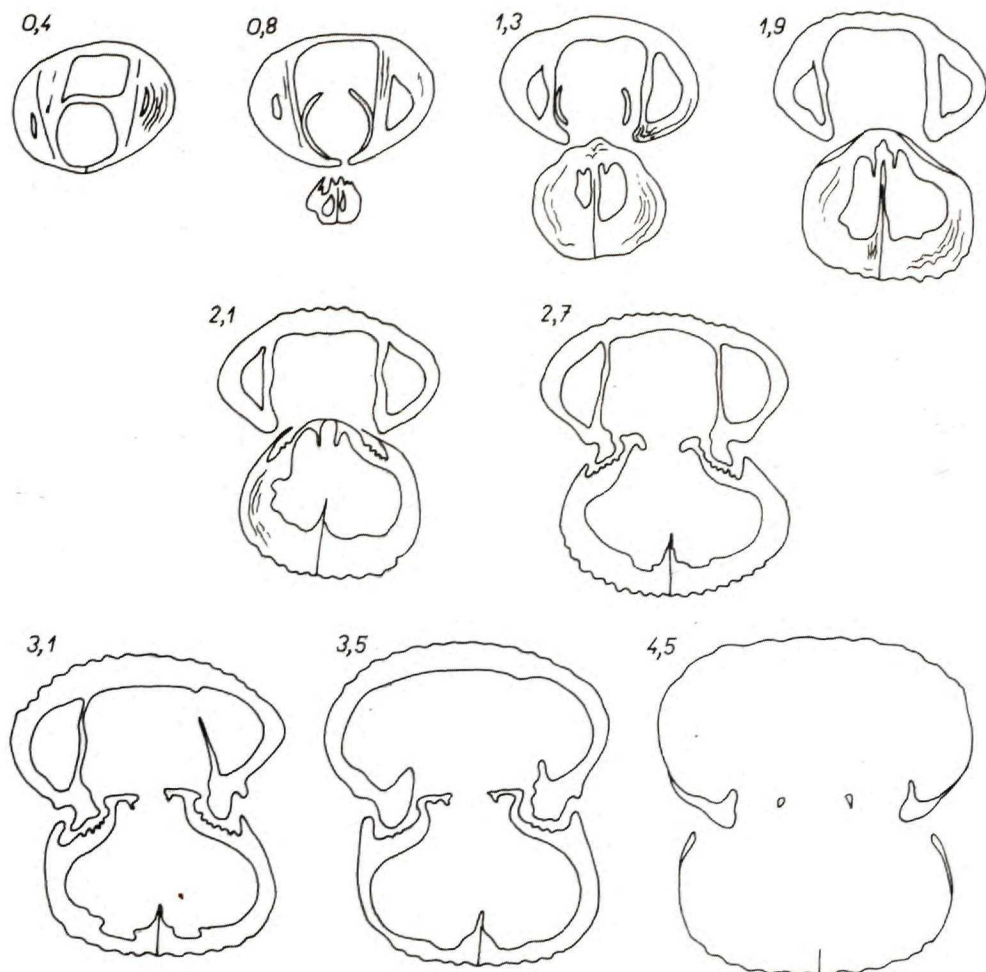


Fig. 7 „*Rhynchonella*” aff. *chningensis* (Quenst.). A series of transverse sections through the shell. Original length of specimen 26,0 mm. Locality 7. All $\times 3$ approx.

tirhynchia Seifert, 1963. They differ, however, from the latter particularly in greater difference between the heights of valves and inflation of umbonal part of the dorsal valve. Different is also the internal structure because in the genus *Robustirhynchia* the septalium and a strong dorsal septum are developed. Some of our smaller specimens display some outer similarities, e.g. with considerably variable species *Rhactorhynchia sublacunosa* (Szajnocha, 1879) and „*Rhynchonella*” *dumortieri* Szajnocha, 1879, from which, however, they differ in an outline more stretched to width, more distinct plication and sharper ribs. The internal structure of our material is closest to the genera *Cymatorhynchia* Buckman, 1918 and *Goniorhynchia* Buckman, 1918, both including a series of species more or less

externally different from the material described here. Assignment of our specimens to some of these Buckman's genera, however, I consider as premature because there are not enough data about the internal structure of the mentioned genera and its variability.

Occurrence: Vršatec – reddish organodetrital limestones of locality 7 (13 specimens) and locality 17 (8 specimens).

„Rhynchonella” aff. triplicosa (Quenst., 1852)

Pl. VII, Fig. 3

aff. 1852 *Terebratula triplicosa* -F. A. Quenstedt, p. 454, Pl. 36, Fig. 26.

Material: 4 variously damaged moulds of two-valved specimens and 1 dorsal valve. Dimensions of figured specimen: $19,9 \times 24,5 \times 13,6$ mm.

Description: Subpentagonal, laterally expanded shells. The pedicle valve is lower and less convex, with a small and slightly incurved beak. The fold of dorsal valve is low and conspicuous in the anterior third of valve only. The plication of the anterior commissure is distinct although sometimes not high. The ribs, 9–10 on valve in number (3 of them on the fold of dorsal valve) are low and rounded, in the posterior third of valves become little distinct or disappear.

Remarks: Quenstedt's species „*triplicosa*” was ranged to the genus *Capillirhynchia* Buckman, 1918 by I. Seifert (1963) in her work about Swabian brachiopods, what is questionable. This genus was characterized by the presence of fine capillae, covering the surface of both valves. Lacking suitable material did not permit to study the internal structure of our specimens and so their generic affiliation has not been possible. Our specimens differ externally from the species of Quenstedt in the character of ribs, which in our forms are lower, more rounded and longer and especially in the smaller and less incurved beak of the pedicle valve.

Stratigraphic range: The species *Capillirhynchia* (?) *triplicosa* (Quenstedt) is mentioned from the „*Makrocephalen-Schichten*” (Dogger ϵ , Low. Callovian).

Occurrence: Vršatec-locality 7.

Acanthothyridinae Schuchert, 1913

Acanthothiris Orbigny, 1850

Acanthothiris spinosa (Linnaeus, 1767)

Pl. V, Fig. 2

1966 *Acanthothyris spinosa* Schlotheim-M. Jordan, p. 266, Pl. 2, Fig. 6.

1966 *Acanthothiris spinosa* (Schlotheim)-Y. Alméras, p. 277, Pl. 17, Fig. 1-3.

1969 *Acanthothiris spinosa* (Linnaeus)-A. Childs, p. 55, Pl. 5, Fig. 12–17, Text-fig. 21–2 (cum syn.).

Material: 2 complete specimens and 3 fragments of pedicle valve. Dimensions of figured specimen? $17,0 \times 19,7 \times 12,3$ mm.

Description: Our specimens correspond to the description published by A. Childs (1969). Different is only development of somewhat weaker ribs in our figured specimen, which may be up to 45 in number at the anterior margin of valves. The internal structure has not been studied because of lacking suitable material.

Remarks: So far the described species included fairly variable material because the majority of spinose forms were assigned to it in literature. Disunity in the question of species authorship also contributed to this view. Whilst some papers mentioned K. Linné (1767), in other publications E. F. von Schlotheim (1813) was quoted as author of species. This contradiction was discussed by A. Childs (1969) in his monograph, considering Schlotheim's species *Terebratulites spinosus* as younger synonym of the species of Linné. In the same monograph A. Childs also introduced the neotype of the species *A. spinosa*.

Stratigraphic range: Upper Bajocian to Lower Callovian.

Occurrence: Vršatec – sandy crinoidal limestones, loc. 2 (2 specimens) and reddish organodetrital limestones, loc. 7 (3 specimens). The species is known from Germany, Austria and Rumania; A. Childs (1969) revised the finds from England, France and Switzerland.

Acanthothiris cf. *costata* Orbigny, 1850

Pl. VIII, Fig. 2

cf. 1969 *Acanthothiris* cf. *costata* Orbigny-A. Childs, p. 60, Pl. 6, Fig. 2-4, Text-fig. 23.

Material: 1 specimen, dimensions $7,9 \times 8,8 \times 4,5$ mm.

Description: Small, oval, laterally expanded shell with equally convex valves. The plica of the anterior margin is low but sharply delimited. The beak of the pedicle valve is slightly incurved. On the surface of the dorsal valve there are 14 strong ribs (5 of them correspond to the plica) with indications of sparse spines.

Remarks: The small dimensions most probably testify for immaturity of the studied specimen, rendering its closer determination more difficult. In its total character it is closest to the species *A. costata* Orb., the original of which was illustrated in cast by A. Childs (1969) and to other specimens, which this author figured under the name *A. cf. costata*.

Stratigraphic range: The species *A. costata* is mentioned from the Bajocian. The quoted specimens, introduced by A. Childs (1969) are from the Upper Bathonian-Lower Callovian.

Occurrence: Vršatec-sandy crinoidal limestones of loc. 2.

? *Acanthothiris* sp.

Pl. VIII, Fig. 3

Material: 1 specimen, dimensions 8,4×7,5×3,7 mm.

Description: Small, rectimarginate, regularly biconvex shell of circular outline, with high, pointed and upright beak of pedicle valve. Both valves have around 25 ribs each at the anterior margin, formed partly by bifurcation, with indications of spines.

Remarks: The finer character of costation of this immature specimen could also remind one of the genus *Acanthorhynchia* Buckman, 1918; nearer determination, however, is not possible.

Occurrence: Vršatec-locality 17.

Cyclothyridinae Makridin, 1955

Capillirhynchia Buckman, 1918

Capillirhynchia (?) *triplicosa furcillata* (Quenstedt, 1871),

Pl. VII, Fig. 1

1871 *Terebratula triplicosa furcillata* -F. A. Quenstedt, p. 101, Pl. 39, Fig. 8-10.

1923 *Rhynchonella triplicosa* Quenst. sp. var. *furcillata* Quenst.-Fr. Trauth, p. 188.

Material: 6 more or less damaged specimens, 1 pedicle and 2 dorsal valves with remnants of original shell. Dimensions of best preserved specimens: ?15,0×16,9×11,2 mm (figured) and 12,7×?15,5×6,7 mm.

Description: The shells are distinctly dorsibiconvex, with trigonal, laterally expanded outline. The fold of dorsal valve is low, plication of anterior commissure variously high but always conspicuous. The ribbing is characteristic. The strong and mostly sharpened ribs are developed at the anterior margin of valves (3-6 of them on the fold of dorsal valve) whilst the remaining surface of valves is covered with a larger number of capillae, 35-45 in number on one valve. The boundary between both types of ornamentation is not sharp, on the sides of valves the capillae sometimes extend to the margin of valves.

Remarks: Due to lacking specimens suitable for the study of internal structure generic assignment of our material is not definitive. Analogous forms with double type of ornamentation are common in the Liassic and are ranged to the genera *Furcirhynchia* Buckman, 1918 and *Rimirhynchia* Buckman, 1918, which, however, according to up to date knowledge, do not reach the Middle Jurassic. The genus *Capillirhynchia* Buckman, to which our material is preliminarily ranged, should, according to original diagnosis, include even spherical forms with double type of ornamentation where the capillae are developed also between the ribs at the anterior margin. This is, however, in contradiction to the illustration of the type-species *C. wrighti* (Davidson, 1852) in the original monograph, in which both types of

ornamentation are more or less connected with each other similarly as in our material. In the case that the described subspecies by Quenstedt is proved to belong to the genus *Furcirhynchia*, a new name should be necessary to introduce for this subspecies (however, rather species!). The existing name would become a secondary homonym as in the genus *Furcirhynchia* already the species *F. furcillata* (von Buch, 1835) exists.

Stratigraphic range: Bathonian (to Lower Callovian?).

Occurrence: Vršatec-reddish organodetrital limestones at loc. 7. D. Andrusov (1945) mentioned this species from the Subpieninic group north of Dlhá in the Orava valley. From the literature are known occurrences in Germany and Austria.

Erymnariidae Cooper, 1959

Septocrurellinae Ager-Childs-Pearson, 1972

Septocrurella Wiśniewska, 1932

Septocrurella sanctaeclarae (Roemer, 1870)

Pl. V, Fig. 1,4; Text-fig. 8

1870 *Rhynchonella Sanctae Clarae* n. sp. -F. Roemer, p. 247, Pl. 22, Fig. 11.

1870 *Rhynchonella Wolfi* nov. sp. -M. Neumayer, p. 554, Pl. 23, Fig. 3.

1892 *Rhynchonella Haasi* n. sp. -J. Siemiradzki, p. 131.

1932 *Septocrurella Sanctae Clarae* (Roemer)-M. Wiśniewska, p. 65, Pl. 6, Fig. 25-35; Text-fig. 19-20.

?1950 *Rhynchonella Wolfi* Neumayer-R. D. Charles, p. 10, Pl. 2, Fig. 9.

1970 *Septocrurella sanctaeclarae* (Roemer)-E. S. Tchorževskij, p. 54, Pl., Fig. 5; Text-fig. 4.

Material: 11 partly damaged internal moulds with remnants of shell and 1 pedicle valve. Dimensions of best preserved specimens: 16,5×?14,0×8,9 mm; ?12,0×12,5×8,0 mm (figured in Pl. V, Fig. 1.), 11,6×?13,0×7,6 mm (figured in Pl. V, Fig. 4); 11,2×11,5×7,5 mm; 8,1×8,9×5,5 mm.

Description: Sulcate shells of subtrigonal outline with moderately convex valves; the height of the pedicle valve mostly exceeds the height of the dorsal valve. The sinus of the anterior commissure is deep with 1-3 strong ribs. The moderately incurved beak of the pedicle valve is strongly developed; beak-ridges rather sharp. The pedicle opening is hypothryid (?). The ribs (attaining the number of 8 on valve) are high and distinct only in the anterior half of valves but may be traced to their umbones. Sometimes antidichotomy may be observed (always 2 ribs are grown together towards the anterior margin of shell into one rib).

Internal structure: The dental lamellae are subparallel and relatively short. The massive teeth without crenulation have a groove-like depression for better articulation (section 1,5). Denticula well developed. The pedicle collar not observed.

The subhorizontal hinge plates are not distinctly separated from the inner socket

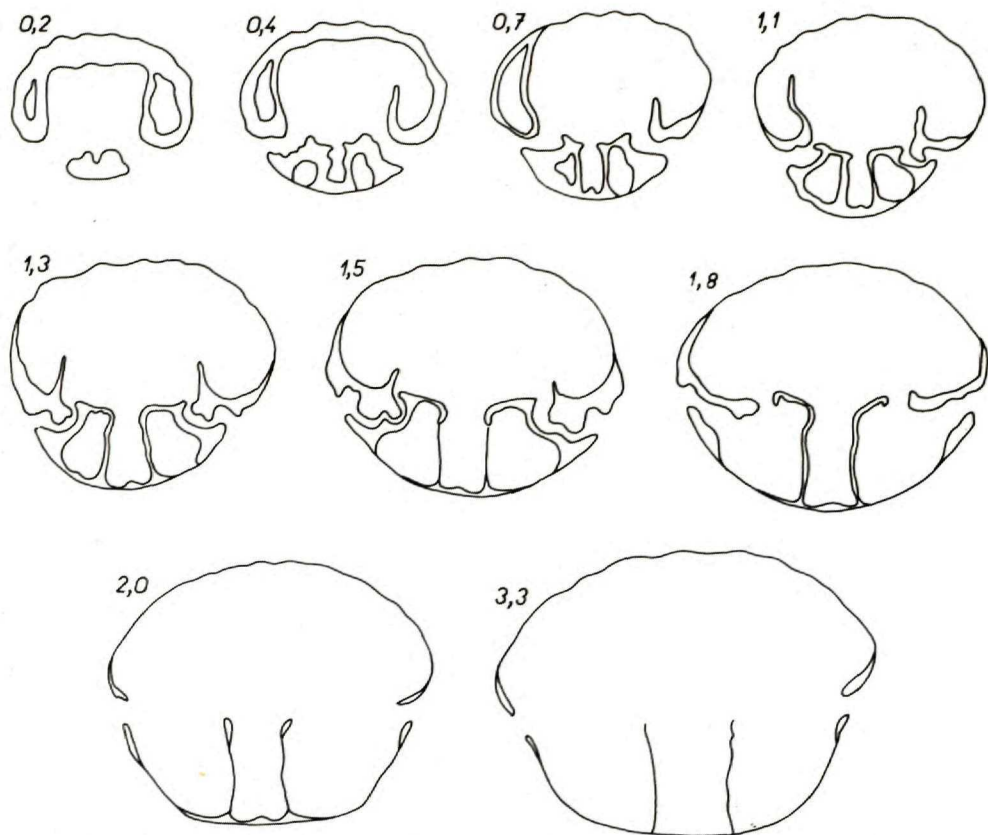


Fig. 8 *Septocrurella sanctaeclarae* (Roem.). A series of transverse sections through the shell. Crura disappeared at 5,1 mm from the posterior end. Original length of specimen 14,5 mm. Locality 1, filling of fissure C. All x 6 approx.

ridges. The dental sockets are very wide and deep, with a low ridge, corresponding to the groove of teeth. The crural bases are lying dorsally. The septifer crura are supported by slightly bent crural plates.

Remarks: It is necessary to agree with M. Wiśniewska (1932) when she ranged the species *Rhynchonella wolfi* Neumayer, 1870 to the synonymy of the species described here. According to J. Siemiradzki (1894) both the species are different from each other and, moreover, the illustration of Roemer does not correspond to the accompanying description (according to J. Siemiradzki this description belongs to the species *Rhynchonella wolfi*). On the basis of Roemer's illustration (1870, Pl. 22, Fig. 11), in my opinion, J. Siemiradzki established even unjustified new species *Rhynchonella Haasi*. The distinguishing features, mentioned by R. P. Charles (1950) in support of his opinion of independent existence of both above mentioned species *Rhynchonella wolfi* and *Rhynchonella Sancta Clarae*

(difference in the height and outline of shell), I do not consider as sufficient regarding to considerable variability of these characters.

Stratigraphic range: Oxfordian (the species is mentioned from the *Cardioceras cordatum* Zone).

Occurrence: Vršatec-locality 1, filling of fissure C (10 specimens) and of fissure H (2 specimens). The species is also known from Moravia, Poland, Ukraine and (?) Provence.

Terebratulida Waagen, 1883

Terebratulidina Waagen, 1883

Terebratulacea Gray, 1840

Terebratulidae Gray, 1840

Dundrythyris Alméras, 1972

Dundrythyris retrocarinata (Rothpletz, 1886)

Pl. X, Fig. 2; Text-fig. 9

1886 *Terebratula retrocarinata* n. sp. - A. Rothpletz, p. 101, Pl. 1, Fig. 8-9; Pl. 2, Fig. 1-8.

1923 *Terebratula perovalis* Sow. var. *retrocarinata* Rothpl.-Fr. Trauth, p. 194.

1946 *Terebratula (Lobidothyris) retrocarinata* Rothpletz-Fr. Lieb, p. 141.

1969 „*Terebratula*” *retrocarinata* Rothpletz-J. Pevný, p. 148, Pl. 29, Fig. 4.

Material: 21 variously damaged specimens with fragments of original shell. Figured specimen of dimensions: 35,0×25,0×14,8 mm. Other better preserved specimens with dimensions: 35,1×27,2×19,7 mm; 33,3×28,1×16,8 mm; 26,6×21,2×18,5 mm. Very probably belong to this species also 10 smaller specimens with rectimarginate or uniplicate anterior commissure.

Description: Oval, elongated shells with higher and more convex (sometimes even carinate) pedicle valve. The anterior margin is sulcinate. The plication is more or less distinct, sometimes „ribs” are developed, delimiting the fold of dorsal valve, which are conspicuous in the anterior third of shell. The strong beak of the pedicle valve has mostly short beak-ridges. The concentric growth lines on valves are sometimes very distinct. On the dorsal valve there are scars of slightly divergent adductors visible.

Internal structure. It was possible to ascertain well developed teeth in close contact with wide and deep dental sockets, distinct denticula, a wide bilobate cardinal process of „comb-like” cross section and the low dorsal euseptoid.

Remarks: Our figured specimen differs from the most other specimens from Vršatec in having a narrower shell, narrower beak of pedicle valve and little distinct biplication. Y. Alméras (1972) ranged some specimens of the species *Terebratula retrocarinata*, illustrated by A. Rothpletz to the synonymy of the species *Dundrythyris perovalis* (Sow., 1825), without giving an explanation. The species of Sowerby is actually very close and differs externally only little in having longer and

more conspicuous beak-ridges and somewhat different shape of the anterior shell margin; however, it is geologically older – on the basis of revisional study of Y. Alméras (1972) it is found within the range Upper Aalenian-Lower Bajocian. As hitherto knowledge of the data of the species described here is not sufficient for satisfactory solution of its relation to the species *D. perovalis*, I consider both the species temporarily as different. The reason is moreover, the different geological age of both species and also the fact that the species „*Terebratula*” *perovalis* appears in literature as collective one; a series of similar forms from the whole Middle Jurassic were ranged to it, which in fact belong not only to other species but also to other genera. As understood so far, this species was of little practical importance.

Stratigraphic range: According to Y. Alméras (1964) Middle Bajocian-Bathonian.

Occurrence: Vršatec-organodetrital limestones of loc. 17. D. Andrusov (1945) mentioned this species („*Terebratula perovalis retrocarinata*”) from crinoidal limestones of the Subpieninic group north of Dlhá in the Orava valley, J. Pevný (1969) from similar limestones in the quarry Podhorie near Slávnica. The finds by Rothpletz are from the Vilser Alpen.

Monsardithyris Alméras, 1972

Monsardithyris ventricosa (Zieten, 1830)

Pl. VIII, Fig. 1

1936 *Terebratula ventricosa* Hartmann-F. Arcelin-P. Roché, p. 73, Pl. 4, Fig. 1–11; Pl. 5, Fig. 12; Pl. 6, Fig. ?10; Pl. 14, Fig. 1–4, 6–7.

1965 *Lobothyris ventricosa* (Hartmann)-L. Rousselle, p. 89, Pl. 9, Fig. 1–8; Text-fig. 54–57.

1966 „*Terebratula*” *ventricosa* (Hartmann)-M. Jordan, p. 267, Pl. 3, Fig. 3.

1969 *Lobothyris ventricosa* (Hartmann)-J. Pevný, p. 150, Pl. 29, Fig. 3.

1972 *Monsardithyris ventricosa* (Hartmann-Zieten)-Y. Alméras, p. 202, Pl. 7, Fig. 1–2; Pl. 12, Fig. 1; Pl. 8 A–B, 9; Text-fig. 57–62 (cum syn.).

Material: 2 partly damaged specimens, the larger and better preserved of them with the dimensions 41,3 × 73,0 × 23,6 mm (figured).

Description: The shells attain larger dimensions, are oval in outline and have a relatively robust pedicle valve. The strongly developed beak of the pedicle valve is high and broad, incurved over the cardinal line. The beak-ridges are rounded but distinct and conspicuous in the posterior valve third. The anterior commissure of valves is uniplicate, with a wide, relatively low linguiform extension of pedicle valve. The surface of specimens is covered with numerous concentric growth lines.

Remarks: The internal structure of our material could not have been studied because of lacking suitable specimens. It was described in detail by Y. Alméras (1972), who also critically evaluated all the preceding data in literature, concerning the described species, also dealt thoroughly with its variability and relation to similar species *M. buckmaniana* (Dav., 1878) and *M. ronzevauxi* Alm., 1972.

Stratigraphic range : Middle and Upper Bajocian. According to Y. Alm  ras (1972) is also known its occurrence in the Lower Bathonian of Algeria.

Occurrence : Vr  atec-crinoidal limestones of locality 26. J. Pevn  y (1969) mentioned occurrence in crinoidal limestones in the Subpieninic group from Pova  ie (localities Meste  cko, Podhorie, Bohunice and Doh  any) and then from Pristodolok in the Mal   Karpaty Mts. The geographical distribution is reviewed by Y. Alm  ras (1972, p. 212).

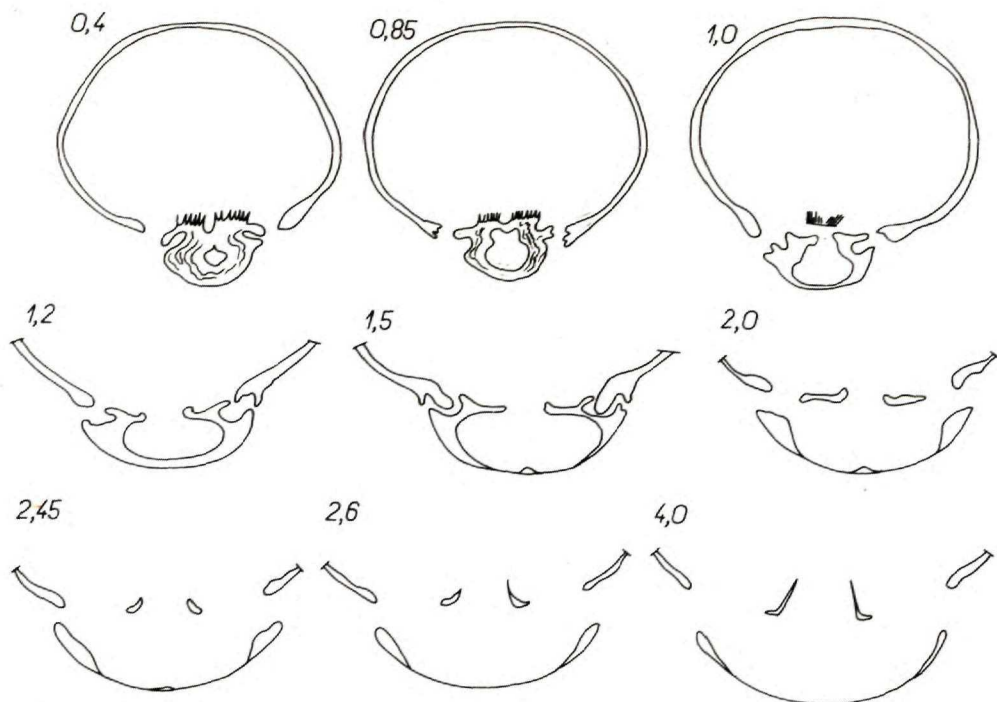


Fig. 9 *Dundrythyris retrocarinata* (Rothpl.). Transverse sections through the shell, measured from dorsal umbo. Original length of specimen ca 27,0 mm. Locality 17. All x 5 approx.

Pygopidae Muir-Wood, 1965

Pygope Link, 1830

Pygope diphya (Columna, 1606)

Pl. V, Fig. 3

1846 *Terebratula diphya* Colonna-L. Zejszner, p. 15, Pl. 1, Fig. 1-8.

1870 *Terebratula diphya* Fabio Colonna sp. -K. A. Zittel, p. 126, Pl. 37, Fig. 1-10.

1956 *Pygope diphya* Col. -M. Ksiazkiewicz, p. 220, 356, Pl. 26, Fig. 14.

1962 *Pygope diphya* Fabius Columna sp. -P. Jarre, p. 48, Tab. D, Fig. 1-3, Tab. E, Fig. 1; Text-fig. 5-6 (cum syn.).

1966 *Pygope diphya diphya* (Buch)-J. Geyssant, p. 78, 88, Pl. 3, Fig. 1-2, ? 3; Text-fig. 5.

1966 *Pygope diphya*-K. Vogel, Pl. 39, Fig. 7, Text-fig. 8.

1972 *Pygope diphya* (Colonna, 1616)-W. Barczyk, p. 509, Pl. 1, Fig. 2-3; Pl. 4, Fig. 1-3, Text-fig. 1.

Material: 16 more or less damaged internal moulds of pedicle and of dorsal valves and 5 incomplete internal moulds of young specimens. The length of valves attains 40 mm, width 45 mm.

Description: The shells are regularly biconvex, subtrigonal in outline, with conspicuous central opening, circular or oval in shape. The opening is situated in the middle or more to the posterior half of valves and penetrates obliquely through the shell so that it appears in this case in the pedicle valve always nearer to the beak than in the dorsal valve. In dorsal view the sides of the shell are concave, less often straight. The shells of young specimens are projecting into 2 lobes at the anterior margin indicating more or less a tendency to later mutual connection and forming of central opening.

Remarks: Unfavourable preservation of our specimens does not permit to get a view of variability of the described species. As it is known, however, the species of the genus *Pygope* are characterized by considerable variability, causing difficulties particularly when the species described here is being distinguished from the species *Pygope janitor* (Pictet, 1867). Total rounding of the shell outline, mentioned in literature as one of the distinguishing features between both the species, appears as unreliable, as it is visible from illustrations in the works quoted. As far as the central opening is small and lying in the posterior half of shell, ranging to the species *P. diphya* renders no difficulties. In the case that this opening is of larger dimensions and lying in the middle or nearer to the anterior margin of shell, the authors differ in determination. The individual principal features for distinguishing of the above mentioned species may be ordered, on the basis of literature as to their importance, as follows: 1. size of the central opening and its location in both valves; 2. convexity or concavity of the sides of shell in dorsal (ventral) view; 3. the course of lateral commissure of valves (simple, straight or moderately bent in the species described). Our specimens agree in total outline with the specimens illustrated by J. Geyssant (1966) and W. Barczyk (1972) and differ from some of them in having a larger central opening, lying nearer to the shell middle.

The genus *Pygope* was living according to K. Vogel (1966) in calm, deep waters, poor in benthos. In this environment with relatively lacking nourishment the central opening in brachiopod shells served for draining off refiltered waters.

Stratigraphic range: Upper Kimmeridgian-Berriasian.

Occurrence: Vršatec-light-coloured muddy limestones of locality 6 (25 specimens) and locality 36 (1 specimen). The species is mentioned from many localities in the Czechoslovak Carpathians; the occurrence in the Klippen Belt is quoted by D. Andrusov (1945). A survey of distribution in the Mediterranean region is presented in detail by J. Geyssant (1966).

Nucleata Quenstedt, 1868

Nucleata bouei (Zejszner, 1846)

Pl. IX, Fig. 4

- 1846 *Terebratula bouei* Z. -L. Zejszner, p. 27, Pl. 3, Fig. 1.
1870 *Terebratula Bouei* Zeuschner-K. A. Zittel, p. 131, Pl. 37, Fig. 15-24.
?1877 *Terebratula Bouei*, Zeuschner-J. Favre, p. 77, Pl. 9, Fig. 10-12.
1890 *Pygope Bouei* Zeuschner-A. Toucas, p. 586, Pl. 14, Fig. 9.
?1956 *Glossothyris bouei* (Zejszn.)-M. Książkiewicz, p. 218, Pl. 26, Fig. 5.
1962 *Glossothyris bouei* Zeuschner sp. -P. Jarre, p. 93, Tab. J. Fig. 10 (cum syn.).
?1966 *Glossothyris bouei* (Zejszner)-J. Geyssant, p. 75, 80, Pl. 1, Fig. 1-4.
1972 *Nucleata bouei* (Zejszner)-W. Barczyk, p. 153, Pl. 1, Fig. 1-2; Text-fig. 1-3.

Material: 5 more or less damaged internal moulds with remnants of shell. Dimensions of figured specimen: length of pedicle valve 18,4 mm, length of dorsal valve 13,9 mm, width of shell ?19,5 mm, height of sinus of anterior commissure of valves 11,8 mm, its maximum width 9,9 mm.

Description: The sulcate smooth shells are distinctly ventribiconvex, subtrigonal or even cordate in outline. Their width somewhat exceeds the length. The sinus of the anterior commissure is of narrower or wider V-shape. The beak of the pedicle valve is fairly strong and high, incurved.

Remarks: Determination is rendered relatively easy only in the case of typically developed specimens, with excessively strong beak of pedicle valve and V-shaped sinus of the anterior commissure. The importance of these characters for the species described is also evident from the work by W. Barczyk (1972), in which he revised species of the genus *Nucleata* from the classical area of Czorsztyn. Ranging of some specimens with rounded sinus of the commissure to the species described is, in my opinion, questionable (e.g. K. A. Zittel, 1870, Pl. 37, Figs. 19 and 24; M. Książkiewicz, 1956; J. Geyssant, 1966). In the genus *Nucleata* the variability of the anterior sinus is considerable and there are many transitional forms from its V-shaped course to rounded shape, in the form of wider or narrower U. Therefore such distinguishing of species of the genus *Nucleata* cannot be considered as satisfactory, which is mostly based upon the shape of anterior sinus (e.g. applied by P. Jarre, 1962). So the need of revision of the genus *Nucleata* is quite evident.

Stratigraphic range: Vršátec-Tithonian of locality 6. In our territory the species is known from Štramberg; -D. Andrusov (1945) mentioned finds from the Czorsztyn limestones near Nižná and from the Tithonian of Kruchý vrch. More often its occurrence is quoted from the Polish part of the Klippen Belt and the High Tatras. Distribution in the Mediterranean region was treated by J. Geyssant (1966).

Nucleata rupicola (Zittel, 1870)

Pl. IX, Fig. 3

1870 *Terebratula rupicola* Zitt.-K. A. Zittel, p. 134, Pl. 38, Fig. 1-2.

1962 *Glossothyris rupicola* Zittel sp. -P. Jarre, p. 101, Tab. J, Fig. 4.

1966 *Glossothyris rupicola* (Zittel)-J. Geysant, p. 76, 82, Pl. 1, Fig. 5.

1972 *Nucleata rupicola* (Zittel)-W. Barczyk, p. 157, Pl. 1, Fig. 6-7, Text-fig. 6.

1975 *Nucleata rupicola* (Zittel)-D. V. Ager, p. 152, Text-fig. 2.

Material: 3 partially damaged specimens with remnants of original shell, with dimensions $18,2 \times 20,4 \times 12,6$ mm; $15,9 \times ?18,0 \times 11,3$ mm (figured) and $15,6 \times 18,6 \times 10,7$ mm.

Description: The shells are smooth, distinctly ventribiconvex and sulcate. The fold of pedicle valve is conspicuous in the anterior half of shell. The sinus of anterior commissure is of regular U-shape. The beak of pedicle valve is broad, the cardinal margin slightly bent only. At the outer periphery of shell growth-wrinkles are visible, they are better developed on the dorsal valve.

Remarks: Our specimens are less laterally expanded than, for instance, the specimens illustrated by K. A. Zittel (1870) and J. Geysant (1966) but are broader than the specimen figured by W. Barczyk (1972a) in Pl. 1, Fig. 6. A very close species is *Nucleata planulata* (Zejszner, 1846) from the Tithonian and Berriasian, characterized by lesser development of lateral parts of shell and wider sinus of the anterior commissure as reported in literature. Both features, however, display considerable variability, which renders determination of most specimens difficult. Barczyk's statement (1972a, p.158) that the species *N. rupicola* is flatter than other species of this genus, is not provable as it is evident also from the illustration in Barczyk's paper.

Stratigraphical range: Oxfordian-Tithonian, according to J. Geysant (1966) also Berriasian.

Occurrence: Vršatec-locality 1, filling of fissure H, and loc. 9 (red nodular limestones). K. A. Zittel (1870) mentioned an occurrence from the Tithonian of the Klippen Belt near Púchov (Bezdedov). From filling of fissures at the locality Rocca Busambra was this species quoted by J. Wendt (1971). A survey of occurrence in the Mediterranean region is included in the paper by J. Geysant (1966).

Pygites Buckman, 1906

?*Pygites diphyoides* (d'Orbigny, 1847)

1847 *Terebratula diphyoides* d'Orbigny-A. d'Orbigny, p. 87, Pl. 509, Fig. 1-9.

1867 *Terebratula diphyoides*, d'Orbigny-F. J. Pictet, p. 99, 158, Pl. 23, Fig. 1-8; Pl. 24, Fig. 9-16; Pl. 29, Fig. 1-3.

Material: 2 fragmental pedicle valves (length of the larger valve cca 57 mm) and 1 bilobate, probably immature specimen. Its dimensions are $15,8 \times 23,0 \times 8,4$ mm.

Description: The pedicle valve is subtrigonal in outline, in the posterior half with large circular opening. Between it and the beak of valve extends a low fold, delimited by sharper keels on the side, and with developed medial sulcus. Similarly the dorsal valve of two-valved specimen has there a shallow sulcus with indicated medial fold. The commissure of valves of this specimen is sulcate at the anterior margin and straight laterally.

Remarks: Incompleteness of our material does not allow to range it with certainty to the significant Lower Cretaceous species *Pygites diphyoides*. Similar keel-like delimitation appearing posteriorly on the fold of pedicle valve, which is developed in our material and is one of the characteristic features of the species *P. diphyoides*, was figured also in some specimens of species *Pygope sima* (Zeuschner, 1846), e.g. by F. J. Pictet (1867, Pl. 33, Fig. 6–7). This species, however, has a distinctly bent lateral commissure. Since the course of this commissure is not well visible in our adult specimen, the question of exact specific classification of our material remains open.

Stratigraphic range: The species *Pygites diphyoides* is found from the Berriasian to the Valanginian (?Hauterivian).

Occurrence: Vršatec-red crinoidal limestones, loc. 23 (2 specimens) and loc. 47 (1 specimen).

Terebratulidina Muir-Wood, 1955

Zeilleriacea Allan, 1940

Zeilleriidae Allan, 1940

Zeilleria Bayle, 1878; s.l.

„*Zeilleria*” *polonica* Rollier, 1919

Pl. X, Fig. 1

1879 *Waldheimia emarginata* Sowerby (partim) - L. Szajnocha, p. 214, Pl. 4, Fig. 17.

1879 *Waldheimia subbuculenta* Chapuis and Dewalque-ibid., p. 215, Pl. 4, Fig. 21–24.

1919 *Zeilleria (Microthyris) Polonica* sp. nov. - L. Rollier, p. 316.

Material: 14 more or less fragmental and sometimes deformed specimens with remnants of original shell. Dimensions of best preserved specimens: $27,5 \times 24,9 \times 13,2$ mm (figured), cca $26,0 \times 23,9 \times 13,2$ mm; $24,8 \times 20,4 \times 11,7$ mm.

Description: The specimens are indistinctly elongated and mostly subtetragonal to subpentagonal in outline, with relatively considerable maximum-width situated in the mid-length. The anterior margin is rectimarginate or indistinct uniplication is indicated. The pedicle valve is mostly more convex, the high beak with distinct and long beak-ridges, sometimes extending far to the valve sides. Not rarely

steplike growth lines are characteristic of this species and most conspicuous in the anterior half of pedicle valve. Not very long dental lamellae are ventrally divergent, the externally visible dorsal septum is developed in the posterior valve third.

Remarks : Figured specimen is somewhat nontypical in its more rounded outline of valve sides in dorsal view. The majority of our other specimens have more distinct laterally expanded valve sides; so the outline of shells of these specimens is subangular. In literature there are many specific names, designating specimens very similar in shape to the species described here. As most original descriptions are not sufficient from modern viewpoint and a few revisional works concerning Jurassic zeillerid brachiopods including the study of their internal structure exist, it is not possible to establish correctly relationships of the species described here to similar ones. Externally similar forms from the European Middle Jurassic were often determined as *Zeilleria* (=recte *Rugitela*) *emarginata* (Sowerby), or *Z. subbuculenta* (Chap. et. Dew.), occurring in the Bathonian or Bajocian of Western Europe. Because of bad preservation, generic attribution of our specimens cannot be studied more in detail. The genus *Microthyris* Eud.-Des., 1884, to which the described species was assigned by some authors, is considered by H. M. Muir-Wood in Moore R.C. (1965) as synonymous with the genus *Ornithella* Eud.-Desl., 1884.

Stratigraphic range : Bathonian-Callovian.

Occurrence : Vršatec-reddish organodetrital limestones, loc. 7 (11 specimens) and loc. 17 (3 specimens); Poland.

Camerothyris Bittner, 1890

Camerothyris wahlenbergi (Zejszner, 1846)

Pl. IX, Fig. 1-2.

1846 *Terebratula wahlenbergii* Z.-L. Zejszner, p. 29, Pl. 8, Fig. 1-5.

1870 *Megerlea Wahlenbergi* Zeuschner sp. -K. A. Zittel, p. 141, Pl. 38, Fig. 16-20.

1971 *Camerothyris wahlenbergi* (Zejszner) -W. Barczyk, p. 426, Pl. 1-2, Text-fig. 1-4.

Material: 16 mostly more or less damaged internal moulds. The figured specimens are of dimensions: $11,2 \times 12,2 \times 7,2$ mm (Pl. IX, Fig. 1) and $?12,0 \times 13,5 \times 8,9$ mm (Pl. IX, Fig. 2).

Remarks : External morphology of our specimens corresponds to the description lately published by W. Barczyk (1971), who also studied the internal structure and growth variability of Polish material.

Stratigraphic range : Tithonian-Berriasian.

Occurrence : Vršatec-loc. 6 (15 specimens) and loc. 23 (1 specimen). The species is mentioned from the French Alps and from the area of the Klippen Belt in the Pieniny.

Antiptychina Zittel, 1880

Antiptychina aff. *bivallata* (Eud.-Deslongchamps, 1859)

Pl. X, Fig. 3

aff. 1885 *Terebratula* (*Terebratella*) *bivallata* (Eug. Desl.)—E.Eud.-Deslongchamps, p. 323, Pl. 92 Fig. 1–6; Pl. 93, Fig. 1–6.

Material: 1 specimen of dimensions $78,0 \times 7,9 \times 4,2$ mm with broken beak of pedicle valve.

Description: Small, obviously immature specimen of distinctly pentagonal outline with little convex valves. The dorsal valve is sulcate, with slightly indicated median fold in the anterior margin. Corresponding to it on the fold of pedicle valve there is a sulcus of trigonal shape, conspicuous in the anterior valve third. The anterior commissure of valves is antiplicate. The beak ridges of pedicle valve are long and rather sharp. The dorsal septum is well visible in the posterior half of valve.

Remarks: Our specimen differs from most specimens of the species *A. bivallata* known from literature in having a shorter and less distinct median sulcus of the pedicle valve and relatively greater width (in its outline it almost agrees only with the broad specimen, illustrated by E. Eud.-Deslongchamps (1885) in Pl. 92, Fig. 1). In the mentioned characters and, moreover, in weaker bending of the lateral commissure of valve our specimen differs from the species *Antiptychina puchovensis* Pevný, 1969. Probable immaturity of our specimen hinders from nearer comparison with both the quoted species.

Stratigraphic range: The species *A. bivallata* is known from the Upper Bajocian (?) and Bathonian.

Occurrence: Vršatec-reddish organodetrritic limestones (Bathonian?) at the locality 28.

Translated by J. Pevný.

Reviewed by J. Michalík.

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Ramenonožci bradla vršateckého hradu (bajok-?berrias) u Ilavy na středním Považí

9 obr., 6 fotogr. tab. (V-X), resumé anglického textu

Studovaná ramenonožcová fauna pochází z bradla hradu Vršatec severně od Ilavy (czorsztynská jednotka).

Byla poměrně málo vhodná ke studiu vnitřní stavby, což bylo dáno jednak její fragmentaritou a zvláště pak rekrystalizací vnitřků schránek na většině lokalit. Příznivěji zachovaný materiál byl získán pouze z kalových vápenců oxfordu a titónu. Kromě druhů, nalezených ve vrstevním sledu od bajoku až do berriasu (?), byl ve výplních rozsedlin zjištěn i překvapivý výskyt ramenonožců oxfordského stáří. Tam představovali jedinou složku fauny (nehledě na nález jednoho fragmentárního aptychu). Přitom je nápadná skutečnost, že další petrograficky obdobné a za oxford považované horniny na Vršatci neposkytly žádné ramenonožce. Podle J. Wenda (1971), který studoval genezi a faunu rozsedlin na řadě jiných lokalit mediteránní jury, je vlastní autochtonní část této fauny dosti omezená a ramenonožce neobsahuje. Ti představují podle jmenovaného autora buď složku zcela allochtonní nebo složku transportovanou na krátkou vzdálenost, při čemž vyřešení otázky příslušnosti k té či oné jmenované složce naráží v konkrétních případech na obtíže. Na tuto otázku se nepodařilo zatím jednoznačně odpovědět ani v souvislosti s poměrně dobře zachovanými ramenonožci z výplní rozsedlin na Vršatci, i když v tomto případě by se vysvětlení autochtonitou ramenonožcové fauny zdálo nejjednodušším.

Byly určeny následující druhy:

Bajok až ? bath – šedé písčité vápence: *Acanthothiris spinosa* (Linn.) a *Acanthothiris* cf. *costata* Orb. (lok. 2); červenavé krinoidové vápence: *Monsardithyris ventricosa* (Zieten) (lok. 26);

bath až sp. callov – načervenalé kalové, resp. organodetriticko-kalové vápence: *Acanthothiris spinosa* (Linn.), *Capillirhynchia* (?) *triplicosa furcillata* (Quenst.) a „*Rhynchonella*” aff. *triplicosa* (Quenst.) (lok. 7), „*Rhynchonella*” aff. *ehningensis* (Quenst.) a „*Zeilleria*” *polonica* Rollier (lok. 7 a 17 – z těchto lokalit pochází i bohatá fauna mlžů, zpracovaná M. Kochanovou; v tisku), *Dundrythyris retrocarinata* (Rothpl.) a ?*Acanthothiris* sp. (lok. 17), *Antiptychina* aff. *bivallata* (Eud.-Desl.) (u lok. 28);

oxford – červenavé kalové vápence (výplň rozsedlin): *Septocrurella sanctaeclarae* (Roem.), *Monticlarella striocincta* (Quenst.), *Lacunosella* aff. *monsalsvensis* (Gill.) a *Nucleata rupicola* (Zittel) (lok. 1); světlé biohermní a přibiohermní vápence: ?*Lacunosella* sp. (lok. 22-bohatá doprovodná fauna mlžů), *Monticlarella triloboides* (Quenst.) (lok. 25), ?*Monticlarella* aff. *triloboides* (Quenst.) (lok. 38);

kimeridž (?) – červený hlíznatý vápenec: *Nucleata rupicola* (Zittel) (lok. 9);

titón – krémové a růžové kalové vápence: *Nucleata bouei* (Zejsz.), *Camerothyris wahlenbergi* (Zejsz.) a *Lacunosella moutoniformis* (Jac.-Fall.) (lok. 6), *Pygope diphyia* (Col.) (lok. 6 a 36);

berrias (?) – červené krinoidové vápence: *Camerothyris wahlenbergi* (Zejsz.) (lok. 23), ?*Pygites diphyoides* (d'Orb.) a *Lacunosella* aff. *moutoniformis* (Jac.-Fall.) (lok. 23 a 47), „*Rhynchonella*” *agassizi* (Zejsz.) (lok. 47).

Explanations to plates V—X

Plate V

- Fig. 1 *Septocrurella sanctaeclarae* (Roem.). Locality 1, filling of fissure C, x3
Fig. 2 *Acanthothiris spinosa* (Linn.). Locality 7, x2
Fig. 3 *Pygope diphya* (Col.). Locality 6, x2
Fig. 4 *Septocrurella sanctaeclarae* (Roem.). Locality 1, filling of fissure C, x2
Fig. 5 *Monticlarella striocincta* (Quenst.). Locality 1, filling of fissure C, x2

Plate VI

- Fig. 1 „*Rhynchonella*” aff. *ehningensis* (Quenst.). Locality 7, x 2
Fig. 2–3 *Monticlarella triloboides* (Quenst.). Locality 25, x3

Plate VII

- Fig. 1 *Capillirhynchia* (?) *triplicosa furcillata* (Quenst.) Loc. 7, x2
Fig. 2 *Lacunosella* aff. *moutoniformis* (Jac.-Fall.). Compressed specimen. Loc. 47, x2
Fig. 3 „*Rhynchonella*” aff. *triplicosa* (Quenst.). Loc. 7, x2
Fig. 4 *Lacunosella moutoniformis* (Jac.-Fall.). Loc. 6, x2

Plate VIII

- Fig. 1 *Monsardithyris ventricosa* (Ziet.). Loc. 26, x2
Fig. 2 *Acanthothiris* cf. *costata* Orb. Loc. 2, x3
Fig. 3 ?*Acanthothiris* sp. Loc. 17, x3

Plate IX

- Fig. 1 *Camerothyris wahlenbergi* (Zejsz.). Loc. 6, x3
Fig. 2 *Camerothyris wahlenbergi* (Zejszn). Loc. 6, x2
Fig. 3 *Nucleata rupicola* (Zitt.). Loc. 1, filling of fissure H, x2
Fig. 4 *Nucleata bouei* (Zejsz.). Loc. 6, x2

Plate X

- Fig. 1 *Zeilleria polonica* Roll. Large specimen. Loc. 7, x2
Fig. 2 *Dundrythyris retrocarinata* (Rothpl.). Loc. 17, x2
Fig. 3 *Antiptychina* aff. *bivallata* (Eud.-Desl.). Loc. 28, x3

Photographs of plates V–X taken by Mrs. M. Páralová. Before photographing the specimens were coated with ammonium chloride. The material is deposited in the Geological Institute of the Czechoslovak Academy of Sciences in Prague.

Jozef Pevný

Brachiopoda of the genus *Aulacothyris* from the Carnian of the West Carpathians

6 Text-figures, 1 plate, (XXXIX), Slovak summary

Abstrakt. In der vorliegenden Arbeit werden karnische Vertreter der Gattung *Aulacothyris* Douvillé aus den Westkarpaten beschrieben. Es handelt sich um die Arten *Aulacothyris rüdti* (Bittner), *A. compressa* (Bittner), *A. zugmayeri* (Bittner) und *A. rupicola* (Bittner). Die betreffenden Arten stammen aus Krinoiden- Korallen- (Korytnica-) Kalken der Niederen Tatra und rosagrauen krinoiden und Lumachellenkalken des Slowakischen Karstes. Beschrieben werden deren äussere Merkmale sowie auch die innere Struktur auf Grund von Schliffserien.

Introduction

Species of the genus *Aulacothyris* form a characteristic component of brachiopod assemblages from the Carnian of the West Carpathians. Their quantity and relatively good state of preservation make possible to study the inner structure by the method of serial sections. Species of the genus *Aulacothyris* are found in the Low Tatra in crinoidal-coral limestones and in the Slovak Karst in greyishpink crinoidal and lumachelle Carnian limestones. Concerned are the species *Aulacothyris rüdti* (Bittner), *A. compressa* (Bittner), *A. zugmayeri* (Bittner) *A. rupicola* (Bittner).

A-Low Tatra

1. South of Liptovská Osada, first quarry in the cutting of the road Ružomberok – Banská Bystrica. (Fig. 1)

In the Korytnica limestones of the Choč nappe (A. Bujnovský 1973, p. 38) is found *Aulacothyris rüdti* (Bittner) together with other brachiopod species – *Camerothyris subangusta* (Münster), „*Terebratula*” aff. *sturi* Laube, *Rhaetina* aff. *pyriformis*

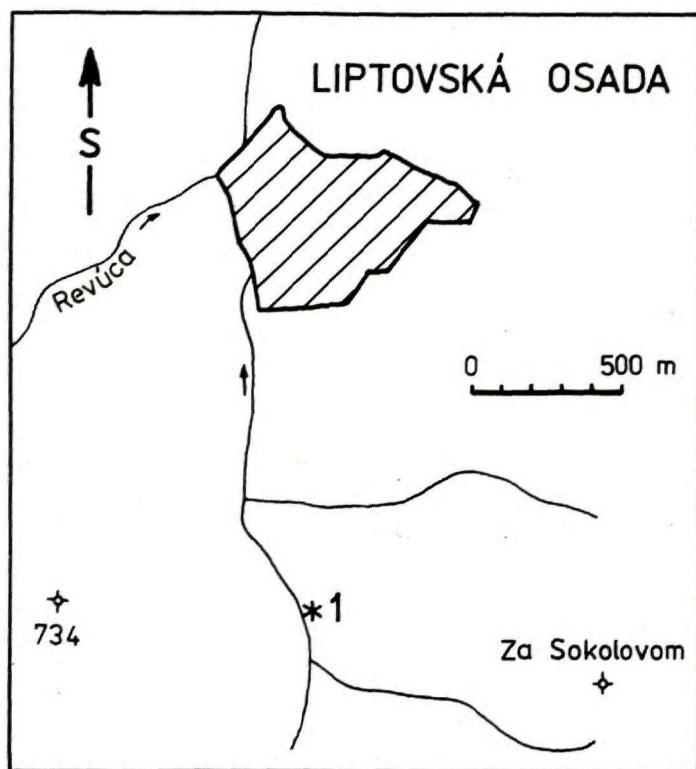
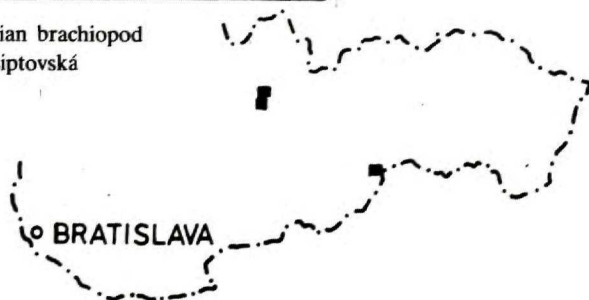


Fig. 1 Sketch-map of locality of Carnian brachiopod species of the genus *Aulacothyris* – Liptovská Osada, quarry



(Suess), *Dioristella indistincta* (Beyrich), *Diplospirella wissmanni* (Münster), *Euractinella contraplecta* (Münster), *Amphiclina amoena* Bittner, *Spiriferina gregaria* Suess; from bivalves determined M. Kochanová (1975): *Mysidioptera submulticostata* sp. n., *Halobia* cf. *rugosa* Gümbel, from echinoids are present *Cidaris dorsata* Braun, *Cidaris hausmani* Wissm.; cyanophyta are represented by *Tubiphytes obscurus* Maslov. The limestones are dark-grey to black, rusty-brown, regularly bedded, containing thin intercalations of marls, thickness of banks is 2–70 cm, the bedding planes are even, seldom deformed brachiopods and lamellibranchs are found, total thickness up to 30 m. The limestones are often organogenic-luma-

chelle with weathering out organic detritus. On the basis of the mentioned fauna the limestones can be considered as sediments of Julian age.

In the underlier are found grey to light-grey Raming limestones, which contain an association of reef-building organisms-calcareous sponges, crinoids, corals and *Tubiphytes obscurus* Maslov. From brachiopods are present „*Terebratula*” aff. *sturi* Laube, *Anisactinella quadriplecta* (Münster), *Dioristella indistincta* (Beyrich), from bivalves (M. Kochanová 1975) *Ornithopecten liptovensis* Kochanová, from echinoids *Cidaris dorsata* Braun, from crinoids *Encrinus cassianus* Laube. On the basis of the stratigraphic range of the mentioned species as well as of the Julian age of the overlier it may be supposed that at least the upper part of the Raming limestones belongs to the Cordevolian.

2. East of Ludrová, about 275 m E of elev. P. 580 (spring of mineral water, outcrop 7×6 m under the Lunz beds, Korytnica (crinoidal coral) limestones (Fig. 2)

Aulacothyris rüdti (Bittner) is found together with the brachiopod species *Cruratula carinthiaca* (Rothpl.), *Anisactinella quadriplecta* (Münster), *Dioris-*

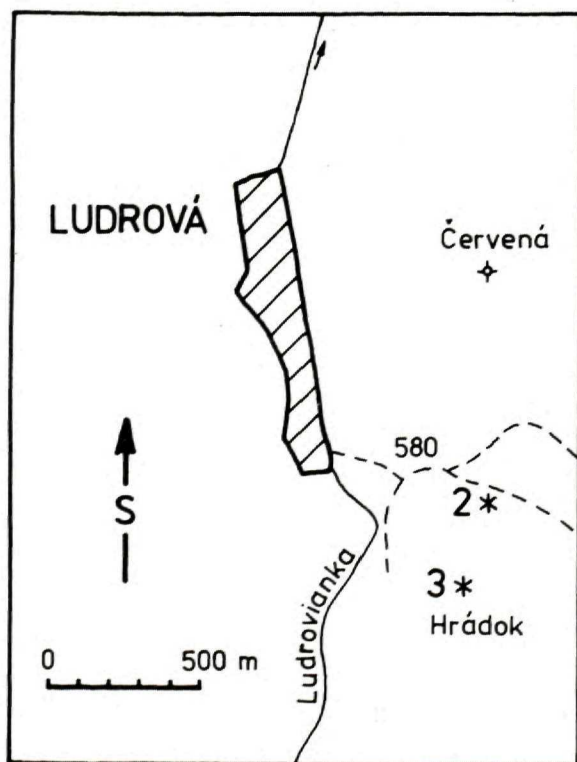


Fig. 2 Sketch-map of localities southeast of Ludrová, 2-spring of mineral water, 3-cutting of the new road

tella indistincta (Beyrich), *Spiriferina gregaria* Suess, *Spiriferina* sp., according to which we may range them to the Lower Julian.

From lamellibranchs M. Kochanová (1975) determined *Eumorphotis* sp. n., *Pecten? octoplicatus* Bittner, from cyanophyta was found *Tubiphytes obscurus* Maslov.

3. Southeast of Ludrová (Hrádok), cutting of the new road about 375 m SE of elev. p. 580, dark-grey Korytnica (crinoidal-coral) limestones under the Lunz beds.

The species *Aulacothyris rüdti* (Bittner) with Lower Julian brachiopods is found there: „*Terebratula*” *neglecta* Bittner, „*T.*” *ladina* Bittner, „*T.*” *oppeli* Bittner, „*T.*” aff. *sturi* Laube, „*Rhynchonella*” *cornaliana* Bittner, *Dioristella indistincta* (Beyrich), *Spiriferina gregaria* Suess.

The lamellibranchs are represented by the species: *Chlamys* sp., *Pseudomonotis* sp., *Lima* cf. *alternans* Bittner, *Lima* sp., gastropods by the species *Temnotropis bicarinata* Laube (M. Kochanová 1975), echinoids by *Cidaris dorsata* Braun, corals: (?) *Thecosmilia* sp.

B. Slovak Karst

4. Near Silická Brezová the most suitable profile for the study of Upper Triassic stratigraphy is situated about 1 km west of the village, south of the quarries for the so called „Brezová marble”

The bed sequence is as follows (J. Bystrický 1964, p. 65–66; 1973, p. 49–52): At the bottom are lying Wetterstein limestones with *Teutloporella herculea* (Stopp.) *Pia*, in places banked (up to 1 m), with small megalodonts. Brachiopod lumachelles with *Halorelloidea rectifrons* (Bittner), previously considered as the base of Carnian limestones (Julian), are only filling of joints in Wetterstein limestones.

Above the Wetterstein limestones of Ladinian age is resting a complex of light-coloured, massive organodetrital limestones, megascopically identical with the underlying Wetterstein limestones. Lithologically three parts may be distinguished in them.

a) Light-coloured, massive organodetrital limestones, equivalent to the dasycladacean zone *Poikiloporella duplicata*. This species (without *Teutloporella herculea*) (Stopp./*Pia*) in association with *Physoporella heraki* Bystr. v. *heraki*, *Ph. heraki* Bystr. v. *tenuipora* Bystr., *Uragiella supratriasica* Bystr., *Macroporella* (*Pianella*) *spectabilis* (Bystr.), *M. (P.) sturi* Bystr., *M. (P.) humilis* Bystr., *Poikiloporella brezovica* (Bystr.) and with various species of the genus *Gyroporella* reaches the underlier of the limestones with ammonite *Styrites* cf. *tropitiformis* Mojs. With dasycladaceans also foraminifers are found (O. Jendrejáková 1973).

b) Light-coloured, bedded limestones with layers of light-coloured and pink crinoidal limestones with brachiopods and ammonites. In this sequence are two ammonite horizons: the lower with *Styrites* cf. *tropitiformis* Mojs., which belongs to the Lower Julian. From the higher horizon we know *Paratropites phoebus* Dittmar only. In both horizons are numerous brachiopods (J. Bystrický – A. Biely 1966, p. 55). The age of ammonites is partially in contradiction to the view of the age of this sequence on the basis of brachiopods, which point to the Norian, mainly *Halorella amphitoma* (Bronn).

This sequence is passing laterally into light-coloured massive limestones with brachiopods, known from crinoidal limestones, with small, recrystallized dasycladaceans. In limestones with brachiopods and ammonites (*Styrites tropitiformis* Mojs.) conodonts were found: *Enantiognathus zieglerei* (Diebel), *Gondolella navicula* Huckriede, *G. polygnathiformis* Budurov-Stefanov, according to which (*G. polygnathiformis*) the limestones should belong to the Tuvanian (R. (Mock 1971, p. 249) and not to the Julian as ammonites indicate (V. Andrusovova 1967, p. 273).

c) The following higher sequence consists of light-coloured limestones. They are coarse-bedded, with pink spots and mostly compact (micrites). In the basal part are brachiopods – *Spiriferina halobiarum* Bittner and ammonites *Discotropites quinquepunctatus* (Mojs.), characteristic of the Tuvanian and *Arcestes* (*Proarcestes*) cf. *reyeri* Mojs. – occurs not higher than the Carnian. In the uppermost part, several metres below the Norian Hallstatt limestones (below the lowest quarries), is a lumachelle with *Halobia styriaca* (Mojs.).

Above light-coloured Carnian limestones are lying Norian Hallstatt limestones, a sequence formed by bedded red or pink nodular limestones, clastic limestones, light-coloured and pink bedded limestones with red cherts and in places with red and pink massive limestones.

Brachiopods from Silická Brezová were described and figured by K. Balogh (1940, p. 170–177, Tab. 1). He mentioned a fauna from two localities: locality I, relatively quite extensive, W or WSW of two depressions. From white or light-grey limestone he determined: *Rhynchonella* (*Austriella*) *gömörens* n. sp., *Rhynchonella* n. sp. div., *Spiriferina* sp. indet div., *Cyrtina* *Suessi* Winkl., *Cyrtina* ? *ambigua* n. sp., *Cyrtina* sp. indet, *Koninckina* sp. (ex aff. *Telleri* ?), *Waldheimia* (*Aulacothyris*) *supina* Bittn., *Waldheimia* (*Aulacothyris*) *supina* Bittn. var. *hungarica* var. m., *Waldheimia* (*Aulacothyris*) *Zugmayeri* Bittn., *Waldheimia* (*Aulacothyris*) *Wähneri* Bittn., *Waldheimia* (*Aulacothyris*) *angusta* Schloth. var. *sinuosa* var. n., *Waldheimia* (*Aulacothyris*) *angusta* Schloth. var. *Rosaliae* Salom., *Waldheimia* (*Aulacothyris*) n. sp. div., further *Pecten* sp. *Ammonites* sp. indet. From locality II south of the white limestone, 320 m of elev. p. 492 to NNW, on the way „Turkish gate”: In the lumachelle bank with numerous halorells he mentioned *Halorella amphitoma* Bronn var., *multicostata* Bittn., *Halorella amphitoma* Bronn var., *multicostata* Bittn., *Halorella* cf. *ancilla* Suess, *Halorella plicatifrons* Bittn.

The species described in this paper come from the locality 1 of K. Balogh, from greyishpink crinoidal limestones.

4/1. At the slope bordering the second sinkhole/locality 5-J. Bystrický – A. Biely 1966, Fig. 10, J. Pevný 1967, p. 4 (Fig. 3). *Aulacothyris zugmayeri* (Bittner) and *Aulacothyris compressa* (Bittner) are found here together with „*Rhynchonella*” *concordiae* Bittner, *Retzia pretiosa* Bittner, *Laballa suessi* (Winkler).

4/2. Second sinkhole, blasted out rock/locality 7 – J. Bystrický–A. Biely 1966, Fig. 10; V. Kollárová–Andrusová 1961, p. 226, J. Pevný 1967, p. 5) Present are *Aulacothyris compressa* (Bittner) and *Aulacothyris zugmayeri* (Bittner) together with „*Rhynchonella*” cf. *seydeli* Bittner (Fig. 3).

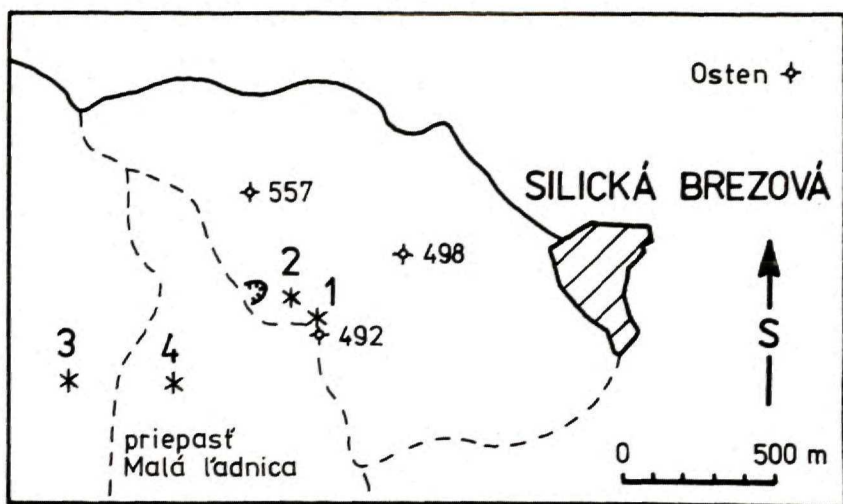


Fig. 3 Sketch-map of locality Silická Brezová

4/3. On the ridge of the plateau between fruit trees, 350 m south of the marble quarry (locality 8 -J. Bystrický–A. Biely 1966, Fig. 10, J. Pevný 1967, p. 5) (Fig. 3).

Present are *Aulacothyris compressa* (Bittner), *Aulacothyris zugmayeri* (Bittner), *Aulacothyris rupicola* (Bittner) together with „*Rhynchonella*” *concordiae* Bittner, *Halorella amphitoma* (Bronn), *Retzia pretiosa* Bittner and *Laballa suessi* (Winkler).

4/4. About 100 m east of the preceding locality, between fruit trees (locality 9 – J. Bystrický – A. Biely 1966, Fig. 10, J. Pevný 1967, p. 6) (Fig. 3). *Aulacothyris compressa* (Bittner), *Aulacothyris zugmayeri* (Bittner), *Aulacothyris rupicola* Bittner, together with „*Rhynchonella*” *raxana* Bittner, „*Rhynchonella*” *concordiae* Bittner, *Retzia pretiosa* Bittner and *Laballa suessi* (Winkler) are found there.

Systematic part

Phylum Brachiopoda Duméril, 1806

Articulata Huxley, 1869

Terebratulida Waagen, 1883

Terebratellidina Muir-Wood, 1955

Zeilleriaceae Allan, 1940

Zeilleriidae Allan, 1940

Aulacothyris Douvillé, 1879

Type-species *Terebratula resupinata* J. Sowerby, 1816,
Liassic, England

Diagnosis: Form of small to medium size, concave—convex or concave carinate to plano-convex, the anterior commissure is usually sulcate, the beak flattened, incurved, with sharp beak-ridges and distinctly delimited interarea. The crural bases are ventrally directed, the median septum reaches nearly half the length. The hinge plates are bent ventrally, indistinctly separated from the inner socket ridges, the septalium is shallow, rounded, of V shape, adductor scars have an elongated-oval outline. The dental lamellae are short.

Range: Triassic to Upper Jurassic of Europe.

Aulacothyris rüdti (Bittner) 1892

Plate XXXIX, Fig. 1a–d, Text-fig. 4

1892 *Waldheimia* (*Aulacothyris*) *Rüdti* nov. spec. —A. Bittner: Brachiopoden der alpinen Trias. Nachtrag I, p. 19, tab. 3, fig. 30.

1920 *Aulacothyris Rüdti* Bittner —C. Diener: Brachiopoda triadica, p. 102.

1957 *Aulacothyris rüdti* (Bittner) —A. Bujnovský —M. Kochanová —J. Pevný: Korytnica limestones —a new lithostratigraphic unit and its fauna, p. 33, tab. 2, fig. 2,3, tab. 3, fig. 4, text-fig. 4.

Material: 61 specimens, 35 from them incompletely preserved from the Korytnica limestones.

Dimensions in mm: Length 20; width 13; height 12			
	18	12	12
	19	14	12
	17	11	11
	16	11	7,5
	13	10	7

Description: The outline is pentagonal, longer than wide, maximum width is in the first to second third of length below the beak, towards the anterior margin the

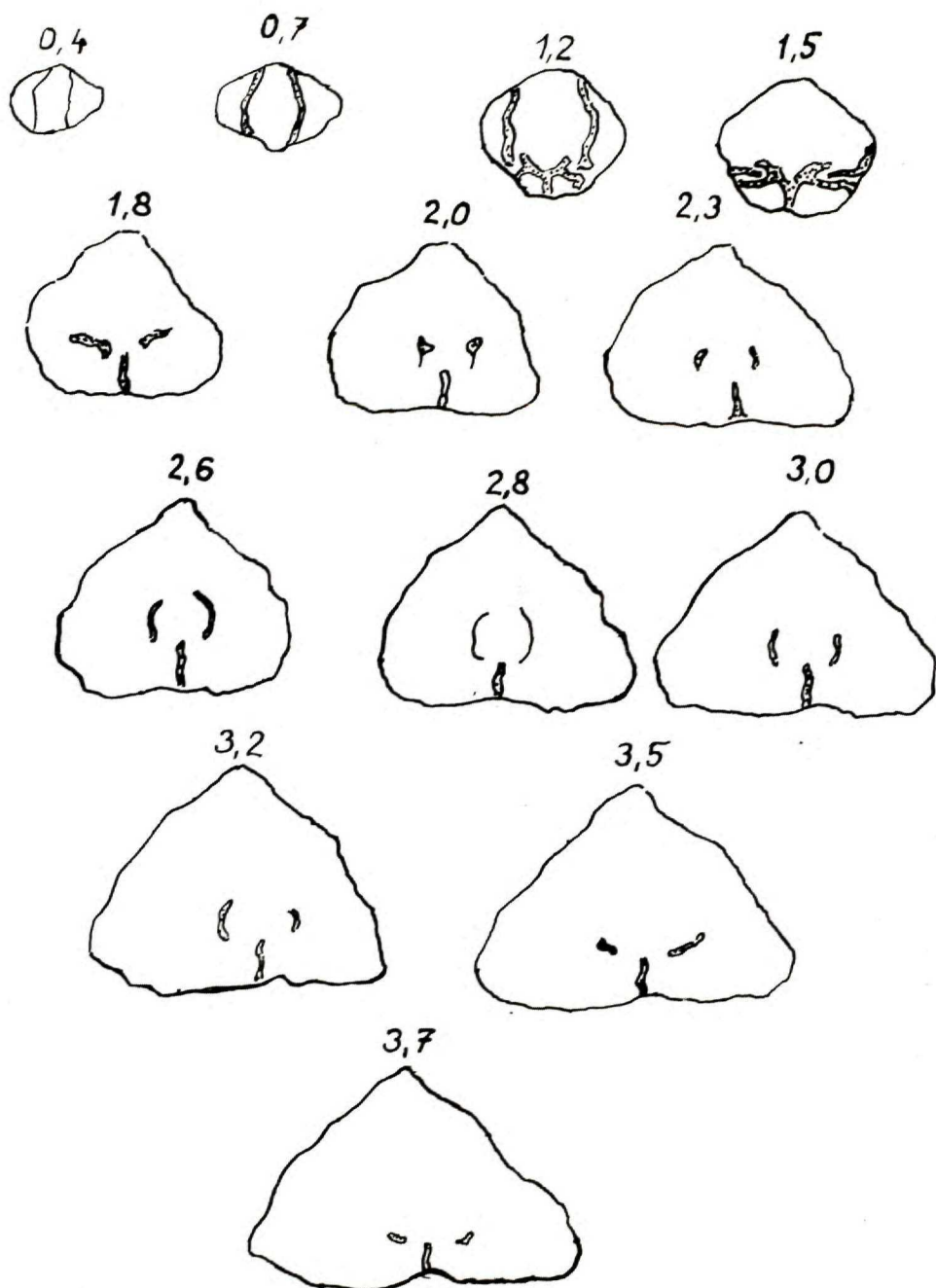


Fig. 4 Serial sections of the posterior part of *Aulacothyris rüdti* (Bittner), original length 13 mm; Julian, SE of Ludrová, in the cutting of the new road, magnif. x 5.

valves are getting much narrower, greatest height is in half of valves. The pedicle valve is highly convex, projecting into a high rounded keel in the central part, the dorsal valve forms a shallow sulcus. The beak is low, strongly, incurved, hiding the deltidium, with short, blunt beak-ridges. The anterior commissure is sulcate, the lateral commissures are bent against the dorsal valve. On the valves coarser and finer growth lines alternate.

Internal structure. Ventral valve: the delthyrial cavity is quadrate in section, the dental lamellae are dorsally divergent, the teeth oblique inwards, surrounded ventrally by the inner socket ridges. Dorsal valve: the inner socket ridges are long and distinctly separated, the outer socket ridges are less distinct, the sockets are wide, dorsal septum long, the septalium is shallow, crural bases are ventrally directed.

Remarks: The described form agrees in general with illustration by A. Bittner (1892), however, differs in lesser width compared to length and in having a more incurved beak. Similar in shape is *Aulacothyris compressa* (Bittner) from the Norian, which differs in having less narrowed shell at the anterior margin and lower keel at the ventral valve.

Stratigraphic range: Carnian in the Eastern Alps – Raibl and Cardita beds, Norian in the Stratenská hornatina Mts., Holý kameň.

Occurrence: Localities 1, 2 and 3.

Aulacothyris compressa (Bittner, 1891)

Plate XXXIX, Fig. 2a–d, Text-fig. 5

1891 *Waldheimia (Aulacothyris) compressa* nov. spec. – A. Bittner: Triasbrachiopoden von der Raxalpe etc., p. 5–6.

1892 *Waldheimia (Aulacothyris) compressa* nov. spec. – A. Bittner: Brachiopoden der alpinen Trias. Nachtrag I., p. 29. tab. 3, fig. 24–26.

1920 *Aulacothyris compressa* Bittner – C. Diener: Brachiopoda triadica, p. 100.

Material: 25 specimens, 9 of them incompletely preserved – valves damaged in the anterior part; 1 without beak, from greyishpink crinoidal and lumachelle limestones.

Dimensions in mm: Length 16; width 12; height 8			
	13	12	6,5
	14	11,5	7
	20	10	9
	17	10	9
	15	9,5	7
	12	9	6
	17	11	9,5
	14,5	11	8
	13,5	12	10

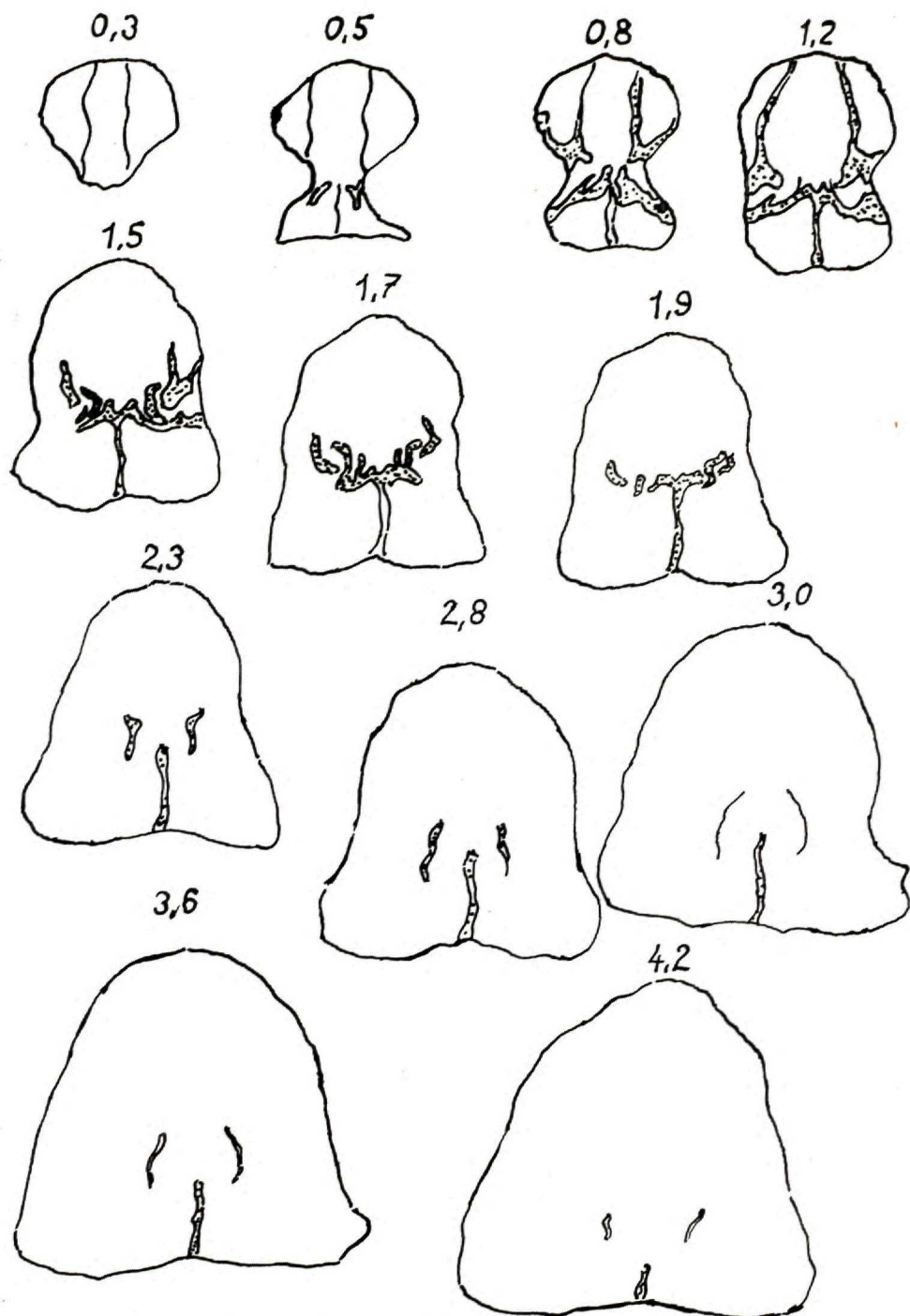


Fig. 5 Serial sections of the posterior part of *Aulacothyris compressa* (Bittner), original length 17 mm; Carnian-Norian, Šilická Brezová, about 100 m NE of the locality at the ridge of the plateau, magnif. x 5.

Description : The outline is trigonal or pentagonal, longer than wide, maximum width is near the anterior margin, or longer specimens reach maximum width already in the umbonal part and retain it to the anterior margin, maximum height is in half or above half the length of valves. The pedicle valve is highly convex, with a wide and rounded keel, its lateral parts are steeply sloping to the commissure. The dorsal valve is deepened, concave, with a wide sulcus, deepening towards the anterior margin. The beak is relatively narrow, slightly incurved, with short distinct rounded beak-ridges. The anterior commissure is sulcate, the lateral commissures are bent against the dorsal valve. The concentric growth lines are relatively thin spaced, distinct, or thinner, more densely- spaced are lying between them.

Internal structure. Pedicle valve: The delthyrial cavity is rectangular in section, umbonal cavities semicircular. The dental lamellae are subparallel, ventrally convergent, the teeth are massive and oblique inward, laterally little distinct denticles are developed. Dorsal valve: the hinge plates are straight, connected with the dorsal septum by a narrow septalium. The sockets are wide, undeeep, the inner socket ridges long, surrounding the teeth, the outer socket ridges short and less distinct. The dorsal septum is long, the loop bent from the sides, extended in the lower part.

Remarks : In morphology the described species is similar to *Aulacothyris porrecta* (Bittner) from St. Cassian and *A. conspicua* (Bittner) from the Rhaetian.

Distribution : Norian in Austria – coral limestones at Raxalpe.

Occurrence : Localities 4/2, 4/3 and 4/4.

Aulacothyris zugmayeri (Bittner, 1891)

Plate XXXIX, Fig. 3 a–b, Text-fig. 6

- 1891 *Waldheimia* (*Aulacothyris*) *Zugmayeri* nov. spec. – A. Bittner: Triasbrachiopoden von der Raxalpe etc., p. 57.
1892 *Waldheimia* (*Aulacothyris*) *Zugmayeri* nov. spec. – A. Bittner: Brachiopoden der alpinen Trias. Nachtrag I, p. 29, tab. 3, fig. 27–29.
1920 *Aulacothyris Zugmayeri* Bittner – C. Diener: Brachiopoda triadica, p. 103.
1940 *Waldheimia* (*Aulacothyris*) *Zugmayeri* Bittner – K. Balogh: Adatok a Pelsőcardó környékének etc., p. 175, tab. 1, fig. 11–12.

Material : 27 specimens, 6 of them incompetely preserved, in 1 the beak is missing, 3 with damaged anterior part, of two ventral valves only. They are found in greyishpink crinoidal and lumachelle limestones.

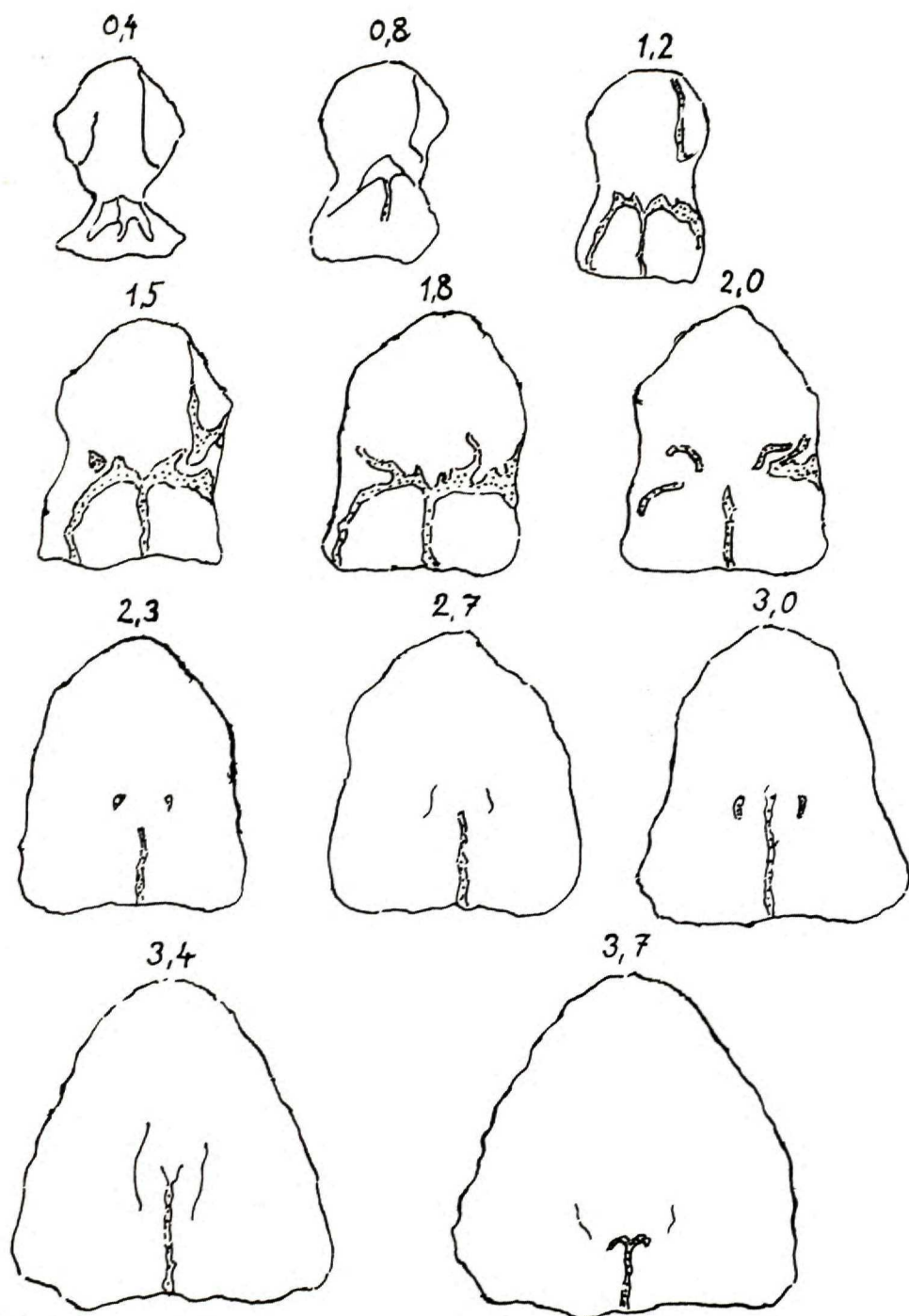


Fig. 6 Serial sections of the posterior part of *Aulacothyris zugmayeri* (Bittner), original length 13 mm; Carnian-Norian, Silická Brezová, 350 m S of the marble quarry, magnif. x 6.

Dimensions in mm: Length 14,5; width 11; height 7		
16	12,5	9,5
14,5	13	9,5
14,5	11	9,5
15	12	9
14	9	12,5
15	10	9
13	11	9,5
12,5	9,5	9
14,5	9,5	7,5

Description: The outline is pentagonal, longer than wide. Greatest width and height are in one third of length from the beak. The pedicle valve is highly convex, the dorsal valve slightly deepened. The ventral sulcus is deepening towards the anterior margin, bordered by two strong folds. The folds are converging and extend to the beak. At the dorsal valve is a wide, shallow sulcus, with one fold in the middle. The lateral commissure is deeply bent dorsally, the anterior commissure is antiplicate. The lateral parts of the pedicle valve are steeply inclined to the lateral commissure. The beak is moderately incurved, wide with keel-shaped elevation. At the surface of the valves are thin-spaced coarser and more densely spaced fine growth lines.

Internal structure. Pedicle valve: the delthyrial cavity is rectangular in section, the umbonal cavities trigonal. The dental lamellae are subparallel, the teeth massive, oblique inward, distinct denticles are developed on the sides. Dorsal valve: the hinge plates are dorsally convergent, the sockets deep, the inner socket ridges are distinct, surrounding the teeth, the outer socket ridges less distinct. The dorsal septum is long, the loop narrow. The left part of the pedicle valve is considerably recrystallized,

Remarks: In external morphology our form agrees with the illustrations of A. Bittner (1892), however, it seems that in our specimens the folds of the pedicle valve are converging closer to the beak, also the middle fold at the dorsal valve extends higher.

Distribution: Norian in Austria – coral limestones at the Raxalpe.

Occurrence: Localities 4/1, 4/2, 4/3 and 4/4.

Aulacothyris rupicola (Bittner, 1892)

Plate XXXIX, Fig. 4 a-b

1892 *Waldheimia (Aulacothyris) rupicola* nov. spec. – A. Bittner: Brachiopoden der alpinen Trias. Nachtrag I, p. 36, tab. 3, fig. 33–35.

1920 *Aulacothyris rupicola* Bittner – C. Diener: Brachiopoda triadica, p. 102.

1957 *Waldheimia (Aulacothyris) rupicola* Bittner – M. MaheI: Geológia Stratsenskej hornatiny, p. 177, tab. 7, fig. 11.

Material: 14 specimens, 2 of them incompletely preserved, from greyishpink crinoidal limestones.

Dimensions in mm: Length 10; width 9,5; height 4,5

10	9	4
9	8	4
10	10	5
10	9	4,5
9,5	9	4

Description: The outline is pentagonal, the width and length are nearly equal, greatest width and height are above half of the valves. The pedicle valve is highly convex, most convex in the posterior part. It is distinctly raised but not forming a keel, moderately sloping to the commissures, the dorsal valve is flat with shallow sulcus, which is broadening to the anterior margin. The beak is fairly incurved, wide, with short, rounded beak-ridges. The lateral commissures are very slightly bent against the dorsal valve, the anterior commissure is little sulcate. The concentric growth lines are thin-spaced, visible at valve margins.

Remarks: The forms described are mostly identical with Fig. 43 in A. Bittner (1892, Tab. 3), his Fig. 33 is longer than wide, the specimen in Fig. 35 has a deeper sulcus of the dorsal valve.

Distribution: Norian in the N. Alps of Austria, coral limestones from the Raxalpe.

Occurrence: Loc. 4/3 and 4/4. Stratenská hornatina mts. – Holý kamenň.

Reviewed: J. Michalík.

Translated: author

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Explanations to plate XXXIX
Vysvetlivky k tabuľke XXXIX

- Fig. 1a–d *Aulacothyris rüdti* (Bittner), Julian, east of Ludrová, spring of mineral water, magnif. x 2
Obr. 1a–d *Aulacothyris rüdti* (Bittner), jul. východne od Ludrovej, prameň minerálnej vody, zväčš. x 2.
- Fig. 2a–d *Aulacothyris compressa* (Bittner), Carnian–Norian, Silická Brezová– slope bordering the second sinkhole, magnif. x 2.
Obr. 2a–d *Aulacothyris compressa* (Bittner), karn–nor, Silická Brezová–svah ohraničujúci druhý závrť, zväčš. x 2.
- Fig. 3a–b, d *Aulacothyris zugmayeri* (Bittner), Carnian–Norian, Silická Brezová – 100 m NE of the locality at the plateau ridge, magnif. x 2.
Obr. 3a–b, d *Aulacothyris zugmayeri* (Bittner), karn–nor, Silická Brezová – 100 m SV od lokality na hrebeni, zväčš. x 2.

Fig. 4a, b. *Aulacothyris rupicola* (Bittner), Carnian–Norian, Silická Brezová – 350 m S of the marble quarry, magnif. x 2,2.

Obr. 4a, b. *Aulacothyris rupicola* (Bittner), karn–nor, Silická Brezová – 350 m J od lomu na mramor, zvčš. x 2,2.

Photo by L. Osvald

Jozef Pevný

Brachiopódy rodu *Aulacothyris* karnu Západných Karpát

6 obr., 1 fotogr. tab., (XXXIX), slovenské resumé

Karníckí zastupcovia rodu *Aulacothyris* Douvillé zo Západných Karpát zahrňujú druhy *Aulacothyris rüdti* (Bittner), *A. compressa* (Bittner), *A. zugmayeri* (Bittner), a *A. rupicola* (Bittner). Tieto druhy sa našli v krinoidovo-koralových (korytnických) vápencoch z Nízkych Tatier (Ludrová, Liptovská Osada) a v ružovkastošedých krinoidových a lumachelových vápencoch zo Slovenského krasu (Silická Brezová). Opísaná je ich vonkajšia morfológia, ako i vnútorná štruktúra na základe sériových rezov. Charakteristické znaky uvedených druhov sú nasledovné:

Aulacothyris rüdti (Bittner), ventrálna miska je silne vyklenutá, prechádza do vysokého zaobleného kýlu, dorzálna miska má úzky sulcus, schránka sa zužuje smerom k anteriórnemu okraju, vrchol je nízky, silne ohnutý. Dentálne lamely sú dorzálné divergentné, zuby šikmé dovnútra, obklopené vnútornými stenami zubných jamiek, ktoré sú dlhé a výrazne oddelené, vonkajšie steny zubných jamiek sú menej výrazné, zubné jamky sú široké, dorzálné septum je dlhé, septaliom plytké.

Aulacothyris compressa (Bittner), ventrálna miska je silne vyklenutá so širokým a zaobleným kýlom, na bokoch upadá strmo ku komisúre, dorzálna miska je prehĺbená, konkávna, so širokým sulcusom, vrchol je pomerne úzky, mierne ohnutý. Dentálne lamely sú subparalelné, ventrálne konvergentné, zuby sú masívne a šikmé dovnútra, po stranách sú vyvinuté málo výrazné dentikula. Zámkové doštičky sú spojené úzkym septaliom s dorzálnym septom, zubné jamky sú široké, nehlboké, vnútorné steny jamiek sú dlhé, obklopujúce zuby, vonkajšie steny jamiek sú krátke a menej výrazné. Dorzálné septum je dlhé, sľučka je ohnutá zo strán, rozšírená v spodnej časti.

Aulacothyris zugmayeri (Bittner), ventrálna miska je silne vyklenutá, so sulcusom ohraničeným dvoma sedlami, zbíhajúcimi sa a dosahujúcimi vrchol; dorzálna miska je mierne prehĺbená, so širokým, plytkým sulcusom, uprostred ktorého sa nachádza slabé sedlo. Vrchol je mierne ohnutý, široký a kýlovitého tvaru, anteriórna komisúra je antiplikátna. Laterálne časti ventrálnej misky upadajú strmo k laterálnej komisúre. Dentálne lamely sú subparalelné, zuby masívne, šikmé dovnútra, po stranách sú vyvinuté výrazné dentikula. Zubné jamky sú hlboké, vnútorné steny jamiek sú výrazné, obklopujúce zuby, vonkajšie steny jamiek menej výrazné. Dorzálné septum je dlhé, sľučka úzka.

Aulacothyris rupicola (Bittner), ventrálna miska je silne vyklenutá, vyvýšená, neprechádza do kýlu, mierne upadá ku komisúram, dorzálna miska je plochá, prehĺbená. Vrchol je značne ohnutý.

Vysvetlivky k obrázkom v texte (1–6):

Obr. 1 Liptovská Osada – lom

Obr. 2 Juhovýchodne od Ludrovej, 2 – prameň minerálnej vody, 3 – zárez novej cesty

Obr. 3 Západne od Silickej Brezovej

Obr. 4 Sériové rezy posteriornou časťou *Aulacothyris rüdti* (Bittner), pôvodná dĺžka 13 mm; jul, jv. od Ludrovej v záreze novej cesty, zvčš. x 5.

Obr. 5 Sériové rezy posteriornou časťou *Aulacothyris compressa* (Bittner), pôvodná dĺžka 17 mm; karn–nor, Silická Brezová, asi 100 m sv. od lokality na hrebeni planiny, zvčš. x 5.

Obr. 6 Sériové rezy posteriornou časťou *Aulacothyris zugmayeri* (Bittner), pôvodná dĺžka 13 mm; karn–nor, Silická Brezová, 350 m j. od mramorového lomu, zvčš. x 6.

Anna Ondrejčíková

Eggenburgian Molluscs of Bánovská kotlina depression

3 text-figures, 4 plates (XI–XIV), Slovak summary

Abstract. The content of macrofossils in Lower Miocene sediments from the Bánovská kotlina depression (the Nitrianska tabuľa plain, Slovakia) is mostly represented by Molluscs of Eggenburgian age. The Molluscs come from two lithofacies: from basal conglomerates and clayey aleurites. The molluscan species described complement the Eggenburgian fauna known so far from South Slovakia (A. Ondrejčíková 1972).

Introduction

Miocene sediments in the Bánovská kotlina (depression) are rather poor in the molluscan fauna. Earlier mapping (V. Čechovič. – E. Brestenská 1959) resulted in occasional finds at several localities, treated by M. Vaňová (1955). This paper contains macrofaunal characteristic and results of examination of the fauna collected during the last years (1971, 1974) in the area under study.

In the area between the villages Kostolné Mitice and Krásna Ves fauna was present in two facially different horizons: in basal carbonatic conglomerates and clayey aleurites.

A. Basal conglomerates rest unconformably and transgressively on the Mesozoic (dolomites and darkgrey limestones). The conglomerates consist of pebbles of subjacent carbonatic rocks. There are two types of conglomerates containing fauna: very solid, compact coarsegrained, grey-brown, with calcareous cement predominant, and finegrained grey conglomerates with sandy-dolomitic cement.

B. The clayey aleurites are lightcoloured, grey-ochre, overlaying carbonatic conglomerates (of the types described above) or sandstones. They contain rich molluscan fauna.

The first horizon is represented by the localities Horné Motešice (quarry), Horné Motešice (the Ostrá hora hill), Kostolné Mitice, Krásna Ves.

The second horizon – by the locality Rožňová Neporadza.

A list of species from localities, situation and description

Horné Motešice (quarry) text-fig. 1

At the southwest of the village Horné Motešice and a group of quarries with similar fauna are at the west, southwest and south of the elevation point 264,2.

	Number of specimens
<i>Pecten (P.) hornensis</i> Dep.-Rom.	(19)
<i>Pecten (P.)</i> cf. <i>hornensis</i> Dep.-Rom.	(5)
<i>Pecten</i> sp.	(6)
<i>Chlamys justiana</i> (Fontannes)	(2)
<i>Chlamys</i> cf. <i>scabrella</i> (Lm.)	(5)
<i>Chlamys</i> sp.	(1)
<i>Anomia ephippium</i> cf. <i>ephippium</i> L.	(4)
<i>Anomia ephippium</i> cf. <i>costata</i> Brocc.	(3)
<i>Anomia ephippium</i> cf. <i>hoernesii</i> Foresti	(4)
<i>Anomia rugosa</i> Schaffer	(4)
<i>Anomia</i> sp. ind.	(3)
<i>Anomia</i> sp.	(62)
<i>Ostrea</i> sp.	(2)
<i>Begüina</i> sp.	(1)
<i>Pitar</i> cf. <i>gauderndorfensis</i> Schaffer	(4)
<i>Pitar</i> cf. <i>lilaciniodes</i> Schaffer	(1)
<i>Pitar</i> sp.	(5)
<i>Venus</i> sp.	(3)
<i>Lutraria</i> sp. (cf. <i>sanna major</i> Schaffer)	(1)
Div. gen. <i>Bivalvia</i> (remains)	(11)
Div. gen. <i>Gastropoda</i> (remains)	(2)

Horné Motešice (Ostrá hora) – text-fig. 1

Between the villages Horné and Dolné Motešice, on the southern and southeastern foothill of the Ostrá hora, at the south of the elevation point 339,0.

	Number of specimens
? <i>Glycymeris</i> sp.	(1)
<i>Pecten (P.) hornensis</i> Dep.-Rom.	(8)
<i>Pecten</i> sp.	(2 fr.)
<i>Anomia ephippium</i> <i>pergibbosa</i> Sacco	(1)
<i>Pitar schafferi</i> Kautský	(1)
<i>Venus</i> sp.	(1)
<i>Balanus</i>	(1)

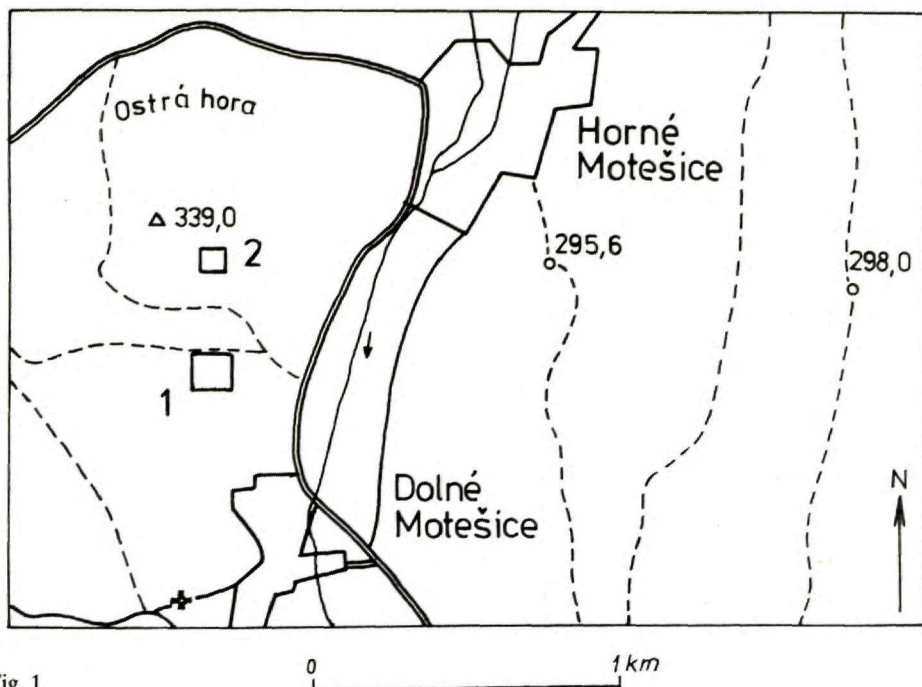


Fig. 1

Kostolné Mitice – text-fig. 3

In creeks and in a road-cut at the northwest of Kostolné Mitice the following fossils were found:

	Number of specimens
<i>Pecten (P.) cf. hornensis</i> Dep.–Rom.	(3)
? <i>Pecten</i> sp.	(9)
<i>Chlamys cf. justiana</i> (Font.)	(1)
<i>Chlamys</i> sp.	(3)

Krásna Ves – text-fig. 2

Gravel-pit at the northwestern periphery of the village. Only the following fossils were found:

	Number of specimens
<i>Chlamys cf. scabrella</i> (Lm.)	(1)
<i>Chlamys</i> sp.	(4)
<i>Anomia</i> sp.	(2)

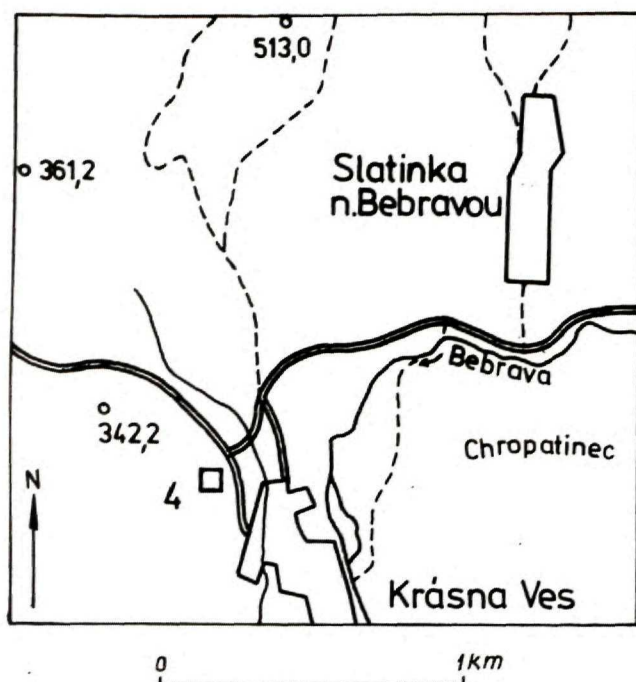


Fig. 2

Rožňová Neporadza – text-fig. 3

The locality is on the southern side of the village at a horse cemetery, 300 m southeastward from the elevation point 310,2.

	Number of specimens
<i>Nucula nucleus</i> (L.)	(19)
<i>Nucula comta</i> Goldf.	(17)
<i>Nucula cf. comta</i> Goldf.	(4)
<i>Nucula laevigata</i> Sow.	(9)
<i>Nucula</i> sp. 1	(3)
<i>Nucula</i> sp. 2	(24)
<i>Yoldia nitida</i> (Brocchi)	(1)
<i>Anadara</i> (A.) <i>diluvii</i> (Lm.)	(2)
<i>Anadara darwini</i> (Mayer)	(1)
<i>Anadara</i> sp.	(1)
<i>Glycymeris</i> sp.	(1)
<i>Modiolus</i> sp.	(1)
<i>Musculus philippi</i> (Wolf)	(1)
<i>Pinna pectinata brocchi</i> Orbigny	(2)
<i>Pinna</i> sp.	(1)

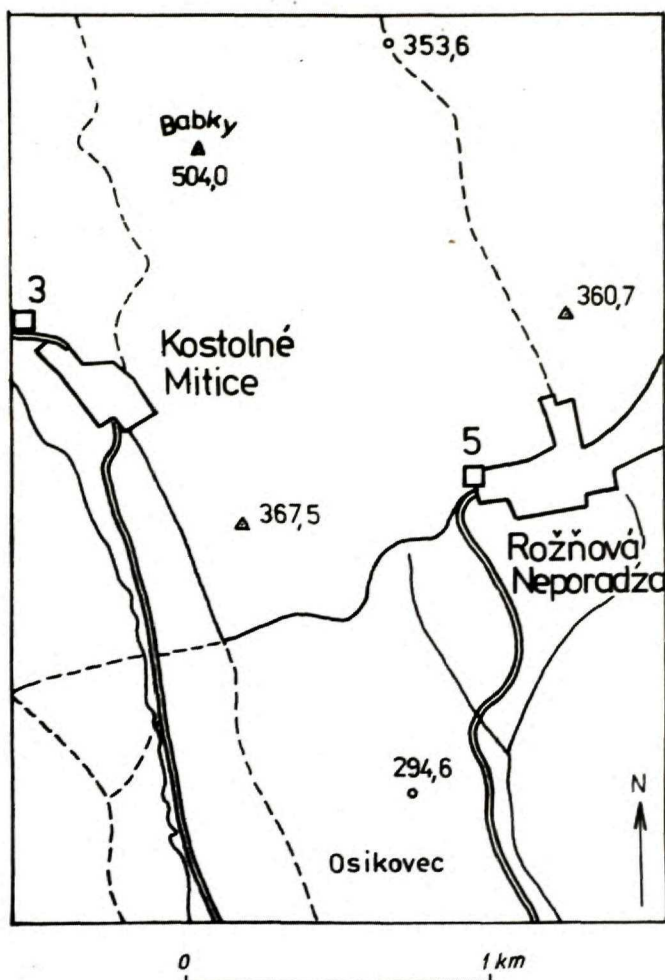


Fig. 3

<i>Lentipecten corneum denudatum</i> (Reuss)	(14)
<i>Cyprina islandica rotundata</i> Braun	(4)
<i>Glossus subtransversus</i> (Orbigny)	(10)
<i>Glossus cf. subtransversus</i> (Orbigny)	(8)
<i>Chione subplicata</i> Orbigny	(9)
<i>Gouldia minima</i> (Mont.)	(1)
<i>Spisula subtruncata triangula</i> (Ren.)	(1)
<i>Lutraria</i> sp.	(1)
<i>Tellina cf. serrata</i> Ren.	(20)
<i>Arcopagia subelegans</i> (Orbigny)	(1)
<i>Thracia eggenburgensis</i> Schaffer	(1)

<i>Thracia</i> cf. <i>eggenburgensis</i> Schaffer	(1)
<i>Thracia pubescens</i> (Pultney)	(4)
<i>Thracia ventricosa</i> Philippi	(14)
<i>Thracia</i> sp.	(12)
<i>Natica</i> sp.	(21)
<i>Polinices</i> sp.	(1)
<i>Calyptrea chinensis</i> (L.)	(1)
<i>Calyptrea</i> sp.	(3)
<i>Ficus conditus</i> (Brongn.)	(1)
<i>Dolium orbiculatum</i> (Brocchi)	(1)
<i>Cassis</i> sp.	(1)
<i>Murex inornatus procera</i> Kautsky	(1)
<i>Murex</i> sp.	(1)
<i>Tudicula rusticula</i> (Bast.)	(1)
<i>Euthriofusus</i> sp.	(1)
<i>Turris</i> sp.	(1)
<i>Conus</i> sp.	(1)
<i>Aturia aturi</i> (Bast.)	(4)
<i>Flabellum</i> sp.	(6)
Fish scale	(1)
Plant remains	(8)

Preservation of fossils

The fossils are very poorly preserved in both horizons. They mostly occur in the form of internal moulds. They are primarily or secondarily broken into fragments. Shells or parts of shells are only preserved in the families *Pectinidae* and *Anomiidae*. In clayey aleurites the shells are weathered. In conglomerates the shells are cemented to the rock (most frequently by their external part) and cannot be separated from the rock. Often the cores of closed valves are joined, like in the genera *Pitaria*, *Pinna*, *Glossus*, *Thracia*.

Ecological and stratigraphical evaluation of fauna

At the first sight the fossils differ from the facies they are present in. In the lithofacies of basal conglomerates are species with originally thick, massive shells indicative of the living environment in a shallow marine zone with normal salinity, like the following species: *Pecten hornensis*, *Chlamys justiana*, *Pitar lilacinoides*, *Pitar gauderndorfensis*, *Lutraria* sp. etc. Abraded and fragmentary shells indicate the fact that they were displaced into a shallower disquiet zone and markedly damaged.

In the lithofacies of clayey aleurites are species of the genera: *Nucula*, *Anadara*, *Lentipecten*, *Spisula*, *Tellina*, *Thracia*, *Ficus*, *Natica*, *Murex*, *Conus* a.o. that lived in a calm marine zone and whose occurrence is autochthonous. It is evidenced by many species with joined valves and absence of allogene elements.

The age of the fauna is Eggenburgian as evidenced by the species: *Pecten hornensis*, *Chlamys justiana*, *Anomia ehippium costata*, *Pitar schafferi* from the facies of carbonate conglomerates and by *Tracia eggenburgensis*, *Murex inornatus procera* from the facies of clayey aleurites.

Summary

The Eggenburgian age of the Lower Miocene sediments represented by the facies of carbonatic conglomerates (localities: Horné Motešice – quarry, Horné Motešice – Ostrá hora hill, Kostolné Mitice, Krásna Ves) and by the facies of clayey aleurites (locality Rožňová Neporadza) is proved by the results of the study of Molluscs from the Bánovská kotlina depression. On the bases of the molluscan fauna the facies of carbonate conglomerates is supposed to have been deposited in the infralittoral marine environment with normal salinity, and the facies of clayey aleurites – in the circalittoral of the Eggenburgian.

Besides already known species from the Eggenburgian of Southern Slovakia the faunal assemblage also comprises species so far undescribed from this stage of our country.

Systematic part

This part only contains species not included in the publication by A. Ondrejičková 1972 concerning the Eggenburgian of South Slovakia; and from the common species only those comprised in tables are mentioned.

The systematic part is based upon Treatise on Invertebrate Paleontology (1969); publications by J. A. Korobkov 1954 and W. Wenz 1938–1940.

BIVALVIA

Nuculidae Grey, 1824

Nucula Lamarck, 1799 (Type species: *Arca nucleus* L.)

Nucula (*Nucula*) Lamarck, 1797

Nucula (*Nucula*) *comta* Goldfuss, 1837

1837 *Nucula comta* – C. Goldfuss: Petrefacta Germania 2. p. 158, tab. 125, fig. 20

1957 *Nucula comta* Goldfuss – M. Glibert: Pélécypodes et Gastropodes etc., p. 10, tab. 1, fig. 2

1962 *Nucula comta* Goldfuss 1837 – O. Hölzl: Die Molluskenfauna des oberbayerischen etc., p. 39, tab. 1, fig. 2–3.

1973 *Nucula comta* (Goldfuss, 1837) – T. Báldi: Mollusc Fauna etc., p. 160, tab. 1, fig. 5

Material: Seventeen perfectly preserved external moulds

Remarks: The species recalls *N. mayeri*, only it is provided with narrow concentric lines visible by naked eye, in addition to radial ribs like in the former species.

Stratigraphical range and geographical distribution: The species is known from the Oligocene of the Boreal bioprovince (Denmark, Belgium, Holland, North Germany) (J. Heering 1942, M. Glibert 1957), from the Rupelian, Egerian and Eggenburgian of Paratethys (Bavaria, Hungary, Slovakia).

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Nucula laevigata Sowerby, 1818

1818 *Nucula laevigata* – Sowerby: Mineral Conch. of Great Britain, 2, p. 207, tab. 197, fig. 1–2.

1884 *Nucula peregrina* Desch. – O. Speyer: Die Bivalven der Casseler etc., 4, tab. 16, fig. 1–7

1952 *Nucula peregrina* Deshayes 1858 – J. Görges: Die Lamellibranchiaten und Gastropoden etc., p. 10

1962 *Nucula laevigata* Sowerby, 1818 – O. Hölzl: Die Molluskenfauna der oberbayerischen etc., p. 40–41, tab. 1, fig. 4

Material: Nine external moulds of the right and left valves.

Remarks: In literature the species is frequently denoted as *Nucula peregrina* Deshayes, 1860. Since it is a synonym – as pointed out by H. J. Anderson (1959) – the former name *Nucula laevigata* Sowerby (1818) is accepted.

Stratigraphical range and geographical distribution: The species is ranging in occurrence from the Oligocene (mostly in the boreal bioprovince) up to the Pliocene (J. Görges 1952, M. Glibert 1957, F. Kautský 1925). In Paratethys it is in the Egerian (Hungary), Eggenburgian (Slovakia, Bavaria); in the Atlantic bioprovince it is recorded in the Helvetian of France.

Occurrence: In clayey aleurites at the locality Rožná Neporadza.

Yoldia Möller, 1842 (Type species: *Nucula arctica*, Gray)

Yoldia nitida (Brocchi, 1814)

1814 *Arca nitida*, Brocchi: Conchiologia fossile etc., p. 482, tab. 11, fig. 3

1870 *Leda nitida* Brocc. – M. Hoernes: Die fossilen Mollusken etc., p. 308, 309, tab. 38, fig. 9a, b, c, d, e

1951–56 *Yoldia* (*Yoldia*) *nitida* (Brocchi, 1814) – C. Rossi-Ronchetti: I tipi della „Conchiologia etc.”, p. 14–15, text. fig. 2a–c (holotyp)

Material: An external mould of the right valve.

Stratigraphical range and geographical distribution: In the Karpatian

and Badenian of Paratethys at the localities: Hrušovany, Grung, Baden, Ruditz. In the Mediterranean bioprovince it is very frequent in the Pliocene (Sicilia, Orciano, Modena a. o.)

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Arcidae Goldfuss, 1820

Anadara Gray, 1847 (Type species: *Arca antiquata* L.)

Anadara (*Anadara*) Gray, 1847

Anadara (*Anadara*) *darwini* (Mayer, 1868)

Pl. XI, Fig. 1

1808 *Arca Darwini* May. – Ch. Mayer: Cat. Foss. Text. etc., 3, p. 18, 71 (non vidi, fide F. Sacco, 1898)

1898 *Anadara darwini* (May.) – F. Sacco: I Molluschi dei terreni terziarii etc., 26, p. 24, tab. 5, fig. 11, 12.

1963 *Arca* (*Arca*) *cf. darwini* May. – S. Venzo – G. Pelosio: La malacofauna etc., p. 141, tab. 43, fig. 1

Material: A mould of the left valve.

Dimensions: length = 25 mm, height = 19,5 mm

Remarks: The shape of the shell is rather variable. By comparatively narrowed anterior part of the valve it recalls *A. diluvii*, whilst by elongated angular posterior part it reminds of *A. turonica*. F. Sacco (1898) referred it to as a type intermediary between the two species mentioned.

Stratigraphical range and geographical distribution: It was not recorded in Paratethys; only in the Italian Tortoniano, Piacenziano, Astiano (F. Sacco 1898).

Occurrence: In clayey aleurites, at the locality Rožňová Neporadza.

Pinnidae Leach, 1819

Pinna Linnaeus, 1758 (Type species: *Pinna muricata* L.)

Pinna pectinata brocchi Orbigny, 1852

Pl. XIII, Fig. 4

1852 *Pinna Brocchi* d'Orb., 1847 – J. A. Orbigny: Prodrome de Paléontologie etc., p. 125, no. 2361

1870 *Pinna Brocchi* d'Orbigny – M. Hoernes: Die fossilen Mollusken etc., p. 372–373, tab. 50, fig. 1–2

1936 *Pinna pectinata* L. var. *Brocchi* – W. Friedberg: Mieczaki miocenske etc., p. 200, tab. 30, fig. 18, tab. 31, fig. 1

1972 *Pinna* (*Atrina*) *pectinata brocchi* Orbigny 1852 – A. Ondřejčková: Eggenburgian Molluscs etc., p. 37–38

Material: An incomplete external mould.

Remarks: stratigraphical range and geographical distribution were published by A. Ondrejičková (1972).

Occurrence: In sandy aleurites at the locality Rožňová Neporadza.

Pectinidae Rafinesque, 1815

Lentipecten Marwick 1928 (Type species: *Pecten hochstetteri* Zittel)

Lentipecten (*Lentipecten*) Marwick 1928

Lentipecten (*Lentipecten*) *corneum denudatum* (Reuss, 1867)

Pl. XI, Fig. 4-5

1867 *Pecten denudatus* Rss. – A. E. Reuss: Die fossile Fauna etc., p. 139, tab. 7, fig. 1

1972 *Pseudamussium corneum denudatum* (Reuss 1867) – A. Ondrejičková: Eggenburgian Molluscs etc., p. 40

Material: Forteen separated and joined larger and smaller valves, partially damaged.

Remarks, stratigraphical range and geographical distribution were published by A. Ondrejičková (1972).

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Pecten Müller, 1776 (Type-species: *Ostrea maxima* L.)

Pecten (*Pecten*) Müller, 1776

Pecten (*Pecten*) *hornensis* Depéret-Roman, 1902

Pl. XII, Fig. 1

1902 *Pecten hornensis* nov. spec. – Ch. Depéret – F. Roman: Monographie des Pectinidés etc., p. 27, tab. 3, fig. 1, 1a

1972 *Pecten* (*Pecten*) *hornensis* Depéret-Roman, – 1902 A. Ondrejičková: Eggenburgian Molluscs etc., p. 41-42, tab. 5, fig. 1-4

Material: Twentyseven well preserved valves, eight fragments.

Remarks, stratigraphical range and geographical distribution were published by A. Ondrejičková (1972).

Occurrence: In conglomerates at the locality Horné Motešice (quarry) – 19 specimens and at Horné Motešice (Ostrá hora) – 8 specimens.

Chlamys Röding, 1798 (Type-species: *Ostrea islandica* Gmelin)

Chlamys justiana (Fontannes, 1878)

Pl. XI, Fig. 3

1878 *Pecten justianus* – Fontannes: Etudes stratigraf. et paleont. etc., p. 73, tab. 1, fig. 3

1939 *Chlamys justiana* Font. – J. Roger: Le genre Chlamys etc., p. 162, tab. 22, fig. 19, 20, tab. 23.

Material: Three valves partially preserved.

Remarks: The parts of valves with the shell preserved display costate sculpture. The costae are comparatively narrow alternatig with broader ones. Spaces between the costae are narrower than the costae. Somewhere a broader costa is divided into two parts by a thin depression.

Stratigraphical range and geographical distribution: In Paratethys the species in the Austrian Eggenburgian (F. X. Schaffer, 1910), in the Mediterranean bioprovince – in the Burdigalian of the Rhône basin (J. Roger 1939).

Occurrence: In conglomerates at the localities Horné Motešice (quarry) – 2 specimens, and at Kostolné Mitice – 1 specimen).

Chlamys (Aequipecten) Fischer, 1886

Chlamys (Aequipecten) cf. scabrella (Lamarck, 1819)

Pl. XI, Fig. 2

1819 *Pecten scabrellus* m. – J. B. Lamarck: Histoire naturelle p. 183, no. 24

1959 *Chlamys scabrella* (Lamarck) – M. Váňová: Burdigalská fauna etc., p. 91, tab. 1, fig. 3, 4, tab. 2, fig. 5–8.

1970 *Chlamys (Aequipecten) scabrella* (Lamarck) – S. Raffi: I Pettinidi del Pliocene etc., p. 114–116, tab. 27, fig. 1, 2, tab. 29, fig. 2a, b (cum syn.)

Material: Six fragments of various individuals.

Remarks: The shell fragments display a pronounced sculpture preventing the finds from being referred with certainty to the species discussed.

Stratigraphical range and geographical distribution: In Paratethys it is present in Slovakia since the Eggenburgian (M. Váňová 1959, P. Čtyroký 1965), in Hungary (I. Csepregy–Meznerics 1960), in Austria (F. X. Schaffer 1910). The species is plentiful in younger stages both in our country and in other European bioprovinces. In the Mediterranean bioprovince it was recorded in the Burdigalian and Helvetian of the Rhône basin (G. F. Dollfuss – Ph. Dautzenberg 1920) since the Elveziano to the Piacenziano of Italy (S. Raffi, 1970).

Occurrence: In conglomerates at the localities Horné Motešice (quarry) – 5 specimens and at Krásna Ves – 1 specimen.

Anomiidae Rafinesque, 1815

*Anomia Müller, 1776 (Type-species: *Anomia ephippium* L.)*

Anomia ephippium cf. ephippium Linnaeus, 1758

Pl. XIII, Fig. 2

1758 *Anomia ephippium* m. – C. Linnaeus: Systema naturae, 10, p. 701

1910 *Anomia ephippium* L. – F. X. Schaffer: Das Miozän von Eggenburg, p. 22, tab. 12, fig. 1, 2

1910 *Anomia ephippium* L. var. *costata* Brocc. – F. X. Schaffer: Ibidem. p. 24, 25, tab. 12, fig. 12, 13

1958 *Anomia ephippium* Linné 1758 – O. Hözl: Die Mollusken-Fauna etc., p. 62, 63

Material: Four valves, partially damaged at margins.

Remarks: Extremely variable forms of shells and sculptural ornamentation, with insufficient quantity of material prevent determination of the type species. Other subspecies show morphological variability of the shell structure, yet it is difficult to say for sure whether they are stable characters of the subspecies or only represent ecological diversity within the type species.

Stratigraphical range and geographical distribution: In Paratethys the type-species and some subspecies appear since the Egerian. In the Boreal bioprovince – since the Upper Oligocene (H. J. Anderson 1959, W. Wolf 1897, a.o.), and in the Mediterranean bioprovince it is in the Miocene, Pliocene and in the Recent.

Occurrence: In conglomerates at the locality Horné Motešice (quarry).

Anomia ephippium cf. *hoernesii* Foresti, 1893

Pl. XIII, Fig. 1

1893 *Anomia ephippium* L. var. *Hörnési* – Foresti: Enumeration Brach. etc., p. 395 (non vidi, fide F. X. Schaffer 1910)

1910 *Anomia ephippium* L. var. *Hörnési* – F. X. Schaffer: Das Miozän von Eggenburg, p. 22, 23, tab. 12, fig. 3, 4

Material: Four valves of different individuals, with partially damaged sculpture.

Remarks: It is difficult to distinguish the species from the type species. There are slight differences in a more regular structure of the shell and in indications of thicker costae. I do, however think that it is only a diversity within the species.

Stratigraphical range and geographical distribution: In Paratethys it is in the Eggenburgian of Austria (F. X. Schaffer 1910), in the Badenian of Rumania; in the Mediterranean bioprovince – in the Pliocene of Italy (S. Cerulli-Irelli 1909) and of Turkey (in L. Hinculov 1968).

Occurrence: In conglomerates at the locality Horné Motešice (quarry).

Anomia ephippium *pergibbosa* Sacco, 1897

1897 *Anomia ephippium* var. *pergibbosa* Sacco – F. Sacco: I Molluschi dei terreni etc., p. 35, tab. 10, fig. 25–27

1910 *Anomia ephippium* L. var. *pergibbosa* Sacco – F. X. Schaffer: Das Miozän von Eggenburg etc., p. 24, tab. 12, fig. 10, 11

Material: One valve.

Remarks: As for the form of costae, the specimen recalls *A. e. rugulostriata* Brocc., differing from it in the dorsal side of the left valve, elongated into a pointed projection.

Stratigraphical range and geographical distribution: In Paratethys it is in the Eggenburgian of Austria, in the Badenian of Rumania (L. Hinculov 1968). In the Mediterranean bioprovince F. Sacco (1897) recorded it since the Italian Aquitaniano to the Piacenziano.

Occurrence: In conglomerates at the locality Horné Motešice (Ostrá hora).

Anomia rugosa Schaffer, 1910

Pl. XIII, Fig. 3

1910 *Anomia rugosa* Schaffer – F. X. Schaffer: Das Miozän von Eggenburg etc., p. 25, 26, tab. 12, fig. 15, tab. 13, fig. 1–7

Material: Four valves with partially damaged sculpture.

Remarks: Thick, pronounced radial costae are characteristic of the species.

Stratigraphical range and geographical distribution: In Paratethys – in the Eggenburgian of Austria and in the Badenian of Rumania (L. Hinculov, 1968).

Occurrence: In conglomerates at the locality Horné Motešice (quarry).

Glossidae Gray, 1847

Glossus Poli, 1795 (Type–species: *Glossus rubicundus* Poli)

Glossus (Glossus) subtransversus (Orbigny, 1852)

Pl. XIV, fig. 1

1852 *Isocardia subtransversa* d'Orb. – M. A. Orbigny: Prodrome de Paleontologie etc., 3, p. 21 No. 287 d.

1972 *Isocardia subtransversa* d'Orbigny 1852 – A. Ondrejčková: Eggenburgian Molluscs etc., p. 53, tab. 9, fig. 6

Material: Ten external moulds and eight fragments.

Remarks, stratigraphical range and geographical distribution were published by A. Ondrejčková (1972).

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Cyprinidae

Cyprina Lamarck, 1812 (Type–species: *Venus islandica* L.)

Cyprina islandica rotundata Braun in Agassiz, 1845

1863 *Cyprina rotundata* Braun – F. Sandberger: Die Conchylien des Mainzer–Beckens etc., p. 313, tab. 25, fig. 1

1962 *Cyprina islandica rotundata* Braun – Hölzl: Die Molluskenfauna etc., p. 68, tab. 3, fig. 1,2

1973 *Cyprina islandica rotundata* Braun in Agassiz, 1845 – T. Báldi: Mollusc Fauna etc., p. 196–197, tab. 10, fig. 1,2

Material: Four external moulds

Remarks: M. Glibert (1945) regards *C. rotundata* and *C. islandica* as two different species. H. J. Anderson (1959) regards the elongated form, less oval posterior and ventral margins, more convex valve a. o. of the species *C. rotundata* as characters of the subspecies.

Stratigraphical range and geographical distribution: In Paratethys – in the Oligocene – Lower Miocene (Hungary, Slovakia, Bavaria); in the Boreal bioprovince and in the Mediterranean bioprovince it has been living since the Oligocene; *C. islandica* – up to the Recent.

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Veneridae Rafinesque, 1815

Chione Megerle, 1811 (Type species: *Venus dysera* L.)

Chione subplicata (Orbigny, 1852)

Pl. XIV, fig. 2

1870 *Venus plicata* Gmel. – M. Hoernes: Die fossilen Mollusken, p. 132–144, tab. 10, fig. 4–6

1910 *Venus plicata* Gmel. – F. X. Schaffer: Das Miozän von Eggenburg, p. 85, tab. 40, fig. 6–7

1911 *Chione subplicata* d'Orb. – M. Cossmann – A. Peyrot: Conchologie néogénique etc., t. 1, p. 337–340, tab. 13, fig. 19–22

1934 *Venus (Chione) subplicata* d'Orb. – W. Friedberg: Mieczaki miocenske etc., p. 64–65, tab. 10, fig. 9.

Material: Nine external moulds.

Remarks: The Miocene species *V. subplicata* differs from the recent *V. plicatus* only slightly and thus the independence of both species is questionable.

Stratigraphical range and geographical distribution: In Paratethys the species is in the Eggenburgian, ? Karpatian and Badenian (Austria, Poland, Slovakia, Hungary). In the Mediterranean bioprovince the varieties of the species were recorded in the Pliocene of Italy. In the Atlantic bioprovince it is in the Helvetian of the Aquitanian basin.

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Pitar Römer, 1857 (Type-species: *Venus tumens* Gmelin)

Pitar (Cordiopsis) Cossmann, 1910

Pitar (Cordiopsis) schafferi Kautsky, 1936

Pl. XII, fig. 2

1936 *Pitaria (Cordiopsis) schafferi* nov. sp. – F. Kautsky: Die Veneriden und Petricoliden etc., p. 4–5, tab. 1, fig. 1–2

1972 *Pitaria (Cordiopsis) schafferi* Kautský, 1936 – A. Ondřejčková: Eggenburgian Molluscs etc., p. 70–71, tab. 11, fig. 6

Material: One mould.

Remarks, stratigraphical range and geographical distribution were published by A. Ondřejčková (1972).

Occurrence: In conglomerates at the locality Horné Motešice (Ostrá hora).

Gouldia C. B. Adams, 1847 (Type-species: *Gouldia cerina* Adams)

Gouldia minima Montagu, 1803)

1803 *Venus minima* – Montagu: Testacea Britanica etc., p. 121, tab. 3, fig. 3 (non vidi, fide M. Hoernes 1870)

1870 *Circe minima* Mont. – M. Hoernes: Die fossilen Mollusken etc., p. 158, tab. 19, fig. 5a–d

1954 *Gouldia minima* (Mont.) – I. Csepregy–Meznerics: Helvetische und tortonische Fauna etc., p. 91, tab. 12, fig. 18

Material: One external mould.

Remarks: Our specimen is well comparable with the form presented by I. Csepregy–Meznerics. It differs from Hörs's material in a more oval form and in a more pointed apex.

Stratigraphical range and geographical distribution: In Paratethys it is most frequent in the Badenian and Karpatian of Austria and Hungary, in the Badenian of Poland. In the Boreal and Mediterranean bioprovinces the species was recorded in the Middle and Upper Miocene. In the Recent it lives in the Mediterranean Sea and in the Atlantic Ocean.

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Tellinidae Latreille, 1825

Arcopagia Leach in Brown, 1827 (Type-species: *Tellina crassa* Pennant)

Arcopagia subelegans (Orbigny, 1852)

1852 *Tellina subelegans*, d'Orbigny: Prodrome etc., p. 103

1910 *Arcopagia subelegans* d'Orb. – M. Cossman – A. Peyrot: Conchologie néogénique p. 252, tab. 9, fig. 17–20

1973 *Arcopagia subelegans* (d'Orbigny, 1852) – T. Báldi: Mollusc Fauna etc., p. 223, tab. 20, fig. 7

Material: Two external moulds.

Remarks: The form of valves of our specimens reminds that of the specimens depicted by M. Cossman–Peyrot (1910), Tab. 9, Fig. 17. It differs from T. Báldi's (1973) specimen in being lower and horizontally elongated.

Stratigraphical range and geographical distribution: In Paratethys – in Egerian and Eggenburgian (Slovakia, Hungary). In the Atlantic bioprovince – in the Aquitanian and Burdigalian of the Aquitanian basin (M. Cossman – A. Peyrot 1910); in the Mediterranean bioprovince in the Elveziano of Italy (F. Sacco 1901).

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

***Thraciidae* Stoliczka, 1871**

***Thracia* Blainville, 1824 (Type-species: *Thracia corbuloidea* Blainville)**

***Thracia eggenburgensis* Schaffer, 1910**

- 1910 *Thracia eggenburgensis* Schaffer, – F. X. Schaffer : Das Miozän von Eggenburg, p. 105–106, tab. 7, fig. 12, 15
1958 *Thracia (Cyathodonta) eggenburgensis* Schaffer, 1910–0. Hözl : Die Mollusken – Fauna etc., p. 168, tab. 16, fig. 5
1959 *Thracia (Cyastoderma) eggenburgensis* Schaffer – I. Csepregy – Meznerics : Die Burdigal-fauna etc., p. 90, tab. 4, fig. 3

Material: Four joined external moulds, one fragment.

Remarks: Characteristic, pronounced sculpture and the form facilitate referring the moulds to the above species.

Stratigraphical range and geographical distribution: In Paratethys it is a species characteristic of the Eggenburgian. It was recorded in the Eggenburgian of Austria, Hungary, Bavaria, Slovakia.

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

***Thracia pubescens* (Pultney, 1799)**

Pl. XIV, fig. 3, 4

- 1799 *Mya pubescens* – Pultney : Catalogue of Dorsetshire etc., 1, p. 27, tab. 4, fig. 6 (non vidi, fide F. X. Schaffer 1910)
1910 *Thracia pubescens* Pultn. – F. X. Schaffer : Das Miozän von Eggenburg, p. 104, 105, tab. 47, fig. 11
1973 *Thracia pubescens* (Pultney, 1799) – T. Báldi : Mollusc fauna etc., p. 236, 237, tab. 22, fig. 1 (cum syn.)

Material: Four joined external moulds.

Remarks: As for shape, the specimen recalls *T. eggenburgensis* which more angular, provided with a pronounced keel and thicker costae.

Stratigraphical range and geographical distribution: In Paratethys it is recorded in the Egerian (Hungary, Bavaria); but it is most frequent in the Eggenburgian (Slovakia, Bavaria, Austria). In the Atlantic bioprovince – in the Helvetian of the Aquitanian basin. In the Mediterranean bioprovince – in the Pliocene of Italy; and its subspecies *T. pubescens tauroparva* Sacco was recorded in the Elveziano.

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Thracia (Cyathodonta) Conrad, 1849

Thracia (Cyathodonta) ventricosa Philippi, 1844

- 1844 *Thracia ventricosa* – B. A. Philippi: *Abbildungen und Beschreibungen etc.*, p. 17 (non vidi, fide O. Hölzl, 1958)
1958 *Thracia (Cyathodonta) ventricosa* Philippi, 1844 – O. Hölzl: *Die Mollusken-Fauna etc.*, p. 170, tab. 16, fig. 7
1972 *Thracia (Cyathodonta) ventricosa* Philippi 1844 – A. Ondřejčková: *Eggenburgian Molluscs etc.*, p. 95–96, tab. 15, fig. 4

Material: Ten joined external and four separated moulds.

Remarks: stratigraphical range and geographical distribution were published by A. Ondřejčková (1972).

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

GASTROPODA

Calyptraeidae Broderip, 1835

Calyptraea Lamarck, 1799 (Type-species: *Patella chinensis* L.)

Calyptraea (Calyptraea) Lamarck, 1799

Calyptraea (Calyptraea) chinensis (Linnaeus, 1766)

- 1856 *Calyptraea chinensis* – M. Hoernes: *Die fossilen Mollusken etc.* p. 632, 633, tab. 50, fig. 18
1952 *Calyptraea chinensis* Linné sp. 1766 – M. Glibert: *Gastropodes du Miocène etc.*, p. 65, tab. 5, fig. 5
1954 *Calyptraea chinensis* Linn. – W. Friedberg: *Mieczaki miocenske etc.*, p. 419, tab. 25, fig. 8
1960 *Calyptraea (Calyptraea) chinensis* (Linnaeus 1766) – E. Kojumdžieva – B. Strašimirov: *Les fossiles de Bulgarie*, p. 123, tab. 34, fig. 2

Material: Two external moulds.

Stratigraphical range and geographical distribution: In Paratethys the species is present throughout the Miocene, predominantly in the Badenian (Austria, Hungary, Bulgaria, Poland). In the Mediterranean Bioprovince – from the Elveziano to the Piacenziano of Italy; in the Boreal bioprovince – in the Anversian of Belgium, in the Hemmoor beds of Germany. In the Recent it is recorded in the Mediterranean and Black Seas and in the Atlantic Ocean.

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Doliidae

Dolium (Argenville) Lamarck, 1799 (Type-species: *Bullinum galea* L.)

Dolium (Cadium) Link, 1807

Dolium (Cadium) *orbiculatum* (Brocchi, 1814)

1814 *Buccinum orbiculatum* – Brocchi: *Conchiologia fossile etc.*, p. 647, tab. 15, fig. 22

1856 *Dolium denticulatum* Desh. – M. Hoernes: *Die fossilen Mollusken etc.*, p. 164, tab. 15, fig. 1

1891 *Malea orbiculata* Brocchi – Sacco: *I molluschi dei terreni etc.*, 18. p. 18, tab. 1, fig. 23, 24

1953 *Dolium* (Cadium) *orbiculatum* (Brocchi) – I. Csepregy-Meznerics: *Helvetische und tortonische Fauna etc.*, p. 35, 36, tab. 4, fig. 5

Material: One external mould.

Remarks: Our specimen is well preserved as for its oval, pear-like shape and characteristic concentric costae.

Stratigraphical range and geographical distribution: In Paratethys – in the Karpatian and Badenian (Austria, Hungary); in the Mediterranean bioprovince – in Piacenziano and Astiano of Italy.

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Muricidae

Murex Linnaeus, 1758 (Type species: *Murex pecten* Montfort)

Murex inornatus procera Kautský, 1925

Pl. XIV, fig. 5

1925 *Murex* (*Haustellum*) *inornatus* Beyr. var. *procera* nov. var. – F. Kautský: *Das Miozän von Hemmoor etc.*, p. 92, tab. 7, fig. 17

Material: One incomplete shell with well preserved sculptural ornamentation of its base.

Remarks: The base is 3/4 of height of the entire shell and has all the characters of a sculpture ornamentation. It is covered by dense thin spiral-formed costae, and with irregular radial costae chaotically arranged. Our specimen differs from the type species provided with distinct radial costae missing on the base and on the latest whorl on the spire of *M. inornatus*. The costae are only on earlier whorls. By examination of more material it could be found whether it is only a variability within the species or not.

Stratigraphical range and geographical distribution: Unknown in Paratethys. In the Boreal bioprovince the type species is frequent in the Miocene of Holland, Belgium, Germany. *M. inornatus procera* was recorded in the Hemmoor beds of North Germany.

Occurrence: In clayey aleurites at the locality Rožňová Neporadza.

Occurrence of Fauna at the Localities Studied and Stratigraphical Distribution in the Paratethys

Species – Genus	Localities										Stratigraphical Distribution	
	Horné Motešice (quarry)	Horné Motešice (Ostrá hora)	Kostolné Mitice	Krásna Ves	Rožňová Neporadza	Egerian	Eggenburgian	Otnangian	Karpatian	Badenian		
a	1	2	3	4	5	6	7	8	9	10		
o <i>Nucula nucleus</i> (L.) L.					+	+	+	+	+	+		
<i>N. compta</i> Goldf.					+	+						
<i>N. laevigata</i> Sow.					+	+	+					
<i>Nucula</i> sp. ₁					+							
<i>Nucula</i> sp. ₂					+							
<i>Yoldia nitida</i> (Brocchi)					+		+	+	+	+		
<i>Anadara darwini</i> (Mayer)*					+							
o <i>A. diluvii</i> (Lm.)					+	+	+	+	+	+		
<i>Anadara</i> sp.					+							
<i>Glycymeris</i> sp.		+			+							
<i>Modiolus</i> sp.					+							
o <i>Musculus philippi</i> (Wolf)					+	+	+					
<i>Pinna pectinata brocchi</i> Orbigny					+		+	+	+	+		
<i>Pinna</i> sp.					+							
<i>Pecten hornensis</i> Dep. – Rom.	+	+					+					
<i>P. cf. hornensis</i> Dep. – Rom.	+		+									
<i>Pecten</i> sp.	+	+	+									
<i>Chlamys justiana</i> (Fontannes)	+		+				+					
<i>Ch. cf. scabrella</i> (Lm.)	+			+								
<i>Chlamys</i> sp.	+	+	+	+								
<i>Lentipecten corneum</i>												
<i>denudatum</i> (Reuss)					+	+	+	+	+	+		
<i>Anomia ehippium</i> cf.												
<i>ehippium</i> L.	+											
<i>A. ehippium</i> cf. <i>costata</i> Brocc.	+											
<i>A. ehippium</i> cf. <i>hoernesii</i> Foresti	+											
<i>A. ehippium</i> <i>pergibbosa</i> Sacco		+					+			+		
<i>A. rugosa</i> Schaffer	+						+			+		
<i>Anomia</i> sp.	+			+								
<i>Ostrea</i> sp.	+											
<i>Begonia</i> sp.	+											
<i>Glossus subtransversus</i> (Orbigny)					+	+	+					

* Tortoniano and Astiano in Italy

The species marked with the circlet (o) are included in the publication by A. Ondrejčková 1972.

a	1	2	3	4	5	6	7	8	9	10
<i>Cyprina islandica rotundata</i> Braun					+	+	+			
<i>Pitar schafferi</i> Kautsky		+					+			
o <i>P. cf. gauderndorfensis</i> Schaffer	+									
o <i>P. cf. lilacinoides</i> Schaffer	+									
<i>Pitaria</i> sp.	+									
<i>Chione subplicata</i> (Orbigny)					+		+		+	+
<i>Venus</i> sp.	+	+								
<i>Gouldia minima</i> (Mont.)					+				+	+
o <i>Spisula subtruncata triangula</i> (Ren.)					+	+	+	+	+	+
<i>Lutraria</i> sp. (cf. <i>sanna</i> major Schff.)	+				+					
o <i>Tellina cf. serrata</i> Ren.					+					
<i>Arcopagia subelegans</i> (Orbigny)					+	+	+			
<i>Thracia eggenburgensis</i> Schaffer					+		+			
<i>T. pubescens</i> (Pultney)					+	+	+	+	+	+
<i>T. ventricosa</i> Philippi					+	+	+	+	+	+
<i>Thracia</i> sp.					+					
<i>Natica</i> sp.					+					
<i>Polinices</i> sp.					+					
<i>Calyptrea chinensis</i> (L.)					+	+	+	+	+	+
<i>Calyptrea</i> sp.					+					
<i>Dolium orbiculatum</i> (Brocchi)					+				+	+
o <i>Ficus conditus</i> (Brongn.)					+	+	+		+	+
<i>Cassis</i> sp.					+					
<i>Murex inornatus procera</i> Kautsky					+		+			
<i>Murex</i> sp.					+					
o <i>Tudicla rusticula</i> (Bast.)					+		+	+	+	+
<i>Euthriofusus</i> sp.					+					
<i>Turris</i> sp.					+					
<i>Aturia aturi</i> (Bast.)					+	+	+	+	+	+
<i>Flabellum</i> sp.					+					
<i>Balanus</i>					+					
Fish scale					+					
Plant remains					+					

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Translated: E. Jassingerová.

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Explanations of plates XI–XIV

Plate XI

- 1 *Anadara (Anadara) darwini* (Mayer) 1,8 x; Rožňová Neporadza
- 2 *Chlamys (Aequipecten) cf. scabrella* (Lm.) 2,5 x; Krásna Ves
- 3 *Chlamys justiana* (Fontannes) 1,7 x; Kostolné Mitice
- 4–5 *Lentipecten (Lentipecten) corneum denudatum* (Reuss) 1,9 x, 1,9 x Rožňová Neporadza

Plate XII

- 1 *Pecten (Pecten) hornensis* Depéret – Roman 2 x; Krásna Ves
- 2 *Pitaria schafferi* Kautský nat. size; Horné Motešice (Ostrá hora)

Plate XIII

- 1 *Anomia ephippium hoernesii* Foresti 2 x; Horné Motešice (quarry)
- 2 *Anomia ephippium* cf. *ephippium* L. 1,7 x; Horné Motešice (quarry)
- 3 *Anomia rugosa* Schaffer 1,8 x; Horné Motešice (quarry)
- 4 *Pinna pectinata brocchi* (Orbigny) 1,5 x; Rožňová Neporadza

Plate XIV

- 1 *Glossus (Glossus) subtransversus* (Orbigny) 1,3 x; Rožňová Neporadza
- 2 *Chione subplicata* (Orbigny) 2 x; Rožňová Neporadza
- 3–4 *Thracia pubescens* (Pultney) 1,3 x, 1,5 x; Rožňová Neporadza
- 5 *Murex inornatus procera* Kautský 1,3 x; Rožňová Neporadza

Photograph: C. Michalíková

Anna Ondrejičková

Mäkkýše eggenburgu Bánovskej kotliny

Resumé anglického textu

Práca podáva makropaleontologickú charakteristiku spodnomiocénnych sedimentov z oblasti Bánovskej kotliny. Štúdium bolo zamerané najmä na faunu mäkkýšov, ktorá potvrdila eggenburský vek sedimentov. Pochádza z fácie karbonatických zlepcov (lokalita: Horné Motešice – lom, Horné Motešice – Ostrá hora, Kostolné Mitice, Krásna Ves) a fácie slienitých aleuritov (lokalita Rožňová Neporadza). Pre fáciu karbonatických zlepcov predpokladám na základe štúdia mäkkýšov sedimentáciu v normálne slanom morskom prostredí infralitorálu, pre fáciu slienitých aleuritov sedimentáciu v circalitorále eggenbergu. Spoločenstvo mäkkýšov dopĺňa faunu známu už z eggenburgu južného Slovenska (A. Ondrejičková 1972) o nové druhy, ktoré ešte neboli doteraz opísané z eggenburgu nášho územia.

Eduard Köhler – Karol Borza – Ondrej Samuel

Occurrence of Genus *Nummofallotia* in Upper Cretaceous of West Carpathians

4 pl. (XV–XVIII), Slovak summary

Abstract. The authors describe the only so far known species of the genus *Nummofallotia* – *Nummofallotia cretacea* (Schlumberger) from the Uppermost Cretaceous in the West Carpathians. This is the first description of the genus *Nummofallotia* from the Carpathians.

The genus *Nummofallotia* belongs among rarely described and illustrated genera. Being restricted to Upper Cretaceous sediments, it is considerably significant stratigraphically. At the study of Orbitoid facies of the Upper Cretaceous in the river Váh valley, characteristic sections of tests of the species were found. Since the tests are well identifiable and we presume that they occur in various facies of the Carpathian Upper Cretaceous, their description and illustrations of sections will follow.

So far the genus *Nummofallotia* has been known only from three areas: from Spain (Catalonia), France (Dordogne) and from Switzerland (Alfermée). Our find extends considerably its geographical span.

The genus *Nummofallotia* was described for the first time in 1899 by Ch. Schlumberger under the name *Nonionina cretacea* Schlumb. n. sp. and presented was also its illustration. The material studied by Ch. Schlumberger is from the Upper Cretaceous (Santonian) in the area of Trago di Noguera in Spain. According to a comparatively brief description by Ch. Schlumberger the tests range to 0,8 mm in size, they are disc-shaped, provided with a keel on the periphery and by conspicuous central thickening (button). Figures in plate XI (Fig. 21 and Fig. 22) show clearly the inner structure of tests both in equatorial and axial sections.

Further description and illustration of the genus followed as late as 1936 when O. Renz described and illustrated this form from the Maastrichtian of Alfermée

RNDr. K. Borza, CSc., RNDr. E. Köhler, CSc., Geologický ústav Slovenskej akadémie vied, Dúbravská cesta, 886 25 Bratislava; RNDr. O. Samuel, DrSc., Geologický ústav Dionýza Štúra, Mlynská dolina, 1, 809 40 Bratislava.

(Switzerland) under the name ?*Meandropsina* n.sp. aff. *Nonionina cretacea* Schlumb. O. Renz was doubtful about the relationship of the form described to the genus *Nonionina* and assumed that it was an intermediary form between the genera *Vidalina* and *Meandropsina*. He did, however, not establish any new genus. He was the first author to mention microspheric and megalospheric forms.

In 1959 J. Barrier – M. Neumann examined in detail the specimens of the species described from the Upper Cretaceous (Coniacian – Maastrichtian) of Dordogne in France. The authors had plentiful material (free specimens and sections in thin-sections) and the specimens studied were compared with specimens from the collection of Ch. Schlumberger in Paris (Institut du Pétrole). The detail study of internal structure of tests by J. Barrier – M. Neumann resulted in a conclusion about the species studied belonging to the family *Peneroplidae*. The species can, however, not be regarded as identical with the genus *Meandropsina* nor *Fallotia*. Since the genus name *Nonionina* has been abandoned in the meantime, J. Barrier and M. Neumann introduced a new genus called *Nummofallotia* and presented its diagnosis.

A. R. Loeblich – H. Tappan (1964) accepted the genus *Nummofallotia* and included it in the family *Soritidae* and subfamily *Meandropsininae* (p. C 488–490). V. Pokorný (1958) did not mention this form.

Foraminiferida Eichvald, 1830

Soritidae Ehrenberg, 1839

Meandropsininae Henson, 1948

Nummofallotia Barrier et Neumann, 1959

Diagnosis of the genus: A. R. Loeblich – H. Tappan (1964), p. C 488.

Nummofallotia cretacea (Schlumberger 1899)

Pl. XV – XVIII

1899 *Nonionina cretacea* Schlumb. n. sp. – Ch. Schlumberger: Note sur quelques Foraminifères nouveaux ou peu connus du Crétacé d'Espagne, p. 460–461, tab. 8, fig. 1, tab. 11, fig. 21, 22.

1936 ?*Meandropsina* n. sp. aff. *Nonionina cretacea* Schlumberger – O. Renz: Über ein Maestrictien–Cénomanien–Vorkommen bei Alfermée am Bielersee, p. 561–562, tab. 30, fig. 3, tab. 31, fig. 3, tab. 33, fig. 1, 2, textfig. 5b.

1959 *Nummofallotia cretacea* (Schlumberger) – J. Barrier – M. Neumann: Contribution à l'étude de *Nonionina cretacea* Schlumberger, p. 223–229, tab. 1, fig. 1–9, tab. 2, fig. 10–16.

Holotype of the species has not been determined as yet. For this reason the specimen in Fig. 22, Tab. 11 in Ch. Schlumberger (1899) is referred to as the holotype.

Material: 36 diverse sections of tests representative only of the megalosperic (A) generation. The specimens are in the depository of the Geological Institute of the Slovak Academy of Sciences in Bratislava.

External characters: The tests are mostly coarse-lenticular, sharp-edged, their diameter varying between 0,16 and 0,64 mm (with adult specimens between 0,50 – 0,64 mm), their thickness ranges from 0,12 to 0,50 mm, the diameter/thickness ratio varies between 1,17–1,58 (see Table 1 in text). The external ornamentation cannot be studied.

Table 1. Measurements of tests of *Nummofallotia cretacea* (Schlumb.) in axial sections

test diameter in mm	test thickness in mm	diameter/thickness ratio	number of whorls
0,16	0,12	1,33	2
0,32	0,26	1,23	4
0,33	0,28	1,17	4
0,35	0,23	1,51	4
0,38	0,24	1,58	4–5
0,50	0,43	1,16	6
0,53	0,46	1,15	6
0,62	0,46	1,34	6–7
0,63	0,46	1,36	6–7
0,64	0,50	1,28	7–8

Internal structure: Cross-sections show that tests are involute, planispiral (nummulitoid) coiled. Protoconch was scarcely seen in sections, its diameter varies between 0,030–0,045 mm. The spiral consists of 2–8 whorls, whose spacing increases toward the periphery. The spiral lamina is approximately 1/3 of the chamber height. In oblique sections (Pl. XV, Fig. 1, 4) the septa are slightly diagonal, almost straight, comparatively thickly arranged.

On 1/4 of the 1st whorl are 1–2 septa.
 2nd whorl are 3–4 septa
 3rd whorl are 5–6 septa
 4th whorl are 6 septa
 5th whorl are 7–8 septa
 6th whorl are 9–10 septa
 7th whorl are 11 septa

The chambers are somewhat higher than longer in all the whorls.

The central conical button is a very conspicuous character visible both in axial and in oblique sections. The button differs markedly from the rest of the test in its light colour and compactness (Pl. XVI, Fig. 1–4). Button is on both sides of the test. The oblique section plane sometimes causes that the button seems more distinct on one side (Pl. XVII, Fig. 1, 3). The button is easy to separate from the rest of a dead test

and sometimes it is isolated, seemingly without any connection with the tests of *Nummofallotia* (Pl. XVIII, Fig. 3, 4). P. Marie (1957) described such isolated buttons of the tests *Nummofallotia* as a new genus and a new species *Goupillaudina sancti-petri*.

J. Barrier – M. Neumann (1959) assume that the tests of *Nummofallotia* consist of perforated and inperforated calcareous parts and their present aspect resulted from epigenetic changes. The original tests were not perforated, calcite, flat, without central button. Owing to epigenetic changes the test thickened and buttons formed from perforated calcite. Since in thin-sections there are no traces of such changes on other organic remains, the authors mentioned assume that the epigenetic changes are due to the test structure alone.

Our results do, however, not agree with the opinions of J. Barrier – M. Neumann (1959) about the secondary origin of calcite button on test. The button contains very fine, unidentifiable (most likely bitumionus) dark pigment emphasizing the original growth layers. In some places is inconspicuous fibrous structure of calcite partially emphasized by orientation of fine dark pigment.

The dark pigment is also on the surface of the spiral lamina and particularly on thin septa of chambers. The septa are in some places made indistinct by the pigment. As a rule, very small pyrite crystals are associated with the pigment. Dark pigment is also dispersed in sparite filling the original cavities of chambers. The dark pigmentation arose most likely after the death of organismus.

Considering the facts, we assume that epigenetic changes of tests might passed in reverse sense in contrast to J. Barrier – M. Neumann's (1959) opinion. The original tests might have been coarse-lenticular, with conspicuous conical buttons making the fragile tests stronger. It is very likely that calcareous chamber walls (and walls of septa) were coated with layers of organic substance. In dead specimen the organic substance decomposed to form dark pigment which partially covered the calcareous walls and caused dark colour in parts of tests. Since central button is almost without organic substance, it only has little pigment. Frequent absence of peripheral parts of tests (for example Pl. XV, Fig. 3, Pl. XVIII, fig. 1, 3) indicates that the peripheral parts consisted of easily soluble material with organic substance predominant. In epigenetic processes the still plastic tests might have been compressed, flattened, and the central button was partially or completely depressed (Pl. XVIII, Fig. 1).

Although this explanation of character of tests of *Nummofallotia cretacea* (Schlumb.) seems logical and more probable, still further examinations of well preserved tests are inevitable for a final conclusion.

Comparison: Numerical data about the structure of tests of *Nummofallotia cretacea* (Schlumb.) are almost completely missing. In our Table 1 in text are the first detail data resulting from measurements of test size in relation to the number of whorls.

Ch. Schlumberger (1899) only stated that test size ranged to 0,8 mm. Repeated measurement of the axial section illustrated by Ch. Schlumberger (Tab. 11, Fig. 22) showed the diameter 0,65 mm and thickness 0,33 mm.

Similar size may also be calculated from figures by O. Renz (1936) – test diameters vary between 0,78–0,86 mm.

Surprising data resulted from repeated measurements of specimens illustrated by J. Barrier – M. Neumann (1959). The tests they illustrate should be 1,0–3,2 mm in diameter which is thrice so high as values measured on Spanish and Carpathian specimens. The discrepancy was also noted by A. R. Loeblich – H. Tappan (1964, p. C 490) who regard it as erroneous information about magnification and assume that the specimens illustrated are magnified not 28 x but most likely 100 x. In this case the test diameter (0,3–0,9 mm) would correspond with other data.

There also are few data about the internal structure of tests. The protoconch of the holotype (Ch. Schlumberger 1899, Tab. 11, Fig. 22) should be about 0,05 mm in diameter, according to J. Barrier – M. Neumann (1959) the protoconch diameter is 0,06 mm. Protoconchs of the Carpathian specimens are somewhat smaller (0,03–0,045 mm). Because of few measurements (5) it is not possible to draw reliable conclusions.

The course of spiral is similar with all illustrated tests, they only differ in the shape of chambers. Ch. Schlumberger (1899, Tab. 11, Fig. 21) presented the cross-section of a test with isometrical chambers or with chambers longer than high. All other tests (also from the Carpathians – Pl. XV, Fig. 1, 4) have chambers higher than longer. O. Renz (1936) found about 25 septa in the fourth whorl which is in accordance with our results.

Tests and protoconchs of the Carpathian specimens are somewhat smaller than those of the Spanish and Swiss specimens. The differences are too little to facilitate determination of a new taxon (subspecies) and in literature are not enough measurements to be illustrative of the variability range of the species.

Variability: As shown by the cross sections studied the degree of convexness of test is variable (expressed by the diameter/thickness ratio in text-tab. 1). Variability of test size depends upon its ontogeny (number of whorls). Characters of the internal structure are considerably stable.

Dimorphism: Studied were only cross sections of megaspheric (A) forms.

Living environment: Specimens of *Nummofallotia cretacea* (Schlumb.) are infrequent in thin-section. The test structure indicates that the species was quite frequent in the original assemblages but easily soluble fragile tests preserved only scarcely in fossil state. Representatives of the specimen lived in shallow-water neritic-littoral zones of warm Upper Cretaceous seas.

Stratigraphical range: *Nummofallotia cretacea* (Schlumb.) lived from the Coniacian to the end of Maastrichtian (cf. J. Barrier – M. Neumann 1959). Carpathian specimens have only been found in sediments of Maastrichtian age so far.

Occurrence in the Carpathians and association: So far there have been only two occurrences associated with the so-called orbitoid facies of the Upper Cretaceous (for details see O. Samuel – K. Borza – E. Köhler 1972, and K. Borza – E. Köhler – O. Samuel – A. Began 1977).

1. The locality Na skale, westward of Žilina. At the construction of a new road, about 300 m northeastward of the elev. point Na skale, Maastrichtian flysch sequence was exposed with marls alternating with horizons of sandstones, finegrained conglomerates and sandy organogenic limestones.

Nummofallotia cretacea (Schlumb.) occurs in sandy organogenic limestones. They contain plentiful organic assemblages: larger foraminifers [*Orbitoides apiculata* Schlumb., *Orb. gensacicus* (Leym.), *Orb. media* (Archiac), *Lepidorbitoides socialis* (Leymerie), *Omphalocyclus macroporus* (Lamarck), *Siderolites calcitrapoides* Lamarck, *Clypeorbis mamillata* Schlumb., *Hellenocyclina beotica* Reichel, *Miscellanea* sp. and *Operculina* sp.], small foraminifers [especially agglutinated and rotalid forms, such like *Rotalia* cf. *trochidiformis* (Lamarck)], scarce ostracods, frequent bryozoans, fragments of conchoides, rudistes, crinoides, echinoides and corals, occasional serpules. Frequent calcareous algae occur in the form of fragments. They partly belong among „*Solenomeris*“ sp. *Pieninia oblonga* Borza et Mišík is very scarce. In thin-sections is rare spherical, smooth-walled *Calcisphaerula innominata* Bonet.

Besides plentiful organic remains the rock contains terrigene admixture of clastic quartz, clasts of limestones and dolomites, muscovite, biotite, chlorite and isolated feldspar grains. Among heavy minerals are zircon, tourmaline, garnet, autigene pyrite, glauconite, autigene crystals of quartz and calcite. Diagenetic phenomena are frequent in the rock, namely clastic fragments pressed into organic remains.

Upper Maastrichtian age of the bed sequence is also proved by foraminiferal assemblages in marly horizons: *Globotruncana contusa* (Cushman), *Gtr. falsostuarti* Sigal, *Gtr. stuarti* (Lapparent), *Gtr. obliqua* Herm, *Abanthomphalus mayaroensis* (Bolli), *Planoglobulina acervulinoides* (Egger), *Gublerina acuta robusta* (Klasz), *Pseudotextularia elegans* Rzehak, *P. nuttalli* (Voorwijk), *Racemiguembelina varians* (Rzehak) a.o.

2. The locality Svätá Helena, at the south of Považská Bystrica. In a conglomerate bed sequence of Paleogene (Ilerdian) age (for detail description see O. Samuel – K. Borza – E. Köhler 1972) are scarce pebbles of sandy limestones of Maastrichtian age. Besides very rare *Nummofallotia cretacea* (Schlumb.) there are larger foraminifers [*Orbitoides apiculata* (Schlumb.), *Orb. gensacicus* (Leym.), *Orb. media* (Archiac), *Lepidorbitoides socialis* (Leymeries), *Siderolites calcitrapoides* Lamarck and *Hellenocyclina beotica* Reichel], small foraminifers, calcareous algae, *Pieninia oblonga* Borza et Mišík, *Pithonella ovalis* (Kaufm.), serpules, corals, crinoidal elements and fragments of tests of conchoides and rudistes.

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Explanations of plates XV – XVIII

Plate XV

Nummofallotia cretacea (Schlumb.), locality Na skale (West of Žilina), magn. 115 x. Fig. 1. Cross-section of test near equatorial plane, thin-section No. 6257. – Fig. 2. Oblique equatorial section of juvenile test, thin-section No. 6336. – Fig. 3. Oblique section of test including protoconch, thin-section, No. 6276. – Fig. 4. Oblique section of test, thin-section No. 6259.

Plate XVI

Nummofallotia cretacea (Schlumb.), locality Na skale (West of Žilina), magn. 115 x. Fig. 1. Axial section, thin-section No. 6444. – Fig. 2. Axial section of partially deformed test, thin-section No. 6338. – Fig. 3. Axial section of test, thin-section No. 6276. – Fig. 4. Axial section of test, thin-section No. 6268.

Plate XVII

Nummofallotia cretacea (Schlumb.), locality Na skale (West of Žilina), magn. 115 x. Fig. 1. Oblique section of test, thin-section No. 6333. – Fig. 2. Axial section of test, thin-section No. 6275. – Fig. 3. Oblique section of test, thin-section No. 6275. – Fig. 4. Axial section of test, thin-section, No. 6272.

Plate XVIII

Nummofallotia cretacea (Schlumb.), locality Na skale (West of Žilina), magn. 115 x. Fig. 1. Axial section of test, thin-section No. 6266. – Fig. 2. Axial section of deformed test, thin-section No. 6334. – Fig. 3. Axial section of test fragment (button), thin-section No. 6267. – Fig. 4. Axial section of test fragment (button), thin-section No. 6263. All mentioned thin-sections are in the depository of the Geological Institute of the Slovak Academy of Sciences in Bratislava.

Reviewed: M. Vaňová.

Výskyt rodu *Nummofallotia* vo vrchnej kriede Západných Karpát

Resumé anglického textu

Jedným z veľmi vzácných a zobrazovaných foraminiferových rodov je rod *Nummofallotia*. Má značný stratigrafický význam, lebo je obmedzený na sedimenty vrchnej kriedy. Pri štúdiu orbitoidového vývinu vrchnej kriedy na Považí sme vo viacerých výbrusoch našli charakteristické prierezy schránok tohoto druhu. Keďže schránky vo výbrusoch sa dajú ľahko identifikovať a predpokladáme, že sa môžu vyskytovať v rozličných vývinoch vrchnej kriedy Karpát, podávame v ďalšom texte ich opis i zobrazenia rozličných rezov.

Rod *Nummofallotia* je doteraz známy iba z troch oblastí: zo Španielska (Katalánsko), Francúzska (Dordogne) a zo Švajčiarska (Alfemée). Nami uvádzaný výskyt značne rozširuje jeho geografický rozsah.

V Západných Karpatoch opisovaný druh bol doteraz nájdený iba na dvoch výskytoch a je viazaný na tzv. orbitoidový vývin vrchnej kriedy (podrobnejšie o ňom viď O. Samuel – K. Borza – E. Köhler 1972 a K. Borza – E. Köhler – O. Samuel – A. Began 1977).

1. Lokalita Na Skale, západne od Žiliny. Pri výstavbe novej cesty bolo asi 300 m sv. od k. Na Skale odkryté flyšové súvrstvie maastrichtu, v ktorom sa striedajú sliené s polohami pieskovcov, jemnozrnných zlepcov a piesčitých organogénnych vápencov.

Nummofallotia cretacea (Schlumb.) sa vyskytuje v polohách piesčitých organogénnych vápencov. Tieto obsahujú bohaté organické spoločenstvá: veľké foraminifery [*Orbitoides apiculata* Schlumb., *Orb. gensacicus* (Leym.), *Orb. media* (Archiac), *Lepidorbitoides socialis* (Leymerie), *Omphalocyclus macroporus* (Lamarck), *Siderolites calcitrapoides* Lamarck, *Clypeorbis mamillata* Schlumb., *Hellenocyclina beotica* Reichel, *Miscellanea* sp. a *Operculina* sp.], malé foraminifery [najmä aglutinované a rotalidné formy, medzi inými *Rotalia* cf. *trochidiformis* (Lamarck)], zriedkavé sú ostrakódy, časté sú machovky, úlomky schránok lastúrníkov a ulitníkov, rudistov, krinoidov, ježoviek i koralov, ojedinele sa vyskytujú serpule. Nezriedkavé vápnité riasy sú vo forme úlomkov, časť z nich patrí „*Solenomeris*” sp. Zriedkavo sa vyskytuje *Pieninia oblonga* Borza et Mišík. Vo výbrusoch sa vzácně nachádza sférická, hladkostenná *Calcisphaerula innominata* Bonet.

Popri hojných organických zvyškoch obsahuje hornina terigénnu prímes klastického kremeňa, úlomky vápencov a dolomitov, muskovit, biotit a chlorit ako i ojedinelé zrná živcov. Z ťažkých minerálov je prítomný zirkón, turmalín a granát, autigénny je pyrit, glaukonit, autigénne kryštály kremeňa a kalcitu. V hornine často možno pozorovať diagenetické javy, najmä vtlačanie klastických úlomkov do organických zvyškov.

Vrchnomaastrichtský vek tohoto súvrstvia potvrdzujú aj spoločenstvá foraminifer, ktoré sa nachádzajú v slienitých polohách: *Globotruncana contusa* (Cushman), *Gtr. falsostuarti* Sigal, *Gtr. stuarti* (Lapparent), *Gtr. obliqua* Herm, *Abanthomphalus mayaroensis* (Bolli), *Planoglobulina acervulinoides* (Egger), *Gublerina acuta robusta* (Klasz), *Pseudotextularia elegans* Rzehak, *P. nuttalli* (Voorwijk), *Racemiguembelina varians* (Rzehak) a.i.

2. Lokalita Svätá Helena, južne od Považskej Bystrice. V zlepcovom súvrství paleogénneho (ilerdského) veku (podrobnejší opis podávajú O. Samuel – K. Borza – E. Köhler 1972) sa ojedinele vyskytujú valúny piesčitých vápencov maastrichtského veku. Popri veľmi vzácnej *Nummofallotia cretacea* (Schlumb.) obsahujú veľké foraminifery [*Orbitoides apiculata* (Schlumb.), *Orb. gensacicus* (Leym.), *Orb. media* (Archiac), *Lepidorbitoides socialis* (Leymerie), *Siderolites calcitrapoides* Lamarck a *Hellenocyclina beotica* Reichel], malé foraminifery, vápnité riasy, *Pieninia oblonga* Borza et Mišík, *Pithonella ovalis* (Kaufm.), serpuly, koral, krinoidové články a úlomky schránok lastúrníkov, ulitníkov a rudistov.

Ondrej Samuel – Eduard Köhler

Foraminiferal genera *Gyroidinella* and *Korobkovella* from West-Carpathian Eocene (Liptov Basin)

2 text-fig., 4 pl. (XIX–XXII), Slovak summary

Abstract. The authors describe from the Paleogene basal transgressive lithofacies of the Liptov Basin a new species *Gyroidinella carpathica* nov. sp. and coarse-perforated forms, which they range to *Gyroidinella magna* Le Calvez, 1949 and to *Korobkovella* ex gr. *grosserugosa* (Gümbel, 1868).

The Carpathian Eocene deposits yield often foraminifers of large dimensions with coarse-perforated walls. Among them belongs *Gyroidinella magna* Le Calvez. With systematical position of the genus *Gyroidinella* Le Calvez deals in detail M. Neumann (1968). On the basis of our study of specimens *Gyroidinella magna* Le Calvez we favour M. Neumann's view (1968) about taxonomical independence of the genus *Gyroidinella*. At the same time we describe a second species of the genus *Gyroidinella* – a new species *Gyroidinella carpathica* nov. sp.

The first data about coarse-perforated foraminifers were given in the paper of C. Gümbel (1868), who paid attention to some forms of this group from the Bavarian Eocene. He placed them in the genus *Truncatulina*. During the second world war the original C. W. Gümbel's material was destroyed and this was the reason that H. Hagn (1955) and H. Hagn – W. Ohmert (1971) collected and in detail described the neotypes from original Bavarian localities. From our standpoint is significant, that specimens of the genus *Truncatulina* described V. Uhlig (1886) from the Carpathian Eocene.

The systematical position of this group of coarse-perforated foraminifers is not stabilized up to present. As the descriptions and illustrations are very rare, it is impossible to determine their geographical and stratigraphical extension and phylogenetical relations. According to H. Hagn – W. Ohmert (1971) the main criterion for genetic distinguishing is the position of the aperture, but this opinion requires further studies of variability of test-structure.

All new data about test-structure and extension of these foraminifers are very

RNDr. O. Samuel, DrSc., Geologický ústav Dionýza Štúra, Mlynská dolina 1, 809 40 Bratislava. RNDr. E. Köhler, CSc., Geologický ústav Slovenskej akadémie vied, Dúbravská cesta, 886 25 Bratislava.

important. From conclusions of the present paper follows the stratigraphical importance of these forms. Doubtless they are widely spread in deposits of the Carpathian Paleogene. We hope that our paper gives an impulse to study of Carpathian coarse-perforated foraminifers.

Paleontological description

***Gyroidinella carpathica* nov. sp.**

Pl. XIX, fig. 1–3, Pl. XX, fig. 1–2, text-fig. 1

Holotypus: The specimen illustrated in pl. XIX, fig. 1; in the depository at the Institute of Geology of the Slovak Academy of Sciences, Bratislava, ČSSR.

Locus typicus: Ružomberok–Paračka, Liptov Basin, West Carpathians.

Stratum typicus: Middle Eocene – Upper Lutetian.

Derivatio nominis: According to the mountains Carpathians.

Material: 21 specimens in thin-sections.

Diagnosis: The test is large, with flattened dorsal side and elevated ventral side. The equatorial profile is circular, the axial margin is oval. The test consists of 2,5 whorls, in the final whorl 20 chambers are found. The wall is perforated, bilamellar. The aperture at the base of the last chamber is interiomarginal.

Description: The test is large, involute. The dorsal side is flat or slightly convex in the central part. The ventral side is markedly convex. The equatorial profile is circular or subcircular. The axial margin is oval to subangular. The test consists of 2–2,5 whorls, which are visible on dorsal (spiral) side. In the final whorl 17–20 more or less equal chambers are present (pl. XIX, fig. 1). They are rhomboidal in section on dorsal side and triangular in section on the ventral side. In the section in the immediate vicinity of the surface of the dorsal side it may be seen that the septa of single chambers are thick, bilamellar, in the lower part abruptly recurved backward (in right angles – Pl. XIX, fig. 1). The umbilicus is wide and deep. The wall is calcareous, fine-perforated (perforations are 0,05 mm in diameter). The aperture is single, slitlike, restricted at the base of the last chamber, interiomarginal. It was impossible to study the apertural lip in thin-sections.

Dimensions: Diameter 2,0–3,3 mm, height 1,5–2,2 mm.

Remark: According to the outer morphology of test, the new species shows the most affinity with the representatives of the genus *Gyroidina* d'Orbigny, 1826. It differs from all known Paleogene representatives of this genus in having larger dimensions, larger number of chambers and in bilamellar walls. As this last mentioned feature is characteristic for the subfamily *Victoriellinae* Chapman et Cressin (see A. R. Loeblich – H. Tappan 1964, p. C 705), the new species belongs to the mentioned subfamily, too. In the subfamily *Victoriellinae* it shows the

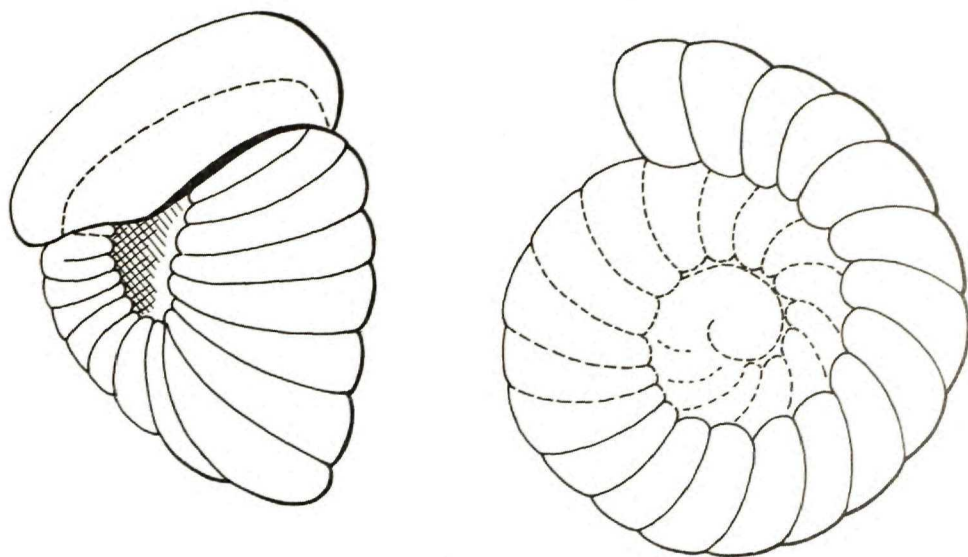


Fig. 1 Schematic reconstruction of *Gyroidinella carpathica* nov. sp.

most affinity with the only known species of the genus *Gyroidinella* – *Gyroidinella magna* Le Calvez, 1949. On this basis we join our new taxon to the genus *Gyroidinella*, which we consider as independent genus. The species described differs from *Gyroidinella magna* Le Calvez in having larger dimensions, larger number of chambers and in more fine-perforated walls.

Occurrence and stratigraphical range: *Gyroidinella carpathica* nov. sp. occurs only in Middle Eocene (Upper Lutetian) deposits of the basal transgressive lithofacies of the Liptov Basin.

At the locality Likavka (in the vicinity of ruins of the castle) the new species is very rare in detrital limestones of shallow-water origin. The species described is in association with *Nummulites perforatus* (Montf.), *N. striatus minor* d'Archiac et Haime, *N. variolarius* (Lamk.), *N. semicostatus* (Kaufm.), *Assilina exponens* (Sow.), *Alveolina elongata* d'Orb. and *Fabiania cassis* Silvestri. Present are also small foraminifers, calcareous algae, bryozoans, crinoidal segments, echinoderm spines and fragments of lamellibranchiate shells.

Most frequent is *G. carpathica* nov. sp. at the locality Ružomberok – Paračka. At the slope of the small hill Paračka (in front of the railway station Ružomberok) are exposures of sandy limestones with frequent organic remains. Among them most frequent are calcareous algae, frequent are also small and larger foraminifers, bryozoans, fragments of lamellibranchiate shells, *Ditrupa* sp., spines of echinoderms and crinoid segments. Larger foraminifers [*Nummulites perforatus* (Montf.), *N.*

millecaput Boubée, *N. variolarius* (Lamk.), *N. rotularius* Desh., *Assilina exponens* (Sow.), *Discocyclina discus* (Rütim.)] are of Upper Lutetian age.

Only rare sections of our new species were found in thin-sections of sandy limestones from an abandoned quarry, north of the village Lisková. The limestones are rich in larger foraminifers of Upper Lutetian age: *Nummulites perforatus* (Montf.), *N. striatus minor* d'Archiac et Haime, *N. aff. parvus* (Prever), *N. semicostatus* (Kaufm.), *Assilina exponens* (Sow.), *Discocyclina discus* (Rütim.) and *D. pratti* (Michelin). Frequent are also small foraminifers, bryozoans, fragments of macrofossils and calcareous algae. A shallow-water origin of limestones is undoubted.

Gyroidinella magna Le Calvez, 1949

Pl. XXI fig. 1-4, pl. XXII, fig. 1-6

1949 *Gyroidinella magna* Le Calvez – Y. Calvez: Révision des Foraminifères lutetiens du Bassin de Paris. II. Rotaliidae et familles affines, p. 27, tab. 6, fig. 103-105.

1968 *Gyroidinella magna* Le Calvez – M. Neumann: A propos de *Gyroidinella magna* Le Calvez en Aquitaine et en Mésogée, p. 85-90, tab. 1, fig. 1-9, text.-fig. 1.

Description: The test is large, involute, the dorsal side is flattened, the ventral side is convex, elevated. The equatorial profile is subcircular, the axial margin is oval. The number of whorls: 1,5-2. The final whorl consists of 8-10 chambers, rhomboidal in section. The septa are calcareous, thick, bilamellar, two laminae are separated by a very thin dark layer. Only the last septum is fine-perforated (pl. XXII, fig. 2). The test-wall is coarse-perforated, the pores are 0,015-0,025 mm in diameter. Although all specimens were studied only in thin-section, the main diagnostical features are analogical with those in the species *Gyroidinella magna* Le Calvez.

Dimensions: Diameter of test 1,0-2,7 mm, the embryonic chamber (protoconch) is oval in section, 0,15-0,25 mm in diameter.

Remark: With systematical position of the genus *Gyroidinella* Le Calvez, 1949 deals M. Neumann (1968). In according with her opinion that whorls aren't coiled around the axial hollow (this feature is a characteristic diagnostic feature of the genus *Eorupertia* Yabe et Hanzawa) we favour the view that the genus *Gyroidinella* has independent taxonomic position in the frame of the subfamily *Victoriellinae*. A. R. Loeblich – H. Tappan (1964) referred this genus to the subfamily *Victoriellinae*, but in synonymy of the genus *Eorupertia*.

Gyroidinella magna Le Calvez differs from our new species *G. carpathica* nov. sp. in having a smaller test, smaller number of chambers and in coarsely perforated walls.

Occurrence and stratigraphical range: *Gyroidinella magna* Le Calvez was found in many places in the basal transgressive lithofacies of the Liptov Basin (text-fig. 2). The most important localities are as follow:

A big quarry south of the town Ružomberok. In the upper part of this quarry the basal transgressive conglomerates are covered by a thin (2–3 m thick) limestone bed. This limestone contains rich organic remains: very frequent are foraminifers,

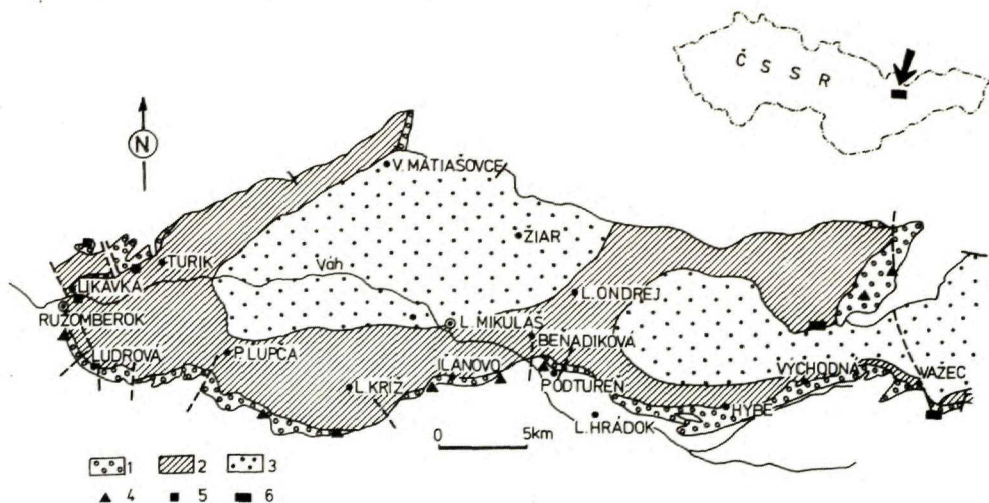


Fig. 2 Locality map showing the distribution of described forms in Liptov Basin. Explanations: 1 – the basal transgressive lithofacies (Middle to Upper Eocene), 2 – the claystone lithofacies (Upper Eocene), 3 – the flysch lithofacies (Upper Eocene) (1–3 – according to geological map 1:200 000 of ČSSR, sheet Banská Bystrica), 4 – occurrences of *Gyroidinella carpathica* nov. sp., 5 – occurrences of *Gyroidinella magna* Le Calvez, 6 – occurrences of *Korobkovella* ex gr. *grosserugosa* (Gümbel).

bryozoans and calcareous algae, infrequent are fragments of macrofossils. The association of larger foraminifers [*Nummulites garnieri* Boussac, *N. striatus* (Brug.), *N. variolarius* (Lamk.), *N. semicostatus* (Kaufm.), *N. chavannesi* de la Harpe, *Operculina alpina* Douv., *Operculinoides* aff. *nassauensis* Cole, *Discocyclina pratti* (Michelin), *D. sella* (d'Archiac), *D. nummulitica* (Gümbel) and *D. chudeaui* (Schlumb.)] indicates an Upper Eocene (Lower Priabonian) age of this limestone.

Further important localities are situated at the southern border of the Liptov Basin. They are: a big quarry to the SW of the village Liptovské Kľačany, a small outcrop SW of the village Lazisko, an abandoned quarry SW of the village Ploštín (elev. point „Jamy”), a quarry SW of the village Závažná Poruba and an abandoned quarry in the vicinity of the village Podtureň. At all these localities *Gyroidinella magna* Le Calvez occurs in sandy limestones. They contain foraminifers, calcareous algae, bryozoans and shells of macrofossils. Larger foraminifers are extraordinary frequent and among them were determined *Nummulites garnieri* Boussac, *N. incrassatus* de la Harpe, *N. striatus* (Brug.), *N. semicostatus* (Kaufm.), *N. chavannesi* de la Harpe, *N. pulchellus* de la Harpe, *N. budensis* Hantken, *Operculina alpina* Douv., *Operculinoides nassauensis* Cole, *Op. vaughani* (Cush-

man), *Discocyclina pratti* (Michelin), *D. sella* (d'Archiac), *D. varians* (Kaufm.) and *D. chudeaui* (Schlumb.). Basing upon this association the sandy limestones are ranged to Upper Eocene. The absence of *Nummulites fabianii* (Prever) – a common form of Middle and Upper Priabonian deposits of the Liptov Basin – confirms the Lower Priabonian age of these limestones.

Different assemblages were found at the northern border of the Liptov Basin. *Gyroidinella magna* Le Calvez was found in bioherm limestones near the elev. point Hrubý grúň (N of the village Východná). The limestones contain calcareous algae, bryozoans and foraminifers. The assemblage of larger foraminifers [*Nummulites* aff. *variolaris* (Lamk.), *Discocyclina* aff. *discus* (Rütim.), *Chapmanina gassinensis* Silvestri, *Fabiania cassis* Silvestri and *Halkyardia* sp.] dated these limestones as Upper Eocene (Lower Priabonian).

The only occurrence of *Gyroidinella magna* Le Calvez in Middle Priabonian limestones was found 2 km south of the gamekeeper's house Tri studničky. In the limestones among organic remains predominate calcareous algae, foraminifers, rare are crinoid segments, lamellibranchiata shells and bryozoans. Among larger foraminifers were determined: *Nummulites fabianii* (Prever), *N. incrassatus* de la Harpe, *N. chavannesi* de la Harpe, *N. pulchellus* de la Harpe, *Operculina alpina* Douv., *Grzybowskiia reticulata* (Rütim.), *Discocyclina pratti* (Michelin), *D. sella* (d'Archiac), *D. augustae* Weijden and *D. varians* (Kaufm.).

M. Neumann (1968) presented a different stratigraphical range of *G. magna* Le Calvez. According to this author *G. magna* is restricted to Upper Lutetian (Middle Eocene) deposits and the occurrence of this species in the Upper Eocene is questionable (for example in Biarritz).

Carpathian forms of *G. magna* occur in shallow-water deposits of Lower and Middle Priabonian age, but their dimensions are larger than those of Lutetian forms [Y. Le Calvez (1949) reported dimensions of tests about 1,6 mm, the maximum diameter of Carpathian forms is 2,7 mm].

Korobkovella ex gr. *grosserugosa* (Gümbel, 1868)

Pl. XX, fig. 3–6

- 1868 *Truncatulina grosserugosa* n. sp. – C. W. Gümbel: Beiträge zur Foraminiferenfauna der nordalpinen Eocäugebilde, p. 660, tab. 2, fig. 104 a–b.
1886 *Truncatulina grosserugosa* Gümb. – V. Uhlig: Ueber eine Mikrofauna aus dem Alttertiär der westgalizischen Karpathen, p. 175–179, tab. 2, fig. 15–21.
1971 *Korobkovella grosserugosa grosserugosa* (Gümbel) 1868 – H. Hagn – W. Ohmert: Révision de „*Truncatulina*“ *grosserugosa* Gümbel, etc., p. 136–140, tab. 1, fig. 1 a–c, tab. 2, fig. 1 a–b, 5, textfig. 3 a–c.

In some thin-sections from the basal transgressive lithofacies of the Liptov Basin sporadically may be seen sections similar to the species *Korobkovella* ex gr. *grosserugosa* (Gümbel). This species was in detail revised by H. Hagn and W. Ohmert (1971).

Figures 3 and 4 in plate XX show that tests of this species were attached to the substratum. The outer wall of test is coarse-perforated, the maximum diameter of pores is 0,015 mm. The number of whorls (1,5–2), number of chambers (9–11) and diameter of tests are similar to values in the paper of H. Hagn – W. Ohmert (1971). The diameter of Carpathian forms varies between 1,2–2,0 mm, their height between 0,8–1,3 mm. Free specimens of this species have been collected at the present time in the claystone lithofacies of the Inner-Carpathian Paleogene (Priabonian). They are identical with the forms described and illustrated in the paper of the above mentioned authors.

The species described was found only at two localities.

To the north of the village Východná in the vicinity of the brook Hybica is an exposure of bioherm limestones. Among organic remains frequent are algae, bryozoans, crinoid segments, echinoderm spines, fragments of lamellibranchiate shells and foraminifers. The following species of larger foraminifers were found there: *Nummulites incrassatus* de la Harpe, *N. striatus* (Brug.), *N. aff. variolarius* (Lamk.), *Operculinoides nassauensis* Cole, *Spiroclypeus granulatus* Boussac, *Sp. carpaticus* (Uhlig), *Grzybowskia multifida* Bieda, *Baculogypsinoidea* (*Silvestriella*) *tetraedra* (Gümbel), *Discocyclina pratti* (Michelin), *D. aff. discus* (Rütim.) and *D. varians* (Kaufm.). These limestones are deposits of shallow sea from the Upper Eocene (Middle Priabonian).

The second locality occurs in the southern neighbourhood of the village Važec. Limestones are rich in larger foraminifers of Upper Eocene (Middle Priabonian) age: *Nummulites fabianii* (Prever), *N. incrassatus* de la Harpe, *N. budensis* Hantken, *N. pulchellus* de la Harpe, *N. anomalus* de la Harpe, *Operculinoides nassauensis* Cole, *Spiroclypeus carpaticus* (Uhlig), *Sp. granulatus* Boussac, *Grzybowskia reticulata* (Rütim.), *Discocyclina pratti* (Michelin), *D. sella* (d'Archiac), *D. augustae* Wejden and *D. varians* (Kaufm.).

At both the mentioned localities the limestones are of Upper Eocene (Middle Priabonian) age. *Korobkovella* ex gr. *grosserugosa* (Gümbel) occurs in these limestones only sporadically.

Conclusions

Eocene deposits of the basal transgressive lithofacies of the Liptov Basin (West Carpathians) contain three different forms of coarse-perforated foraminifers:

Gyroidinella carpathica nov. sp. occurs in limestones of Middle Eocene (Upper Lutetian) age.

Gyroidinella magna Le Calvez is widely spread in shallow-water limestones of Lower Priabonian (Upper Eocene) age. This species only sporadically was found in Middle Priabonian limestones.

Korobkovella ex gr. *grosserugosa* (Gümbel) is present very scarcely in limestones of Middle Priabonian age.

The age determinations of limestones are based on assemblages of larger foraminifers.

Translated by the authors.

Reviewed V. Gašpariková.

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Explanations of plates XIX–XXII

Plate XIX

Gyroidinella carpathica nov. sp. Fig. 1. Equatorial section, holotypus, locality Ružomberok–Paračka, thin-section 2/K, magn. 25 x. Fig. 2. Oblique section, loc. Ružomberok–Paračka, thin-section 4/K, magn. 25 x. Fig. 3. Axial section, paratype, loc. Ružomberok–Paračka, thin-section 10/K, magn. 25 x.

Plate XX

Figs. 1–2. *Gyroidinella carpathica* nov. sp. Fig. 1. Oblique axial section, locality Ružomberok–Paračka, thin-section 8/K, magn. 25 x. Fig. 2. Cross-section of test near to periphery, loc. Ružomberok–Paračka, thin-section 9/K, magn. 25 x. – Figs. 3–6. *Korobkovella* ex gr. *grosserugosa* (Gümbel). Fig. 3. Axial section, loc. Hybica, thin-section 4/K, magn. 25 x. Fig. 4. Oblique axial section, loc. S of Važec, thin-section 1/K, magn. 25 x. Fig. 5. Oblique section, loc. Hybica, thin-section 10/K, magn. 25 x. Fig. 6. Oblique equatorial section, loc. Hybica, thin-section 12/K, magn. 25 x.

Plate XXI

Gyroidinella magna Le Calvez. Fig. 1. Oblique section, locality Ploštín–Jamy, thin-section 4/K, magn. 25 x. Fig. 2. Oblique section, loc. S of Tri studničky, thin-section 1/K, magn. 25 x. Fig. 3. Oblique section, loc. Závažná Poruba, thin-section 10/K, magn. 25 x. Fig. 4. Equatorial section, loc. Važec, thin-section 7/K, magn. 25 x.

Plate XXII

Gyroidinella magna Le Calvez. Fig. 1. Equatorial section, locality Ružomberok, thin-section 7/K, magn. 25 x. Fig. 2. Equatorial section, loc. Podtureň, thin-section 6/K, magn. 25 x. Fig. 3. Equatorial section, loc. Závažná Poruba, thin-section 3/K, magn. 25 x. Fig. 4. Oblique section, loc. Ružomberok,

thin-section 12/K, magn. 25 x. Fig. 5. Oblique section, loc. Ružomberok, thin-section 10/K, magn. 25 x. Fig. 6. Oblique section, loc. Ružomberok, thin-section 8/K, magn. 25 x. Photo of pl. XIX–XXII by H. Brodnianska.

Ondrej Samuel – Eduard Köhler

Foraminiferové rody *Gyroidinella* a *Korobkovella* z eocénu Západných Karpát (Liptovská kotlina)

Resumé anglického textu

V sedimentoch karpatského paleogénu sa miestami vyskytujú foraminifery veľkých rozmerov s hrubo perforovanými stenami. Túto skupinu podrobnejšie preskúmal ako prvý C. W. Gümbel (1868), ktorý formy z bavorského eocénu zaradil do rodu *Truncatulina*. Onedlho po ňom, roku 1886, opísal zástupcov rodu *Truncatulina* z karpatského eocénu V. Uhlig.

Keďže pôvodná zbierka C. W. Gümbela bola počas 2. svetovej vojny zničená, H. Hagn (1955) a H. Hagn – W. Ohmert (1971) vyžbierali a podrobne opísali neotypy z pôvodných lokalít. Roku 1949 Y. Le Calvezová opísala nový rod *Gyroidinella*, ktorým sa podrobnejšie zaoberala a jeho systematickú samostatnosť obhajovala M. Neumannová (1968).

Dodnes nie je ustálené zatriedenie týchto foraminifer, lebo chýbajú podrobnejšie údaje o ich geografickom a stratigrafickom rozšírení, o stavbe ich schránok ako i štúdie o ich fylogenetických vzťahoch. Z hľadiska doplnenia týchto vedomostí je dôležitý každý nový publikovaný údaj.

Vo výbrusoch hornín bazálnej transgresívnej litofácie Liptovskej kotliny boli vymedzené 3 formy hrubo perforovaných foraminifer:

Gyroidinella carpathica nov. sp. – Nový druh sa podobá na zástupcov rodu *Gyroidina*, ale odlišuje sa značnou veľkosťou, ako i bilamelárnymi stenami, ktoré ho zaraďujú do podčľadu *Victoriellinae* a do rodu *Gyroidinella*. Od jediného známeho druhu tohoto rodu – *Gyroidinella magna* Le Calvez sa odlišuje značne väčšími rozmermi, väčším počtom komôr a jemnejšie perforovanými stenami. Nový druh bol nájdený v plytkovodných piesčitých vápencoch na lokalitách Likavka, Ružomberok-Paračka a Lisková. Spoločenstvá veľkých foraminifer umožňujú zaradiť tieto vápence do stredného eocénu – vrchného lutétu.

Gyroidinella magna Le Calvez bola nájdená vo výbrusoch z mnohých lokalít. Vyskytuje sa prevažne v spodnom priabóne, jej výskyty v strednom priabóne sú zriedkavé. Prítomnosť tohoto druhu vo vrchnom eocéne Liptova (dokázanom spoločnosťami veľkých foraminifer) značne rozširuje vedomosti o stratigrafickom rozpätí druhu, ale i rodu *Gyroidinella*, lebo podľa M. Neumannovej (1968) hlavný rozvoj druhu bol vo vrchnom lutéte a jeho výskyty vo vrchnom eocéne sú otáznе. Liptovské formy druhu *G. magna* sa vyznačujú trochu väčšími rozmermi schránok, ale všetkými ostatnými znakmi sa zhodujú s typom.

Korobkovella ex gr. *grosserugosa* (Gümbel) bola nájdená iba na dvoch lokalitách vo vápencoch strednopriabónskeho veku. Táto, pôvodne na podklad upevnená forma, je vo výbrusoch veľmi vzácna a nemohla byť podrobnejšie študovaná. V poslednom čase voľné exempláre druhu *Korobkovella grosserugosa* (Gümbel) boli nájdené vo vrchnoecénnych sedimentoch ílvcovej litofácie.

Keďže hrubo perforované foraminifery v sedimentoch karpatského paleogénu nie sú vzácnosťou a – ako vyplýva z našich štúdií – majú i značný stratigrafický význam, bude potrebné i v budúcnosti ich výskumu venovať primeranú pozornosť.



Hedviga Bystrická

Middle–Oligocene calcareous nannoplankton in the Banskobystrická kotlina (depression)

10 pl. (XXIII–XXXII), Slovak summary

Abstract. The article contains description and remarks on taxonomy of calcareous nannoplankton found in Upper Rupelian sediments near the village Kordíky in the Banskobystrická kotlina (depression).

A new combination is introduced in the nomenclature of the species *Reticulofenestra ornata* Müller and *Discolithina bicaveata* Perch-Nielsen, namely: *Dictyococcites ornatus* (Müller) nov. comb. and *Pontosphaera bicaveata* (Perch-Nielsen) nov. comb.

Engineering-geological operations aimed at the investigation of landslides in the Banskobystrická kotlina resulted in finds of plentiful calcareous nannoplankton in the drillhole JK-9 situated at the northern margin of the village Kordíky. The find is significant in respect of both stratigraphy and paleontology. As regards stratigraphy, it is the first paleontologically proved occurrence of Upper Rupelian sediments in the Banskobystrická kotlina. The existing opinions about the age of beds in the depression (E. Planderová, M. Pulec, O. Samuel, M. Vaňová 1964, O. Samuel 1975, J. Cicha 1960, B. Pacltová 1966) will be complemented and solving of paleogeographical and tectonical questions concerning the Inner Carpathian depressions will be facilitated.

Well preserved and in species varied calcareous nannoplankton represents valuable material for paleontological study. The association was found in greyish extremely fine-sandy schistose claystones at the depth of 21 m. The association comprised the following species: *Coccolithus eopelagicus* (Bram. et Ried.) Bram. et Sul., *Coccolithus pelagicus* (Wall.) Schil., *Coccolithus rupeliensis* Müll., *Chiasmolithus altus* Buk. et Perc., *Chiasmolithus cf. solitus* (Bram. et Sul.) Hay, Moh. et Wade., *Chiasmolithus titus* Gart., *Cruciplacolithus delus* (Bram. et Sul.) Perch.-Niel., *Cyclicargolithus floridanus* (Roth et Hay) Buk., *Cyclococcolithus formosus* Kampt., *Cribocentrum reticulatum* (Gart. et Smith) Perch-Niels., *Dictyococcites daviesi* (Haq) Perch-Niel., *Dictyococcites ornatus* (Müll.) nov. comb., *Reticulofenestra abisecta* (Müll.) Roth, *Reticulofenestra clatrata* Müll.,

Reticulofenestra lockeri Müll., *Reticulofenestra umbilica* (Lev.) Mart. et Ritz., *Dictyococcites bisectus* (Hay, Moh. et Wade) Buk. et Perc., *Toweius callosus* Perch-Niel., *Toweius occultatus* (Lock.) Perch-Niel., *Pontosphaera multipora* (Kampt.) Haq., *Pontosphaera bicaveata* (Perch-Niel.) nov. comb., *Helicosphaera recta* Haq., *Helicosphaera* sp., *Lophodolitus nascens* Bram et Sul., *Transversopontis obliquipons* (Defl.) Hay, Moh. et Wade, *Neococcolithes* cf. *nudus* Perch-Niel., *Neochiastozygus chiastus* (Bram. et Sul.) Perch-Niel., *Isthmolitus recurvus* Defl., *Sphenolithus moriformis* (Brön. et Strad.) Bram. et Wilc., *Orthozygus aureus* (Strad) Bram. et Wilc., *Trochoaster simplex* Klumpp, *Discoaster barbadiensis* T. S. H., *Discoaster deflandrei* Bram. et Ried., *Discoaster saipanensis* Bram. et Ried., *Discoaster tani* Bram. et Ried., *Nannotetrina spinosa* (Strad.) Achut et Strad. and various Cretaceous species.

The species composition shows that the thanatocenosis contains plentiful allochthonous elements. Stratigraphical pattern of the association is distorted mainly by many forms characteristic of Upper Eocene and Lower Oligocene associations.

Species ranged in the standard nannoplankton scale of E. Martini (1971) as index species (*Sphenolithus ciperoensis* Bram. et Wilc., *Sphenolithus predistentus* Bram. et Wilc. and *Sphenolithus distentus* (Mart.) Bram. et Wilc.) were not found among the Oligocene forms. Stratigraphical ranging was facilitated by isolated species *Reticulofenestra abisecta* (Müll.) Roth and *Helicosphaera recta* Haq. According to the existing data, both species occur in upper Middle Oligocene in the Zone NP 24 – *Sphenolithus distentus*. The zone represents the upper part of the Middle Oligocene (Rupelian) and the lower part of the Upper Oligocene (Egerian). Criteria for the division of the zone NP 24 into the Rupelian and Egerian parts have not been found as yet.

The association studied is ranged to the lower part of the zone NP 24 i.e. into the Upper Rupelian, on the basis of analogy with Upper Rupelian associations from the Bavarian lower marine molasse. C. Müller (1970) found an association almost identical with ours in Upper Rupelian sediments of the drillhole Füssing 1. The association – as well as ours – comprises plentiful Cretaceous and Eocene resedimented species, the autochthonous component being identical with ours.

Systematic part

Coccolithophorales Schiller, 1926

Coccolithaceae Kamptner, 1928

Coccolithus Schwarz, 1894

Type species: *Coccosphaera pelagica* Wallich

Coccolithus eopelagicus (Bramlette et Riedel, 1954) Bramlette et Sullivan, 1961

Pl. XXIII, Fig. 1

- 1954 *Tremalithus eopelagicus* Bramlette and Riedel, n. sp. – M. N. Bramlette W. R. Riedel: Stratigraphic value of *Discoasters* etc., p. 392, pl. 39, figs 2a, b.
1961 *Coccolithus eopelagicus* (Bramlette and Riedel) – M. N. Bramlette, F. R. Sullivan: Coccolithophorids and related nannoplankton etc., p. 141.
1962 *Coccolithus eopelagicus* (Bramlette et Riedel) nov. comb. – E. Kamptner: Coccolithineen-Skeletreste etc., p. 15, Abb. 12, Tab. 3, fig. 23.

Remarks: The form typical of Upper Eocene and Oligocene nannoplankton associations, is strikingly large. In this, and in more lamellae on both discs it differs from the very similar species *Coccolithus pelagicus* (Wallich) Schiller. It was quite frequent in the association studied.

Stratigraphical range: Middle Eocene – Oligocene.

Coccolithus pelagicus (Wallich, 1977) – Schiller, 1930

Pl. XXIII, Fig. 2

- 1877 *Coccosphaera pelagica* Wallich – G. C. Wallich: Observations on the coccosphaere etc., p. 348, tab. 17, fig. 1, 2 – non vidi.
1902 *Coccolithophora pelagica* (Wallich) Lohm. – H. Lohmann: Die Coccolithophoridae etc., p. 138, 139, tab. 5, fig. 58 a, c.
1930 *Coccolithus pelagicus* (Wallich) Schiller – J. Schiller in L. Rabenhorsts Kryptogamenflora etc., p. 91, fig. 246.
1970 *Cruciplacolithus tenuiforatus* n. sp. – M. Clocchiatti, L. Jerkovič: *Cruciplacolithus tenuiforatus*, nouvelle espece etc., p. 2–5, tab. 1, fig. 1 a–d, 2, 3, tab. 2, fig. 1 a–c, 2–6.
1971 *Ericsonia insolita* n. sp. – K. Perch-Nielsen: Elektronenmikroskopische Untersuchungen an Coccolithen etc., p. 13, tab. 1, fig. 1, tab. 7, fig. 4, 6, tab. 61, fig. 15, 16.
1971 *Cruciplacolithus devinensis* nov. sp. – R. Lehotayová: Electron-microscopic examination of calcareous nannoflora etc., p. 163, tab. 19, fig. 1, 2, tab. 20, fig. 1.

Remark: Placoliths of the species are quite frequent in the association studied. Their discs consist as a rule of 35–40 lamellae. A small oval central aperture is in some forms crossed with a cruciform structure composed of a row of irregular

granules. Similar forms were described by K. Perch – Nielsen (1971) from the Upper Eocene of Denmark as *Ericsonia insolita*, by M. Clocchiatti and L. Jerkovič (1970) from the Miocene of Algeria and Yugoslavia as *Cruciplacolithus tenuiforatus* and by R. Lehotayová from the Badenian of Slovakia as *Cruciplacolithus devinensis*.

Stratigraphical range: Paleogene – Recent

Coccolithus rupeliensis Müller, 1970

Pl. XXIII, Fig. 4, 5

1970 *Coccolithus rupeliensis* n. sp. – C. Müller: Nannoplankton-Zonen etc., p. 112, 113, tab. 4, fig. 1–4, tab. 6, fig. 1

Remark: Circular to broad-oval placoliths are conformable with forms described from Bavarian molasse. The distal disc consists of 50–55 slightly imbricated lamellae. Depressed central area is about 1/2 disc diameter. It is littered with thin rectangular lamellae projecting above the margin of the area to form ridge-shaped elevation. The central area is small, occupying about 1/7 of the disc diameter. We failed in getting an elektronmicrograph of the proximal side.

Stratigraphical range: The species is so far known from the Middle Oligocene, namely the zone NP-23-*Sphenolithus predistentus* and NP-24-*Sphenolithus distentus*.

Chiasmolithus Hay, Mohler et Wade, 1966

Type species: *Tremalithus oamaruensis* Deflandre

Chiasmolithus altus Bukry et Percival, 1971

Pl. XXIII, Fig. 6

1971 *Chiasmolithus altus* Bukry and Percival, n. sp. – D. Bukry, S. F. Percival: New Tertiary calcareous nannofossils, p. 126, pl. 2, fig. 1–2.

1975 *Chiasmolithus altus* Bukry and Percival – A. R. Edwards, K. Perch–Nielsen: *Calcareous nannofossils* etc., pl. 15, fig. 4, 5, 9, 10, pl. 18, fig. 13

Remark: Elektronmicrograph in tab. 1, fig. 6 represents the distal side of the placolith.

Visible are narrow lamellae of the distal disc, and the large central area with indistinct microstructure. The large central area is crossed by an X-shaped structure dividing it into two larger apertures situated along the long axis of the placolith, and into two smaller apertures situated along the short axis. The X-shaped structure consists of 3 rows of narrow lamellae oriented along the arms of the cruciform

structure. The species is described on the basis of examination under optical microscope. A 90° angle between the arms of the cruciform structure is quoted as one of the principal identification characters. Scanning-electron micrographs of forms with well preserved microstructure are presented by A. R. Edwards – K. Perch-Nielsen from drillholes in the SW Pacific (1975).

Stratigraphical range: Upper Eocene – Lower Miocene.

Chiasmolithus cf. solitus (Bramlette et Sullivan, 1961) Hay, Mohler et Wade, 1966

Pl. XXIV, Fig. 1

1961 *Coccolithus solitus* Bramlette and Sullivan, new species – M. N. Bramlette, F. R. Sullivan: Coccolithophorids and related nannoplankton etc., p. 140, pl. 2, fig. 4 a–c.

1966 Genus *Chiasmolithus* n. gen. – W. W. Hay, H. P. Mohler, M. E. Wade: Calcareous nannofossils etc., p. 338.

Remark: Precise species identification of the form is rather problematic. The species was described on the basis of examination under optical microscope when microstructure could not have been deciphered accurately. A cruciform structure shaped to a broad irregular H is the most conspicuous character of the species. Our specimens are conformable with the forms depicted by K. Perch-Nielsen (1975) from the Middle Eocene of SW Pacific, they do, however, differ from the form quoted by St. Gartner (1971) from Blake Plateau.

Stratigraphical range: Upper Lower Eocene–Upper Eocene. Occurrences in higher stratigraphical levels are most likely secondary.

Chiasmolithus cf. titus Gartner, 1970

Pl. XXIV, Fig. 2, 4

1970 *Chiasmolithus titus* Gartner n. sp. – St. Gartner Jr.: Phylogenetic lineages etc., p. 945, fig. 17, 1–3c.

Remark: According to the author of the species it may be easily identified according to the shape of the central structure. The central structure consists of two crossed lines, one being straight, the other S-bended. The cross-lines consist of lamellar prisms placed partially on one another as shown by the picture of the distal side of the holotype. Our specimens have cross-lines on the proximal side, formed of two rows of granules. Microstructure of discs is conformable with the holotype.

Stratigraphical range: So far it has been quoted from the Middle and Upper Eocene. In the association studied it is most likely resedimented.

Cruciplacolithus Hay et Mohler, 1967

Type species: *Heliorthus tenuis* Stradner

Cruciplacolithus delus (Bramlette et Sullivan, 1961)

Perch-Nielsen, 1971

Pl. XXIV, Fig. 3

- 1961 *Coccolithus delus* Bramlette and Sullivan, new species – M. N. Bramlette, F. R. Sullivan: Coccolithophorids and related nannoplankton etc., p. 151, pl. 7, fig. 1, 2.
1967 *Campylosphaera dela* (Bramlette et Sullivan) – W. W. Hay, H. P. Mohler: Calcareous nannoplankton etc., p. 1531, tab. 198, fig. 14.
1971 *Cruciplacolithus delus* (Bramlette et Sullivan, 1961) n. comb. – K. Perch – Nielsen: Elektronmikroskopische Untersuchungen etc., p. 22, tab. 13, fig. 7, 8.

Remark: Occasional placoliths of the species are allochthonous in the association.

Stratigraphical range: Upper Paleocene – Middle Eocene – Upper Eocene?

Cyclicargolithus Bukry, 1971

Type species: *Coccolithus floridanus* Roth et Hay

Cyclicargolithus floridanus (Roth et Hay, 1967) Bukry, 1971

Pl. XXIV, Fig. 5, 6

- 1967 *Coccolithus floridanus* Roth et Hay, n. sp. – W. W. Hay et al. Calcareous nannoplankton zonation etc., p. 445, tab. 6, fig. 1–4.
1967 *Cyclococcolithus neogammation* Bramlette et Wilcoxon, n. sp. – M. N. Bramlette, J. A. Wilcoxon: Middle Tertiary calcareous nannoplankton etc., p. 104, tab. 1, fig. 1–3, tab. 4, fig. 3–5.
1971 *Cyclicargolithus floridanus* (Roth and Hay) n. comb. – D. Burkry. Cenozoic calcareous nanofossils etc., p. 312, 313.

Remark: Circular placolith consist of two discs of different sizes. Our specimens have 40–50 lamellae. In the large central area of the distal disc is a small garland of tiny irregular granules. The central aperture is small, varying between 1/7 and 1/5 of the disc diameter. Lamellae of the proximal disc converge radially to the central aperture to bend there and form a wall of a vertical tube connecting the discs. Interlamellar sutures of the proximal disc are very fine as a rule. Frequently they are filled and the disc seems a compact structure.

Stratigraphical range: Upper part of the Middle Eocene – Miocene?

Cyclococcolithus Kamptner, 1954

Type species: *Coccosphaera leptopora* Murray et Blackmann

Cyclococcolithus formosus Kamptner, 1963

Pl. XXIII, Fig. 3; Pl. XXV, Fig. 1

- 1963 *Cyclococcolithus formosus* nov. spec. – E. Kamptner: Cocolithineen – Skeletreste etc., p. 163, tab. 2, fig. 8, text-fig. 20.
1966 *Cyclococcolithus lusitanicus* (Black) – W. W. Hay, H. P. Mohler, M. E. Wade: Calcareous nanofossils etc., p. 390, tab. 7, fig. 3–6.
1971 *Cyclococcolithina formosa* (Kamptner) Wilcoxon – J. A. Wilcoxon: Cyclococcolithina Wilcoxon, nom. nov. etc., p. 390, tab. 7, fig. 3, 6.

Remark: In the association studied were some typical specimens of the species. Electronmicrographs show distinctly microstructure of the distal and proximal sides with the typical „ericsonian” structure (pl. XXIII, fig. 3).

Stratigraphical range: Occasionally in Lower Eocene, frequently in Upper Eocene and Lower Oligocene, scarcely in Middle Oligocene.

Prinsiaceae Hay et Mohler, 1967

Cribrocentrum Perch–Nielsen, 1971

Type species: *Coccolithus faveolatus* Reinhardt

Cribrocentrum reticulatum (Gartner et Smith, 1967) Perch – Nielsen, 1971

Pl. XXVII, Fig. 1, 2

- 1967 *Cyclococcolithus reticulatus* Gartner et Smith, n. sp. – St. Gartner Jr., Lee A. Smith: Coccolithus and related etc., p. 4, tab. 5, fig. 1–4.
1971 *Cribrocentrum reticulatum* (Gartner et Smith, 1967) n. comb. – K. Perch – Nielsen: Elektronenmikroskopische Untersuchungen etc., p. 28, tab. 25, fig. 4–9.

Remark: The species was scarce in the association. All placoliths had comparatively small central apertures – approximately 1/3 of the disc diameter – in contrast to Middle Eocene forms, with extremely variable size of aperture. The comparatively thick central grid resulted evidently from prolongation of every second lamella of the disc. On the proximal side the grid is formed by regularly distributed round pores. On the distal side in the middle of the grid are frequent irregular granules and the grid resembles then microstructure of the grid of the genus *Dictyococcites*.

Stratigraphical range: The species described is from the Upper Eocene of Luisiana. K. Perch–Nielsen (1971) confined its occurrence to the middle part of the Upper Eocene. In sediments of the West Carpathians it has been occurring since the Middle Eocene. Autochthony of the species in the Middle Oligocene is problematic.

Dictyococcites Black, 1967

Type species: *Dictyococcites danicus* Black

Dictyococcites bisectus (Hay, Mohler et Wade, 1966)

Bukry et Percival, 1971

Pl. XXV, Fig. 3, 4

- 1966 *Syracosphaera bisecta* n. sp. – W. W. Hay, H. P. Mohler, N. Wade, Calcareous nannofossils etc., p. 393, tab. 10, fig. 1–6.
- 1966 *Reticulofenestra scissura* n. sp. – Ibidem, p. 387, tab. 5, fig. 1–6.
- 1967 *Coccolithus bisectus* (Hay, Mohler et Wade) Bramlette et Wilcoxon, n. comb. – M. N. Bramlette, J. A. Wilcoxon: Middle Tertiary calcareous nannoplankton etc., p. 102, tab. 4, fig. 11–13.
- 1969 *Dictyococcites dictyodus* (Deflandre et Fert) nov. comb. – E. Martini: Nannoplankton aus dem Latdorf etc., p. 133, 134, tab. 1, fig. 5, 6, tab. 4, fig. 35.
- 1970 *Reticulofenestra bisecta* (Hay, Mohler et Wade) n. comb. – P. H. Roth: Oligocene calcareous nannoplankton etc., p. 847, tab. 6, fig. 6.
- 1971 *Dictyococcites bisectus* (Hay, Mohler et Wade) Bukry and Percival, n. comb. – D. Bukry, S. F. Percival: New Tertiary calcareous etc., p. 127, tab. 2, fig. 12, 13.

Remark: In the association studied are quite plentiful large broad-oval placoliths of the species. The species is identifiable easily according to many (60–80) fine lamellae forming discs, according to the large central area filled with rectangular, massive, irregularly distributed lamellae. They are oriented toward the long axis of the area and form an elongated, slot shaped, central aperture.

Stratigraphical range: upper part of the Middle Eocene–Oligocene.

Dictyococcites daviesi (Haq, 1968) Perch–Nielsen, 1971

Pl. XXVI, Fig. 1–3

- 1968 *Stradnerius daviesi* Haq n. sp., B. Haq: Studies on Upper Eocene etc., p. 32, tab. 4, fig. 4, 5.
- 1971 *Dictyococcites daviesi* (Haq 1968) n. comb. – K. Perch–Nielsen: Elektronenmikroskopische Untersuchungen etc., p. 29, tab. 20, fig. 1, 2.
- 1971 *Dictyococcites callidus* n. sp. – K. Perch–Nielsen: Ibidem, p. 28, 29, tab. 22, fig. 1–4, tab. 23, fig. 3, tab. 61, fig. 30, 31.
- 1971 *Dictyococcites onustus* n. sp. – K. Perch–Nielsen: Ibidem, p. 29, tab. 20, fig. 3, 4.

Remark: Placoliths are oval to broad-oval. The distal disc consists of 60–80 narrow, dextrally overlapping lamellae. The large central area occupies 2/3–3/4 of the disc diameter. In the central area is a ringlet of rectangular lamellae, dextrally superimposed on one another. Approximately every third lamella narrows and extends into the central area to join the oval convex rugged central field formed of irregular granules. The central field is rimmed with large irregular apertures.

The proximal disc consists of narrow, trapezoid lamellae aligned tightly beside one another. Every second lamella extends into the central aperture to form there a grid. The lamellae terminate at a narrow slot-shaped aperture extending toward the long axis of the disc.

K. Perch-Nielsen (1971) basing on the structure of the central field, distinguishes three species of this form: *D. callidus* with a small and compact central field, *D. daviesi* with small central field with tiny pores, and *D. onustus* with large porous central fields. According to data obtained by examination of our material, it is the only species with variably formed central area.

Stratigraphical range: So far Middle and Upper Eocene.

Dictyococcites ornatus (Müller, 1970) nov. comb.

Pl. XXV, Fig. 5

1970 *Reticulofenestra ornata* n. sp. – C. Müller: Nannoplankton-Zonen etc., p. 116, tab. 1, fig. 4–6, tab. 2, fig. 4.

Remark: Discs of the broad-oval form consist of 55–70 narrow lamellae. The central area is large, occupying $1/2 - 2/3$ of a disc. The central grid on the distal side is convex. It is formed of thick segments running from the basal part of the central area toward the long axis of the disc to meet there. In its central part the grid is frequently strengthened by secondary CaCO_3 . Through slot-like apertures among segments the proximal grid with tiny pores is visible. At the periphery of the grid the pores are oval, in its central part – circular. Basing on the grid structure, I range the species to the genus *Dictyococcites*.

Stratigraphical range: So far Middle Oligocene.

Reticulofenestra Hay, Mohler et Wade, 1966

Type species: *Coccolithus umbilicus* Levin

Reticulofenestra abisecta (Müller, 1970) Roth, 1972

Pl. XXV, Fig. 2

1970 *Coccolithus? abisectus* n. sp. – C. Müller: Nannoplankton aus dem Mittel-Oligozän etc., p. 92, tab. 9, fig. 9, 10, tab. 12, fig. 1.

1971 *Dictyococcites abisectus* (Müller) Bunkry and Percival, n. comb. – D. Bunkry, S. F. Percival: New Tertiary calcareous nannofossils, p. 127, tab. 2, fig. 9–11.

1972 *Reticulofenestra abisecta* (Müller) n. comb. – P. H. Roth, H. R. Thierstein: Calcareous nannoplankton, Leg. 14, etc., p. 436.

Remark: The central grids are broken out on most placoliths both in our specimens and in material from other localities, and for this reason the species was ranged to different genera. The species resembles *S. bisectus*, only it has less lamellae on a disc, (45–50) they are imbricated, and different arrangement of segments littering the central area on the distal side. The segments are arranged radially around the central aperture in contrast to *D. bisectus* – there they run toward the central slot extending toward the long axis of the disc.

Stratigraphical range: Upper Middle Oligocene – Upper Oligocene.

Reticulofenestra clatrata Müller, 1970

Pl. XXVII, Fig. 5

1970 *Reticulofenestra clatrata* n. sp. – C. Müller: Nannoplankton-Zonen etc., p. 115, tab. 7, fig. 1–3, tab. 8, fig. 1–2.

Remark: In the association studied were few specimens of the species. Large oval placoliths have a somewhat smaller proximal disc than distal. The large central aperture is covered by a grid composed of broad segments. A narrow ring around the central aperture from which the segments run out, is preserved only partially.

Stratigraphical range: Middle and Upper Oligocene.

Reticulofenestra lockeri Müller, 1970

Pl. XXVI, Fig. 4–6; Pl. XXV, Fig. 6

1970 *Reticulofenestra lockeri* n. sp. – C. Müller: Nannoplankton – Zonen etc., p. 116, tab. 6, fig. 3–5, tab. 7, fig. 4.

1974 *Reticulofenestra pseudolockeri* n. sp. – F. Jurášová: Nannoplankton from the Menilitic Formation etc., p. 93, tab. 3, fig. 1–3.

Remark: Representatives of the species were frequent in the association. Placoliths consist of 60–100 narrow lamellae converging toward the central area. On the distal side, near the central area they turn upward at an approx. 90° angle. The central aperture is smaller than on typical specimens. It varies between 1/5 and 2/5 of the disc diameter which is similar on forms described by F. Jurášová (1974) as *Reticulofenestra pseudolockeri*. Number and shape of lamellae rimming the central aperture, are the same as on typical forms. The grid crossing the central aperture is distal – convex and covered with fine pores. Usually in its central part there is a slot-like aperture extending toward the long axis. On both sides of the slot are tiny granules, most likely of secondary CaCO₃.

Stratigraphical range: C. Müller (1970) presents a species from the Middle Oligocene from the zones NP 23 and NP 24. If we take the species *R. pseudolockeri* for a synonym of the species *R. lockeri* then the lower limit of its occurrence is shifted to the Lower Oligocene, the Zone NP 21. According to M. Báldi–Béke (1973) it is also frequent in the Upper Oligocene.

Reticulofenestra umbilica (Levin, 1965) Martini et Ritzkovski, 1968

Pl. XXVIII, Fig. 1

- 1965 *Coccolithus umbilicus* Levin, n. sp. – H. L. Levin: Coccolithophoridae and related etc., p. 265, tab. 41, fig. 2.
1966 *Reticulofenestra caucasica* n. sp. – W. W. Hay, H. Mohler, M. E. Wade: Calcareous Nannofossils etc., p. 386, tab. 2, fig. 5, 6, tab. 3, fig. 1, 2, tab. 4, fig. 12.
1966 *Apertapetra samodurovi* n. sp. – Ibidem, p. 388, tab. 6, fig. 1–7.
1967 *Coccolithus stavensis* Levin and Joerger, new species – H. L. Levin, A. P. Joerger: Calcareous nannoplankton etc., p. 165, tab. 1, fig. 7a–d.
1967 *Apertapetra umbilicus* (Levin) – Ibidem, p. 166, tab. 1, fig. 9a–c.
1968 *Reticulofenestra placomorpha* (Kamptner) nov. comb. – H. Stradner, A. R. Edwards: Electron microscopic studies etc., p. 22, tab. 19, 20, 22–25.
1968 *Reticulofenestra umbilica* (Levin) nov. comb. – E. Martini, S. Ritzkovski. Was ist das etc., p. 20, tab. 1, fig. 11.

Remark: In the association were frequent large, broad – oval placolithes of the species with discs composed of about 100 narrow lamellae. Most specimens have central areas occupying as much as 5/7 of placolith diameter. Rectangular lamellae of the central ringlet are markedly overlapping sinistrally. The central aperture varies between 1/3–2/3 of placolith diameter in size. On most specimens the thin central grid is broken out. It is completely or partially preserved on forms with a small central aperture.

Stratigraphical range: Middle Eocene–Middle Oligocene.

Toweius Hay et Mohler, 1967

Type species: *Toweius craticulus* Hay et Mohler

Toweius callosus Perch–Nielsen, 1971

Pl. XXVIII, Fig. 6

- 1971 *Toweius callosus* n. sp. – K. Perch–Nielsen: Elektronenmikroskopische Untersuchungen etc., p. 31, 32, tab. 17, fig. 3, 5, 6, tab. 18, fig. 5, tab. 61, fig. 32, 33.

Remark: Some specimens of the association are evidently allochthonous. It is also evidenced by considerably recrystallized placoliths.

Stratigraphical range: So far only Lower Eocene.

Toweius craticulus Hay et Mohler, 1967

Pl. XXVIII, Fig. 3, 4

1967 *Toweius craticulus* n. sp. – W. W. Hay, H. P. Mohler: Calcareous nannoplankton etc., p. 1530, tab. 196, fig. 9–7, tab. 197, fig. 2, 3.

Remark: The association comprised some specimens of this evidently resedimented species. Depiction of the proximal disc (tab. IV, fig. 3) supports the statement of K. Perch-Nielsen (1971) about the disc being composed of two layers placed tightly on each other.

Stratigraphical range: Paleocene–Lower Eocene.

Toweius occultatus (Locker, 1967) Perch – Nielsen, 1971

Pl. XXVIII, Fig. 5

Coccolithus occultatus sp. n. – S. Locker: Neue, stratigraphisch wichtige Coccolithoriden etc., p. 764, tab. 1, fig. 5, tab. 2, fig. 9, 10.

1971 *Toweius occultatus* (Locker 1967) n. comb. – K. Perch-Nielsen: Elektronenmikroskopische Untersuchungen etc., p. 32, tab. 17, fig. 1, 2, 4, 7, tab. 18, fig. 6.

Remark: Isolated placoliths found in the association are well identifiable according to two circular pores in the central part of the disc.

Stratigraphical range: S. Locker presents autochthonous occurrences of the species from the Middle and Upper Eocene of N. Germany. He regards the occurrences in the Middle Oligocene as allochthonous. K. Perch-Nielsen (1971) recorded plentiful occurrences in the Lower and Middle Eocene of Denmark. The existing data show the necessity of revising the stratigraphical range of the species.

„*Ericsonia*” *fenestrata* (Deflandre et Fert, 1954) Stradner, 1968

Pl. XXVII, Fig. 3, 4

1954 *Discolithus fenestratus* Defl. et Fert, centr. nov. – G. Deflandre, Ch. Fert: Observations sur les Coccolithophorides etc., p. 19, tab. 11, fig. 25, text-fig. 18, 52.

1968 *Ericsonia fenestrata* (Deflandre et Fert) – H. Stradner, A. R. Edwards: Elektronmicroscopic studies etc., p. 18, tab. 10, fig. 1–4, tab. 11, fig. 1–7.

Remark: Generical ranging of the species is problematic. Ranging it to *Ericsonia* is not right because the genus is not valid. Microstructure of both discs is indicative of the genus *Coccolithus*, the ranging is, however, prevented by the presence of the central lamella. The central lamella is composed of trapezoid lamellae aligned tightly beside one another and every one provided with a large circular aperture in its centre. Microstructure of the central lamella differs from central grids of all types on Tertiary placoliths (*Reticulofenestra*, *Dictyococcites*, *Cribricentrum*).

Stratigraphical range: Middle Eocene–Oligocene.

Pontosphaeraceae Lemmermann, 1908

Pontosphaera Lohman, 1902

Type species: *Pontosphaera syracusana* Lohmann

Pontosphaera bicaveata (Perch-Nielsen, 1967) nov. comb.

Pl. XXIX, Fig. 1, 2

1967 *Discolithina bicaveata* n. sp. – K. Perch-Nielsen: Nannofossilien aus dem Eozän etc., p. 23, tab. 4, fig. 8.

Remark: Microstructure of specimens of the association studied is partly covered with secondary CaCO_3 . The position and size of central pores and their general form facilitate the species determination. Our specimens are identical with forms quoted from the Danish Eocene (K. Perch-Nielsen, 1971, tab. 27, fig. 7).

Basing on priority in synonymous apprehension of the genera *Pontosphaera* and *Discolithina*. I rerange the species to the genus *Pontosphaera*.

Stratigraphical range: Lower–Upper Eocene.

Pontosphaera multipora (Kamptner, 1948) Haq, 1971

Pl. XXIX, Fig. 3–6

1948 *Discolithus multiporus* n. sp. – E. Kamptner: Coccolithen aus dem Torton etc., p. 5, tab. 1, fig. 9.

1971 *Pontosphaera multipora* (Kamptner) n. comb. – B. Haq: Paleogene calcareous nannoflora I, p. 21, cum. syn.

Remark: The species is highly variable in shape and size of lopadolite, in form, size and distribution of pores. The lopadolite is low, its wall consisting of narrow diagonal lamellae. The lamellae extend to the proximal side to form there a slightly concave floor. On the periphery of the floor is a compact belt, and it is covered by pores in its central part. The pores are either tiny, slot-like, irregularly dispersed (*Pontosphaera vadosa* sine W. W. Hay, H. P. Mohler, M. E. Wade, 1966) or large, circular. They are either of equal size or diminishing toward the middle of the floor.

Stratigraphical range: Middle Eocene – Miocene.

Helicosphaera, Kamptner, 1954

Type species: *Helicosphaera carteri* Kamptner

Helicosphaera recta Haq, 1966

Pl. XXX, Fig. 1–3

1966 *Helicosphaera seminulum* Bramlette et Sullivan *recta*, n. subsp. – Electron microscope etc., p. 34, tab. 2, fig. 6, tab. 3, fig. 4.

- 1967 *Helicosphaera truncana* Bramlette et Wilcoxon, n. sp. – M. N. Bramlette–J. A. Wilcoxon: Middle Tertiary etc., p. 106, tab. 6, fig. 13, 14.
1969 *Helicopontosphaera recta* (Haq 1966) nov. comb. – E. Martini: Nannoplankton aus dem Latdorf etc., p. 136.

Remark: Our specimens agree in shape with forms presented by C. Müller (1970) from the Middle Oligocene of the Bavarian molasse. In contrast to typical forms from Syria they are shaped in a rounded triangle rather than oval. On our specimens the central bridge is built of 2 tiers of lamellae. It is perpendicular to longer walls of the lopadolite and divides the central aperture into two openings of different sizes.

Stratigraphical range: The upper part of the Middle Oligocene and Upper Oligocene.

Helicosphaera sp.

Pl. XXX, Fig. 5

Description: The only electronmicrograph obtained shows the proximal side of the species. The lopadolite is broad-oval. Its spiral-coiled margin is equally broad in both whorls, it is only slightly broadened before its termination. The lopadolite consists of narrow, radially oriented lamellae. A large central aperture is divided by a bridge of two rows of prisms directed to the short axis. The form is mostly resemblant to the species *H. seminulum* Bramlette et Sullivan among the species known. It only has a narrower margin, equal width of both whorls and a different length of lamellae forming its margin. On our specimen the lamellae are comparatively shorter and broader.

Lophodolithus Deflandre, 1954

Type species: *Lophodolithus mochloporus* Deflandre

Lophodolithus nascens Bramlette et Sullivan, 1961

Pl. XXXI, Fig. 1, 2

1961 *Lophodolithus nascens* Bramlette and Sullivan, new species. – M. N. Bramlette, F. R. Sullivan: Coccolithophorids and related nannoplankton etc., p. 145, tab. 4, fig. 7a–c, 8a–c.

Remark: Microstructure of the specimen on the species depicted is inconspicuous—with the exception of the central bridge whose distal side consists of short narrow lamellae.

Stratigraphical range: Eocene. In the association allochthonous.

Transversopontis Hay, Mohler et Wade, 1966

Type species: *Discolithus obliquipons* Deflandre

Transversopontis obliquipons (Deflandre, 1954) Hay,
Mohler et Wade, 1966

Pl. XXX, Fig. 4

1954 *Discolithus obliquipons* Defl., cent. nov. – G. Deflandre, Ch. Fert: Observations sur les Coccolithophorides etc., p. 139, tab. 11, fig. 1, 2, textfig. 53.

1964 *Discolithus pulcheroides* n. sp. – F. S. Sullivan: Lower Tertiary nanoplankton etc., p. 183, tab. 4, fig. 7a, b.

1966 *Transversopontis obliquipons* (Deflandre) – W. W. Hay, H. P. Mohler, A. M. Wade: Calcareous nannofossils etc., p. 391, tab. 2, fig. 5.

Remark: The specimens of the association studied show deep loop-shaped pores trimming the periphery of the lopadolite. Microstructure of the transverse bridge is indistinct but its oblique position is evident. In the association the species was scarce.

Stratigraphical range: Middle Eocene–Oligocene.

Zygodiscaceae Hay et Mohler, 1967

Neococcolithes Sujkowski, 1931

Type species; *Neococcolithes lososnensis* Sujkowski

Neococcolithes cf. nudus Perch–Nielsen, 1979

Pl. XXXI, Fig. 3

1971 *Neococcolithes nudus* n. sp. – K. Perch–Nielsen: Elektronenmikroskopische Untersuchungen etc., p. 48, tab. 42, fig. 5, 6, 9.

Remark: The first description and depictions of the species are not accurate enough, and therefore our specimens cannot be unambiguously identified as for species. Size, general shape and form of the central structure are the same. The marginal wall of our specimens consists of more lamellae.

Stratigraphical range: So far the species was only quoted from the type locality, from the Upper Eocene of Denmark.

Neochiastozygus Perch-Nielsen, 1971

Type species: *Neochiastozygus perfectus* Perch-Nielsen

Neochiastozygus chiastus (Bramlette et Sullivan, 1961) Perch-Nielsen, 1971

Pl. XXXI, Fig. 4

1961 *Zycolithus chiastus* Bramlette et Sullivan, new species – M. N. Bramlette, F. R. Sullivan: Cocolithoporidae and related etc., p. 149, tab. 6, fig. 1, 2, 3.

1971 *Neochiastozygus chiastus* (Bramlette et Sullivan 1961) n. comb. – K. Perch-Nielsen: Neue Cocolithen etc., p. 58, tab. 4, fig. 5, tab. 7, fig. 13–14.

Remark: The species is frequently regarded as synonymous with the species *N. concinnus* (Martini) Perch-Nielsen. K. Perch-Nielsen studied both species from the type locality and found the following differences: The species *N. chiastus* is usually smaller and the cross-lamellae of the central structure are situated, and the cross-lamellae of the central structure are situated vertically on one another, *N. concinnus* is larger and the cross-lamellae meet at an angle below 90°.

Stratigraphical range: Paleocene – Lower Eocene. The species is secondary in the association studied.

Isthmolithus Deflandre, 1954

Type species: *Isthmolithus recurvus* Deflandre

Isthmolithus recurvus, Deflandre 1954

Pl. XXXI, Fig. 5

1954 *Isthmolithus recurvus* Defl., spec. nov. – G. Deflandre, Ch. Fert: Observations sur les Cocolithophoridés etc., p. 169, tab. 12, fig. 9–13, text-fig. 119–122.

Remark: The association comprised some specimens of the species. The degree of their preservation is different. Some display traces of recrystallization and others a well preserved microstructure.

Stratigraphical range: The species is regarded as an index fossil of the Uppermost Eocene and Lower Oligocene. The finds do not exclude possible occasional primary occurrences in the Middle Oligocene.

Sphenolithaceae Deflandre, 1951

Sphenolithus Deflandre, 1952

Type species: *Sphenolithus radians* Deflandre

Sphenolithus moriformis (Bronnimann et Stradner, 1960)
Bramlette et Wilcoxon, 1967

Pl. XXXI, Fig. 6

- 1960 *Nannoturbella moriformis* n. sp. – P. Brönnimann, H. Stradner: Die Foraminiferen und Discoasteridenzonen etc., p. 368, fig. 11–16.
1967 *Sphenolithus moriformis* (Brönnimann et Stradner) Bramlette et Wilcoxon, n. comb. – M. N. Bramlette, J. A. Wilcoxon: Middle Tertiary calcareous nannoplankton etc., p. 124, tab. 3, fig. 1–6.

Remark: The species is identifiable easily according to its low-conical shape. Its low basal disc consists of 9–10 trapezoid lamellae arranged radially. The rounded apical end consists of irregularly arranged lamellae and not of granules so frequent with the species.

Stratigraphical range: Eocene-Miocene.

Calyptroshaeraceae Boudreaux et Hay, 1969
Orthozygus Bramlette et Wilcoxon, 1967

Type species: *Zycolithus aureus* Stradner

Orthozygus aureus (Stradner, 1962) Bramlette et Wilcoxon, 1967

Pl. XXVII, Fig. 6

- 1960 *Zycolithus aureus* nov. spec. – H. Stradner: Über neue und wenig bekannte Nannofossilien etc., p. 368, tab. 1, fig. 31–36.
1967 *Orthozygus aureus* (Stradner) Bramlette et Wilcoxon, n. comb. – M. N. Bramlette, J. A. Wilcoxon: Middle Tertiary calcareous nannoplankton etc., p. 116, tab. 9, fig. 1–4.
1968 *Zygosphaera aurea* (Stradner) nov. comb. – H. Stradner, A. R. Edwards: Electron Microscopic studies etc., p. 46, tab. 44, fig. 6.

Remark: Scarce occurrences of small damaged specimens of the species in the association are most probably allochthonous.

Stratigraphical range: Upper Eocene – Lower Oligocene.

Trochoaster Klumpp, 1953

Type species: *Trochoaster simplex* Klumpp

Trochoaster simplex Klumpp, 1953

Pl. XXXII, Fig. 2

- 1953 *Trochoaster simplex* n. sp. – B. Klumpp: Beitrag zur Kenntniss etc., p. 385, fig. 4, tab. 16, fig. 7.

- 1972 *Trochoaster simplex* Klumpp, 1953 – R. W. Sherwood, H. L. Levin: A closer look etc., p. 591, fig. 1a–c.
1975 *Lithostromation simplex* (Klumpp) 1953 n. comb. – L. M. Bybell: Middle Eocene calcareous nannofossils etc., p. 204, tab. 19, fig. 2.

Remark: A detail description of the species based on examination under optical microscope presented H. Stradner (1961). R. W. Sherwood and H. L. Levin gave a more precise description resulting from the study by scanning-electron microscope, and pointed out to its biconvex structure. There is only one electronmicrograph of the association, displaying most of its diagnostic characters.

Stratigraphical range: Lower Eocene – Middle Miocene?

Discoasteraceae Tan Sin Hok, 1927

Discoaster Tan Sin Hok, 1927

Type species: *Discoaster pentaradiatus* Tan Sin Hok

Discoaster barbadiensis Tan Sin Hok, 1927

Pl. XXXII, Fig. 3

- 1927 *Discoaster Barbadiensis* nov. spec. typ. – Tan Sin Hok: Over de samenstelling etc., p. 119, tab. 2, fig. 4.

Remark: In the association were only scarce asteroliths of the species, mostly damaged.

Stratigraphical range: Uppermost Paleocene – Upper Eocene.

Discoaster deflandrei Bramlette et Riedel, 1954

Pl. XXXII, Fig. 4

- 1954 *Discoaster deflandrei* Bramlette and Riedel, n. sp. – M. N. Bramlette, W. R. Riedel: Stratigraphic value of discoaster etc., p. 399, tab. 39, fig. 6, text fig. 1.

Remark: The species was infrequent in the association.
Most asteroliths are covered by secondary CaCO_3 .

Stratigraphical range of the species is indicative of its primary occurrence in the association studied. Specimens with secondary CaCO_3 prove that the manner of preservation of discoasters is not unambiguously indicative of their primary or secondary occurrence.

Stratigraphical range: Upper part of Lower Eocene – Lower Miocene.

Discoaster saipanensis Bramlette et Riedel, 1954

Pl. XXXII, Fig. 5

1954 *Discoaster saipanensis* Bramlette and Riedel, n. sp. – M. N. Bramlette, W. R. Riedel: Stratigraphic value of discoasters etc., p. 398, tab. 39, fig. 4.

Remark: In the association were some well preserved asteroliths of the species with 7–8 rays. In spite of a thin coat of secondary CaCO_3 the microstructure was well visible, particularly keel-shaped elevations extending along the distal sides of rays, the low central umbilicus and transversal lamellae on the proximal side, with variably long stem in the middle of asterolith.

Stratigraphical range: Upper part of Middle Eocene–Upper Eocene. In the association studied the forms were allochthonous.

Discoaster tani Bramlette et Riedel, 1954

Pl. XXXII, Fig. 6

1954 *Discoaster tani* Bramlette and Riedel, n. sp. – M. N. Bramlette, W. R. Riedel: Stratigraphic value of discoasters etc., p. 397, tab. 39, fig. 1.

Remark: Scarce asteroliths of the species found in the association were mostly considerably damaged and recrystallized which resulted in thickening and shortening of rays. All asteroliths have a large, flat polygonal central umbilicus oriented so that its edge is pointing toward the margin of ray and not symmetrically between two adjoining rays.

Stratigraphical range: Middle Eocene – Middle Oligocene.

INCERTAE SEDIS

Nannotetrina Achuthan et Stradner, 1969

Type species: *Nannotetraster fulgens* Stradner

Nannotetrina spinosa (Stradner, 1960) Achuthan et Stradner, 1969

Pl. XXX, Fig. 6

1960 *Nannotetraster spinosus* n. sp. – E. Martini, H. Stradner: *Nannotetraster*, eine stratigraphisch bedeutsame etc., p. 269, fig. 17a–c.

1969 *Nannotetrina* nom. nov. subst. pro *Nannotetraster* sensu restr. – M. V. Achuthan, H. Stradner: *Calcareous nannoplankton* etc., p. 7.

Remark: Scarce specimens of the species are resedimented in the association. The form depicted shows clearly that the basal lamella shaped as a rounded rectangle

consists of four sectors. On the periphery they run out into a thick short spine. On the basal lamella is a massive cruciform structure composed of two rectangularly situated lamellae. They are oriented toward the margins of sectors at the right of marginal spines.

Stratigraphical range: Middle Eocene.

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Hedviga Bystrická

Strednooligocénny vápnitý nanoplanktón Banskobystrickej kotliny

Resumé anglického textu

V Banskobystrickej kotline, východne od obce Kordíky, bol z vrtného materiálu získaný bohatý vrchnorupelský vápnitý nanoplanktón. Na základe prítomnosti druhov *Reticulofenestra abisecta* (Müll.) Roth a *Helicosphaera recta* Haq, bolo spoločenstvo zaradené do zóny NP 24–*Sphenolithus distentus* (E. Martini 1971). Spoločenstvo zložením autochtónnych druhov i množstvom a kvalitou alochtónnej zložky je veľmi podobné nanoflóre zistenej vo vrchnorupelskej bavorskej spodnej morskej molase C. Müller (1970). Dôkaz, že v Banskobystrickej kotline sa nachádzajú aj sedimenty rupelského veku, prispeje k riešeniu sporných otázok o sedimentačných pomeroch v tejto kotline (E. Planderová, M. Pulec, O. Samuel, M. Vaňová 1963, O. Samuel 1975, I. Čícha 1960, B. Pacltová 1966).

V systematickej časti je uvedený stručný opis zistených druhov a urobená nová kombinácia u druhov *Reticulofenestra ornata* Müller) *Dictyococcites ornatus* (Müller) nov. comb. a *Discolithina bicaveata* Perch-Nielsen *Pontosphaera bicaveata* (Perch-Nielsen) nov. comb.

Explanations to plates XXIII – XXXII

PL. XXIII

- Fig. 1 *Coccolithus copelagicus* (Bramlette et Riedel) Bramlette et Sullivan. – Distal view, x 4500.
- Fig. 2 *Coccolithus pelagicus* (Walich) Schiller – Proximal view of a form with central cruciform structure, x 5000.
- Fig. 3 *Cyclococcolithus formosus* Kamptner. – Proximal view, x 4500.
- Fig. 4, 5 *Coccolithus rupeliensis* Müller. – Distal view, x 4500, x 5000.
- Fig. 6 *Chiasmolithus altus* Bukry et Percival. Distal view, x 3500.

Pl. XXIV

- Fig. 1 *Chiasmolithus cf. solitus* (Bramlette et Sullivan) Hay, Mohler et Wade. Distal view, x 4500.
- Fig. 2, 4 *Chiasmolithus cf. titus* Gartner. – Fig. 2 – distal view, x 4250, fig. 4, proximal view, x 4350.
- Fig. 3 *Cruciplacolithus delus* (Bramlette et Sullivan) Perch-Nielsen. – Distal view, x 5000.
- Fig. 5, 6 *Cyclicargolithus floridanus* (Roth et Hay) Bukry. – Proximal view, x 5000.
- Fig. 6 Distal view, x 5000.

Pl. XXV

- Fig. 1 *Cyclococcolithus formosus* Kamptner. – Distal view x 3500.

- Fig. 2 *Reticulofenestra abisecta* (Müller) Roth. – Distal view, x 3500.
 Fig. 3,4 *Dictyococcites bisectus* (Hay, Mohler et Wade) Bukry et Percival. Fig. 3, distal view x 3500, Fig. 4 Proximal view, x 4000.
 Fig. 5 *Dictyococcites ornatus* (Müller) n. comb. – Distal view, x 5000.
 Fig. 6 *Reticulofenestra lockeri* Müller. – Proximal view, x 5000.

Pl. XXVI

- Fig. 1,2,3 *Dictyococcites daviesi* (Haq) Perch-Nielsen. Fig. 1,2, Distal view, x 4500, x 5000, Fig. 3 proximal view, x 5000.
 Fig. 4,5,6 *Reticulofenestra lockeri* Müller – Fig. 4,5 distal view, magn. x 4500, x 5000, Fig. 6 proximal view, magn. x 6000.

- Fig. 1,2 *Criboecentrum reticulum* (Gartner et Smith) Perch-Nielsen. – Fig. 1 – proximal view, x 5000, Fig. distal view, x 6000.
 Fig. 3,4 „*Ericsonia*” *fenestrata* (Deflandre et Fert) Stradner. Distal view, x 5000.
 Fig. 5 *Reticulofenestra clatrata* Müller. – Proximal view x 5000.
 Fig. 6 *Orthozygus aureus* (Stradner) Bramlette et Wilcoxon. – Distal view, x 5000.

Pl. XXVIII

- Fig. 1 *Reticulofenestra umbilica* (Levin) Martini et Ritzkowski. – Distal view, x 2500.
 Fig. 2 Coccosphere of undetermined species
 Fig. 3,4 *Toweius craticulus* Hay et Mohler. – Fig. 3 – distal view, x 5000, Fig. 4 – proximal view, x 7000.
 Fig. 5 *Toweius occultatus* (Locker) Perch-Nielsen. – Distal view, x 5000.
 Fig. 6 *Toweius callosus* Perch-Nielsen. – Distal view, x 5000.

Pl. XXIX

- Fig. 1,2 *Pontosphaera bicaveata* (Perch-Nielsen) n. comb. – Fig. 1, proximal view, magn. x 5000; Fig. 2 – distal view, magn. 4500 x.
 Fig. 3,6 *Pontosphaera multipora* (Kamptner) Haq – Fig. 3 distal view, magn. 5000 x, 6000 x, Fig. 4,5 proximal view, magn. 6000 x, 5000 x.

Pl. XXX

- Fig. 1–3 *Helicosphaera recta* Haq. – Fig. 1 distal side, magn. 5000 x, fig. 2,3 proximal view, magn. 5000 x.
 Fig. 4 *Transversopontis obliquipons* (Deflandre) Hay, Mohler et Wade. – Distal view, x 4500.
 Fig. 5 *Helicosphaera* sp. – Proximal view, x 5000.
 Fig. 6 *Nannotetrina spinosa* (Stradner) Achuthan et Stradner – x 4000.

Pl. XXXI

- Fig. 1,2 *Lophodolichus nascens* Bramlette et Sullivan. – Fig. 1 proximal view, x 5000, Fig. 2 distal view, x 4500.
 Fig. 3 *Neococcolithites cf. nudus* Perch-Nielsen. – Distal view, x 7000.
 Fig. 4 *Neochiastozygus* Perch-Nielsen (Bramlette et Sullivan). – Proximal view, x 9000.
 Fig. 5 *Isthmolithus recurvus* Deflandre – x 5000.
 Fig. 6 *Sphenolithus moriformis* (Brönnimann et Strandner) Bramlette et Wilcoxon. – x 8000.

Pl. XXXII

- Fig. 1 *Discoaster wemmelensis* Achuthan et Stradner – x 7000.

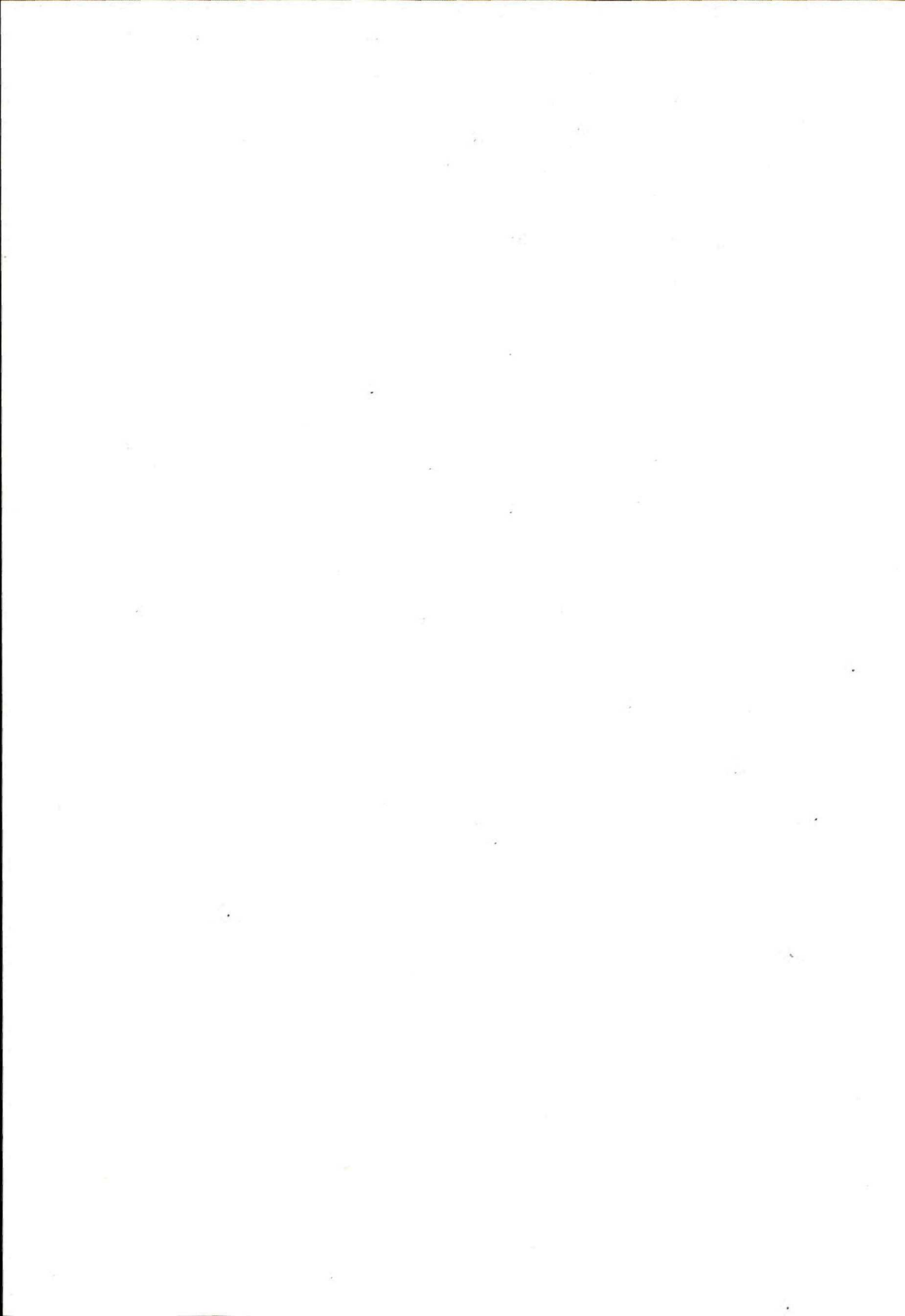
- Fig. 2 *Trochoaster simplex* Klumpp. – x 3000.
Fig. 3 *Discoaster barbadiensis* Tan Sin Hok. – x 4500.
Fig. 4 *Discoaster deflandrei* Bramlette et Riedel. – x 3500.
Fig. 5 *Discoaster saipanensis* Bramlette et Riedel. – x 4500.
Fig. 6 *Discoaster tani* Bramlette et Riedel. – x 5000.

Photographs are made by scanning-electron microscope JSM U₃ in Dionýz Štúr Institute of Geology in Bratislava.

Photographed by K. Šebor, M. Švec.

Reviewed: R. Lehotayová.

Translated: E. Jassingerová.



Viliam Sitár – Ivan Dianiška

Flóra v mladoterciérnych vulkanitoch od Vyšného a Nižného Skálnika

1 obr. v texte, 6 fotogr. tab. (XXXIII – XXXVIII), anglické resumé

Pri geologickom mapovaní mladoterciérnych vulkanitov severne od Rimavskej Soboty, v úseku Vyšný Skálnik – Vyšná Pokoradz, bola v roku 1971 jedným z autorov vyzbieraná flóra lokalizovaná na bazálnu časť tohto vulkanického komplexu. Vzhľadom k tomu, že otázka jeho stratigrafického začlenenia nebola dosiaľ s určitou doriešená, štúdium flóry sa robilo práve v snahe pomôcť riešeniu tejto otázky.

Vulkanický komplex v predmetnej oblasti, o celkovej hrúbke 150–200 m, pozostáva z vulkanoklastických hornín s nehojnou prímесou nevulkanického materiálu. Výnimku tvorí len menšia dajka pyroxenického andezitu pri Vyšnej Pokoradzi. Podľa I. Vargu (1973) a v zhode s výsledkami geologického mapovania jedného z autorov (I. Dianiška) je možné vulkanický komplex rozdeliť na 5 základných litologických horizontov (O. Fusán in O. Fusán et al. 1962 rozčlenil komplex na 3 litologické horizonty):

α^1 – Niekoľko desiat m hrubý horizont jemnozrnných tufitov až tufitických (piesčitých) ílovcov, tvoriaci bazálnu časť vulkanického komplexu. Charakteristické pre tento horizont sú i polohy vulkanomiktných zlepcov (cm – dm hrúbky), prípadne droboštrkovité polohy s dobre zaoblenými valúnmi kremeňa, veľkosti do 2 cm. Na tento horizont je lokalizovaná aj vyzbieraná flóra.

α^2 – Horizont drobozrnných vulkanomiktných zlepcov s polohami andezitových zlepcov, v striedaní s piesčitými tufitmi. Hrúbka horizontu je do 30 m.

α^3 – Horizont strednozrnných andezitových zlepcov s polohami hrubozrnných andezitových zlepcov. Fragmenty dosahujú veľkosť prevažne 20 – 30 cm. Tento horizont (menej nasledujúci – α^4) obsahuje pestrú paletu fragmentov cudzorodého materiálu (granitoidy, aplity, serpentinity, svory, porfyroidy, ílovité bridlice atď.). Ich hrúbka je do 50 m.

α^4 – Horizont hrubozrnných andezitových zlepcov buduje podstatnú časť

študovaného územia. Jeho hrúbka dosahuje až 100 m. Veľkosť fragmentov je v priemere nad 0,5 m.

α^5 – Horizont chaotických andezitových brekcií tvorí najvyššie časti územia, budovaného vulkanickým komplexom. Veľkosť ostrohranných fragmentov kolíše od 0,5 do 100 cm, ojedinele i viac. Hrúbka horizontu je do 20 m.

Litológia, charakter zvrstvenia (šošovkovité, gradačné, krížové, ronové) a nedokonale vytriesnenie a opracovanie materiálu poukazujú na fluviálno-limnické podmienky uloženia prvých dvoch horizontov (α^1 a α^2). Celkové hrubnutie materiálu a menší stupeň vytriesnenia a opracovania vo vyšších horizontoch (α^3 a α^4) indikujú jednak zväčšovanie zdrojovej oblasti (vulkanického kužeľa) a jednak uplatnenie sa procesov masového transportu (občasné toky). Samostatné polohy chaotických brekcií (α^5) reprezentujú zrejme uloženiny lahárov.

Vulkanický komplex svojím vývinom reprezentuje externú zónu vulkanického aparátu mimo vlastného vulkanického kužeľa. Vulkanické centrum možno predpokladať v širšom okolí Fabovej hole, kde boli zistené početné subvulkanické intruzívne telesá, dajky a neky (D. Kubíny 1957).

O. Fusán (l. c.) priradzuje uvedený vulkanický komplex k II. andezitovej fáze, považovanej za vrchnobádenskú až spodnosarmatskú.

Lokalizácia a opis výskytov flóry

Flóru sme študovali z dvoch prirodzených odkryvov, vzdialených od seba asi 950 m. (obr. 1).

Lokalita Vyšný Skálnik (A) je situovaná asi 550 m východne od okraja obce, 330 m jz. od k. 386,8, na hranici pasienku a lesa, zvýraznenej stenovým východom vrstiev bazálneho horizontu (α^1), rozmerov 15 x 6 m. Litologický profil v tomto odkryve je nasledovný:

Na báze je poloha svetlobéžových, dobre vrstevnatých jemnopiesčitých tufitov, husto priečne dopukaných. Hrúbka do 1 m. Na ňu nasadá 1,5 – 2,0 m hrubá poloha hnedých, ľahko rozpadavých tufitových pieskovcov s ojedinelými 1 – 4 cm hrubými polohami vulkanomiktného zlepenca.

Vyššie je 0,6 m hrubá poloha toho istého charakteru ako bazálna s 5–6 cm hrubou polohou pelitického tufitu (filovca?) s dobre zachovanými odtlačkami flóry.

Najvyššie je poloha sivofialového piesčitého tufitu s vrstvičkami okrovohnedého tufitického vulkanomiktného zlepenca, s veľkosťou fragmentov do 3–4 cm. Hrúbka polohy je 2–3 m. Úklon súvrstvia je 10–15 ° k V–SV.

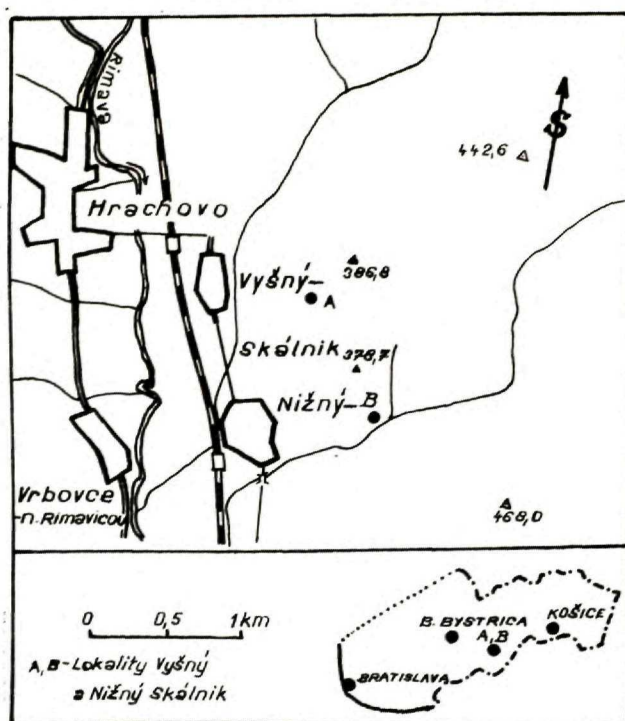
Lokalita Nižný Skálnik (B) sa nachádza asi 900 m východne od obce, 400 m jjv. od k. 378,7.

V mohutnom odkryve, asi 30x50 m, sa striedajú polohy veľmi ľahko rozpadavých hnedozelenkastých tufitických pieskovcov s polohami svetlobéžových tenkovrstev-

natých piesčitých ílovcov. Hrúbka jednotlivých polôh kôliše v rozmedzí 0,1–0,9 m. Úklon vrstiev je 10° k VSV. Na vrstevných plochách piesčitých ílovcov sú odtlačky pomerne slabó zachovanej flóry.

V nadloží sú prítomné sivofialové, dobre spevnené, avšak silne rozpukané tufitické ílovce v striedaní s polohami rozpadavého fialkastého piesčitého tufitu.

Súvrstvie patrí bazálnemu litologickému horizontu (α^1).



Obr. 1

Zhodnotenie flóry

Fosilná flóra z vyššie uvedených lokalít je známa už z práce F. Němejca (1960). Opisuje odtlačky rastlín z tufitických lupkov, ktoré vychádzajú na povrch pri vyústení doliny v. od Nižného Skálnika (naša lokalita B). Uvádza 19 druhov, z ktorých prevládajú hlavne druhy rodov *Fagus*, *Zelkova* a *Juglandaceae*. Na základe celkového rázu flóry usudzuje, že sedimenty sú pomerne mladé – sarmatské a nevylučuje ani spodný pliocén.

Náš materiál je obohatený o zber odtlačkov z lokality Vyšný Skálnik, ktorý je bohatší čo do počtu foriem. Na odkryve Nižný Skálnik boli nájdené dobre zachované odtlačky, ale v menšom množstve. Aj materiál po petrografickej stránke je odlišný.

Odtlačky získané z oboch lokalít uvádzame spolu, nakoľko celkový ráz spoločenstva je rovnaký. Boli určené nasledujúce druhy:

Equisetopsida

Equisetum parlatorii (Heer) Schimper

Tab. XXXIII, obr. 1

Odtlačky ružencovito-hľuzkovitých koreňov prasličiek (*Equisetum*). Na jednom odtlačku vidieť uzol (nodus), z ktorého vyrastajú hľuzky elipsovitého tvaru dlhé 1 cm, široké 8 mm. Smerom od uzla sa zmenšujú. Stonka je ryhovaná. Hľuzky majú tiež jemné ryhy.

Equisetum parlatorii je v Európe známe hlavne z vrchého miocénu a z pliocénu. Rizomy fosilizujú obyčajne na mieste rastu, môžeme preto predpokladať, že miesto, kde tieto odtlačky nachádzame, bolo pobrežnou oblasťou. Nález: Nižný Skálnik.

Monocotyledoneae

Smilax sp.

Neúplný odtlačok, na ktorom vidieť bazálnu časť so stopkou a tri bazálne žilky. List bol celokrajný, podobá sa dnešnému druhu *Smilax oldhami* Miq., ktorý je domáci v severnej časti východnej Ázie. Podobný odtlačok uvádza G. Andreánszky (1959) od Balatónu. Nález: Nižný Skálnik.

Poacites sp.

Odtlačky rôznych trávovitých listov do 1 cm široké s mnohými buď rovnako silnými, alebo rozdielnymi rovnobežnými žilkami. Sú to močiarné formy tráv. Nález: Vyšný Skálnik.

Dicotyledoneae

Cercidiphyllum crenatum (Unger) Brown

Tab. XXXIII, obr. 4

Okrúhly, pri báze srdcovito vykrojený list. Okraj má tupo pilkovitý. Zo stopky vybieha deväť bazálnych žiliek, z ktorých prostredná sa končí v hrote listu. Ostatné sú oblúkovité, pri okraji sa rozvetvujú a navzájom spájajú. Treťoradé žilky vytvárajú polygonálnu sieť.

Cercidiphyllum crenatum je teplomilný prvok a v sarmatskej flóre sa častejšie vyskytuje južne od nášho územia. Na Slovensku je zámy z oblasti južného Slovenska, kde sa hojne nachádza na lokalite Bory. Nález: Nižný Skálnik.

Juglans acuminata Al. Braun

Tab. XXXV, obr. 4

Neúplný odtlačok listu s priamou hlavnou žilkou a oblúkovitými druhotnými žilkami, ktoré sa pri okraji navzájom spájajú. Okraj je celokrajný.

J. acuminata je známy už od kriedy a v trefohorách bol v Európe veľmi rozšírený.
Nález: Vyšný Skálnik.

Carya denticulata (Weber) Iljinskaja

Tab. XXXV, obr. 1,3

Odlahky neúplných listov. Majú typický ostro pílkovitý okraj s nepravidelnými zubami. Hlavná žila je priama a výrazná. Druhotné žily sú jemné, mierne oblúkovité; pri okraji sa vidličnate vetvia a končia v zúbkoch.

Z dnešných druhov sú im najviac podobné severoamerické druhy *Carya olivaeformis* Nutt., alebo *C. amara* Nutt. Sú to stromy s opadavými listami, ktoré rastú v strednovlhkých podmienkach spolu s druhmi rodu *Acer*, *Fraxinus* a *Ulmus*.

Hoci sa vo vrchnom miocene táto forma vyskytuje vo flórach strednej Európy často, nálezy sú pomerne vzácne. Na študovanom území ich je pomerne dosť. Nález: Vyšný a Nižný Skálnik.

Pterocarya castaneifolia (Goeppert) Schlechtendal

Tab. XXXIV, obr. 4

Podlhovasté listy na báze šikmo kýlovité s úzko vytiahnutým hrotom. Sú asymetrické s pílkovitým okrajom. Zúbky sú jemné. Hlavná žila, ohnutá podľa tvaru listu, je pri báze výrazná a smerom k špičke sa zjemňuje. Druhotné žilky sú jemné, pri okraji oblúkovite ohnuté a vzájomne pospájané. Treforadé žilky vytvárajú jemnú polygonálnu sieť.

Z dnešných pterokárií sa najviac podobá druhu *Pterocarya fraxinifolia* (Lam.) Spach, ktorý je rozšírený vo východnej Ázii.

Z Moravy uvádza E. Knobloch (1969) pterokárie pod názvom *Pterocarya paradisiaca* (Ung.) Ilj. Tieto sú podobné kaukazskému druhu *P. pterocarpa* (Michx.) Kunth, no od odtlačku, ktorý uvádzame na tab. XXXV sa líši veľkosťou. *P. pterocarpa* má širšie a väčšie listy ako *P. castaneifolia*, a teda aj ako *P. fraxinifolia*.

Druh *P. castaneifolia* (Goepp.) Schlecht. sa vyskytuje viac vo forme plodov ako listov. Na študovanom území plody neboli nájdené. Nález: Vyšný Skálnik.

Alnus crebrinervis É. Kovács

Tab. XXXIII, obr. 3

Neúplné odtlačky listov, ktoré priebehom žilnatiny pripomínajú rod *Alnus* a najviac druh *Alnus crebrinervis* É. Kovács (1957). Hlavná žila je výrazná, z ktorej vybiehajú pod uhlom asi 50° druhotné žily a mierne sa oblúkovite zahýbajú smerom ku hrotu. Asi 1,5 cm od okraja sa niekoľkokrát vidličnate vetvia a končia v zúbkoch. Treforadé žilky vytvárajú typickú sieť medzi druhoradými žilkami. Tvar listu je podlhovastý.

Táto forma je zatiaľ známa z neogénnych sedimentov Maďarska a Zakarpatskej oblasti ZSSR (Iljinskaja 1968). Nález: Nižný Skálnik.

Alnus sp.

Pod týmto názvom sú uvedené odtlačky šištíciiek, ktoré patria rodu *Alnus*. Sú dlhé 1,5–2,5 cm a široké 1 cm. O tom, že patria k rodu *Alnus* niet pochyb, no je otázne, k akému druhu. Nález: Vyšný Skálnik.

Carpinus grandis Unger

Tab. XXXVI, obr. 3

Odtlačky typické pre rod *Carpinus* s priamou hlavnou žilkou; z nej pod ostrým uhlom vychádzajú druhoradé žilky a končia sa v dvojito zúbkatom okraji. Niektoré druhoradé žilky sa pri okraji vidličnato vetvia a končia sa v menších zúbkoch. Na báze sú mierne zúžené a zahrotené. Stopka je asi 1 cm dlhá.

Táto forma sa vyskytuje v našich mladotretihorných sedimentoch veľmi často. Na študovanom území bol nájdený len jeden úplný odtlačok. Nález: Nižný Skálnik.

Carpinus kisseri Berger

Malá plodová čiaška (neúplná) je kosákovitá, nesúmerná. Zo stopky vybieha vejárovite päť žiliek. Podobné odtlačky sú známe z Močiara (V. Sitár 1973), no tie sú podstatne väčšie. Nález: Vyšný Skálnik.

Betula prisca Ettingshausen

Nejasný odtlačok eliptického listu, ktorého hlavná žila je mierne ohnutá, druhotné žily v počte osem vybiehajú priamo k okraju, ktorý je dvojito pílkovitý.

Aj táto forma brezy je častá vo vrchnom neogéne, hlavne na strednom Slovensku (Turčianska kotlina, Močiar). Nález: Nižný Skálnik.

Betula macrophylla (Goeppert) Heer

Tab. XXXV, obr. 2

Dobre zachovaný neúplný odtlačok listu, ktorý tvarom a priebehom žilnatiny pripomína Heerov druh *Betula macrophylla*. Šírka listu je asi 7 cm, dĺžka 10–11 cm. Hlavná žila je priama, druhotné žilky sú mierne ohnuté, striedavé. Asi 1 cm od

okraja vybiehajú zo spodnej strany jemnejšie žilky, ktoré sa končia v menších zúbkoch. Z dnešných briez majú podobné listy severoamerické druhy *Betula lenta* L. a *B. papyrifera* March.

Táto forma sa vyskytuje od spodného miocénu. V mladších trefohorách je častejšia. Nález: Nižný Skálnik.

Fagus herthae (Unger) Iljinskaja

Tab. XXXVI, obr. 4

Najviac zastúpená forma odtlačkov, hlavne na lokalite Nižný Skálnik (11 exemplárov). Listy sú podlhovasté, štíhle, na báze klinovité alebo jemne zaokrúhlené. Hrot je zúžený. Hlavná žila je priama alebo mierne ohnutá, u niektorých exemplárov je viac výrazná. Druhoradé žilky sú priame, k okraju sa mierne rozširujú a končia sa v zúbkoch. Väčšinou sú jemne zúbkované.

Odtlačky bukových listov z nášho sarmatu sú veľmi podobné dnešnému severoamerickému buku *Fagus ferruginea* Ait (pozri V. Sitár 1973). Túto formu možno považovať za vrchnomiocénny prvok u nás. Svedčia o tom mnohé nálezy v maďarskom sarmate, na strednom Slovensku, na Morave (E. Knobloch 1969) a i. Nález: Vyšný a Nižný Skálnik.

Castanea atavia Unger

Tab. XXXV, obr. 12

Odtlačky z lokality Vyšný Skálnik nie sú úplné, ale aj tak niet pochyb, že ide o túto formu. Majú typický štetinkato-pílkovitý okraj. Hlavná žila je výrazná, priama alebo len mierne ohnutá. Druhotné žilky vybiehajú pod 50–60° uhlom. Končia sa v zúbkoch.

Druh *C. atavia* Ung. je známy v strednej Európe od akvitánu až po pliocén. Na lokalitách stredného Slovenska (Močiar, Jastrabá, Turčianska Kotlina, Čaradice) sa vyskytujú jeho odtlačky omnoho častejšie. Nález: Vyšný Skálnik.

Castanea sp.

Tab. XXXVII, obr. 3

Odtlačok plodu gaštanu, takmer okrúhly, o priemere 2 cm. Ide pravdepodobne o jadro plodu. Nálezy plodov gaštanov vo fosílnom stave sú zriedkavé. Nález: Nižný Skálnik.

Ulmus longifolia Unger

Tab. XXXIII, obr. 2

Dva odtlačky, ktoré sú k dispozícii, sú úzke a tenko zahrotené. Na jednom odtlačku je zachovaná aj báza, ktorá je typická pre rod *Ulmus* – je asymetrická. Najširšie sú

asi v strede 2,4 cm, dlhé sú 7,5 cm. Okraj je dvojito zúbkovaný. Hlavná žila je priama, druhoradé žilky, takmer rovnobežné, končia buď jednotlivo v zúbkoch, alebo sa vidličnato vetvia. S hlavnou žilou zvierajú uhol 35–40°.

Z dnešných druhov je veľmi podobný ázijský druh *Ulmus castaneifolia* Hemsl. *U. longifolia* Ung. môže byť prvkom rovinatých pobrežných lesov. V treťohorách bol v Európe rozšírený hlavne v miocéne. Nález: Nižný a Vyšný Skálnik.

Zelkova zelkovaefolia (Unger) Bužek et Kotlaba

Tab. XXXIV, obr. 3, Tab. XXXVII, obr. 4

Miocénnu flóru strednej Európy si bez tohto prvku nemôžeme ani predstaviť. Sú to typické odtlačky podlhovasto-vajcovitých, na báze mierne zaokrúhlených, často asymetrických listov. Hrot je málo vytiahnutý. Okraj je ostro pilkovitý. Veľkosť varíruje, v priemere sú dlhé 4–6 cm, široké 2,5–3 cm. Hlavná žila je priama, pri hrote je často ohnutá. Druhoreadé žilky sú takmer rovnobežné, v zúbkoch sú smerom k hrotu ohnuté. Popri *Fagus herthae* (Ung.) Ilj. je to najčastejší prvok na študovanom území.

Dnešný porovnávajuci druh *Zelkova carpinofolia* (Pall.) K. Koch je prvkom vlhkejších (lužných) lesov spolu s *Ulmus*, *Carpinus*, *Alnus* a i. *Zelkova zelkovaefolia* (Ung.) Bužek et Kotl. je známa už od oligocénu a u nás sa uvádza ešte aj z pliocénu (Spišské Podhradie). Najčastejšia je vo vrchnom miocéne. Nález: Nižný a Vyšný Skálnik.

Zelkova praelonga (Unger) Berger

Tab. XXXIV, obr. 1

Úzke a dlhé odtlačky listov so zúženou bázou. Pomer dĺžky k šírke je asi 4 : 1. Tvarom zúbkov a priebehom žilnatiny sa od predchádzajúcej formy nelíšia. Sú iba užšie a dlhšie a na báze klinovité.

Dnešným porovnávacím druhom je *Z. serrata* (Thbg.) Mak., ktorá v Japonsku rastie na suchších stanovištiach ako západoázijský druh *Z. carpinofolia* (Pall.) K. Koch. Nález: Nižný a Vyšný Skálnik.

Platanus platanifolia (Ettinghausen) Knobloch

Odtlačok vrchnej časti stredného laloku prináleží k rodu *Platanus*. Vidieť na ňom priamu bazálnu žilu, z ktorej vybiehajú druhotné žilky, oblúkovite lomené a pri okraji vidličnate vetvené. Nález: Nižný Skálnik.

Salix tenera Al. Braun

Tab. XXXIV, obr. 2

Takmer úplný odtlačok podlhovastého celokrajného listu, klinovite zúženého pri báze aj pri hrote (chýba). Hlavná žila je priama, výrazná. Druhoradé žilky sú veľmi jemné, vybiehajú pod ostrým uhlom, oblúkovite sa ohýbajú a navzájom spájajú. Podobné odtlačky uvádza E. Knobloch (1969) z lokality Moravská Nová Ves z panónu pod názvom *Salix moravica* Knobloch. Celokrajné odtlačky vrbovitéch listov sú známe z viacerých lokalít strednej Európy (pozri V. Sitár 1973). Nález: Vyšný Skálnik.

Populus populina (Brongniart) Knobloch

Tab. XXXVIII, obr. 2

Odtlačok takmer úplného listu. Okraj je zubkovaný. Hlavná žila je priama, k vrcholu veľmi stenčená. Bazálne žily vybiehajú od stopky a s hlavnou žilou zvierajú uhol 30–35°. Končia sa asi v polovici listu v zúbkoch. Z vonkajšej strany vyrastá z nich 4–6 druhoradých žiliek. Ostatné druhoradé žilky vyrastajú z hlavnej žily striedavo. Aj tie sa viackrát vetvia zo spodnej strany.

V trefohorách je táto forma rodu *Populus* častá. Dnešný porovnávaci severoamerický druh *Populus canadensis* Michx. rastie na brehoch riek v mierne teplých podmienkach. Nález: Nižný Skálnik.

Rosa sp.

Pod týmto názvom uvádzame odtlačok troch neúplných perovito zložených listov. Lístky sú pílkovité, pri báze klinovité, smerom k hrotu sa rozširujú. Najširšie sú asi v prvej tretine. Hlavná žila je priama, druhoradé žilky sú jemné, mierne ohnuté (kamptodrózne), končia sa v zúbkoch. Tvarom aj pílkovitým okrajom sa naše odtlačky podobajú formám, ktoré sú uvádzané pod názvom *Rosa bohemica* Engelhardt, známe zo severočeskej neogénnej panvy. Nález: Vyšný Skálnik.

Robinia sp.

Odtlačok celokrajného lístku pri báze klinovitého. Hlavná žila je málo výrazná, priama, druhoradé žilky nie sú viditeľné. Nález: Vyšný Skálnik.

cf. *Diospyros brachysepala* Al. Braun

Odtlačky eliptických listov s trochu asymetrickou bázou s málo výraznou hlavnou žilou. Druhoradé žilky sú jemné, oblúkovite ohnuté (kamptodrózne) pri okraji sa

vzájomne spájajú. Odtlačky možno porovnať s dnešným ázijským druhom *Diospyros lotus* L. Nález: Vyšný Skálnik.

Cedrela caucasica Kutuzkina

Tab. XXXVII, obr. 1,2

Odtlačky podlhovastých listov, pri báze asymetrické, celokrajné. Hlavná žila je výrazná, mierne ohnutá, druhotné žilky vyrastajú z hlavnej žily pod uhlom 70–80°, smerom k okraju sa ohýbajú a navzájom spájajú. Tretoradé žilky vyrastajú takmer pod pravým uhlom druhoradých žiliek, v strede sa vetvia a vytvárajú dva rady podlhovastých mnohouholníkov. Odtlačky sú rôznej veľkosti. Väčšinou sú dlhé okolo 10 cm, široké 2,5–3 cm.

Od druhu *Cedrela sarmatica* É. Kovács sa náš druh líši hlavne morfológiou. Pribeh žilnatiny je podobný, ale listy *C. Caucasica* sú omnoho štihlejšie. E. F. Kutuzkina (1967) ju porovnáva s dnešným druhom *Cedrela sinensis* Juss., ktorý rastie v subtropickkej oblasti Číny v údoliach potokov a riek.

C. caucasica bola prvýkrát nájdená v sedimentoch stredného sarmatu. Aj *C. sarmatica* É. Kovács pochádza zo sarmatských sedimentov. Môžeme usudzovať, že rod *Cedrela* mal v miocéne v oblasti strednej Európy široký areál. Nález: Vyšný Skálnik.

Rhus pyrrhae Unger

Odtlačok eliptického listu, ktorý je pri báze aj pri hrote zúžený. Okraj je od polovice smerom k vrcholu zúbkovaný. Žilnatina je jemná so siedmimi pármami druhoradých žíl. Podobá sa F. Ungerovmu (1847) vyobrazeniu. Podobné formy uvádza H. Weyland (1934) z Porýnia a N. Stojanoff – B. Stefanoff (1929) z pliocénu Bulharska pod názvom *Rhus coriaria*. L. Nález: Vyšný Skálnik.

Vitis teutonica Al. Br.

Tab. XXXVIII, obr. 1

Pomerne veľký odtlačok listu s asymetrickou bázou so siedmimi bazálnymi žilami, z ktorých iba spodné sú mierne oblúkovite ohnuté. Okraj je zúbkovaný. Dĺžka listu 9 cm. Bazálne žily prechádzajú do stopky širokej asi 2 mm. Podobné odtlačky boli už nájdené aj na Slovensku a to v Turčianskej kotline a v Močiari (V. Sitár 1969, 1973). Nález: Vyšný Skálnik.

Sapindus falcifolius Al. Braun

Tab. XXXVIII, obr. 3

Odtlačky na báze asymetrických listov. Sú celokrajné, vajcovito-kopijovité až podlhovasto-kopijovité, niekedy kosákovito ohnuté. Hlavná žila mierne ohnutá, druhoradé žilky sú jemné, mierne oblúkovité.

Druh *S. falcifolius* A.Br. sa v terciérnej flóre vyskytuje veľmi často. U nás je známy hlavne zo sarmatských sedimentov stredného Slovenska aj z panónu. Nález: Vyšný Skálnik.

Cornus sp.

Neúplný odtlačok s oblúkovitými druhoradými žilami, čím pripomína listy rodu *Cornus*. Na odtlačku vidieť len polovicu celokrajného listu. Nález: Nižný Skálnik.

Uvedené rastlinné zvyšky sú ekologicky približne rovnaké. Svedčí to o tom, že celé spoločenstvo rástlo za rovnakých ekologických podmienok. Väčšina druhov sú rastliny teplého, vlhkého nížinatého lesa. Vyslovene barinatý prvok je *Equisetum parlatorii* (Heer) Schimper a mnohé zvyšky tráv. Ostatné elementy rastú skôr na vlhkejších miestach ako na vyslovene suchých. Ide hlavne o druhy rodov *Carya*, *Pterocarya*, *Alnus*, *Ulmus*, *Zelkova*, *Salix*, *Populus*. O teplej klíme svedčia hlavne *Cercidiphyllum*, *Diospyros*, *Cedrela*, *Sapindus*, *Fagus*, *Castanea*, *Platanus*, ale aj viaceré vyššie spomenuté rastlinstvo.

Pri porovnávaní študovaného rastlinného spoločenstva so spoločenstvom doteraz už preskúmaným na iných lokalitách môžeme usudzovať, že chýbajú niektoré prvky, ktoré sú v sarmatských sedimentoch veľmi hojné. Chýbajú prvky rodov *Quercus*, *Byttneriophyllum*, a hlavne zástupcovia ihličnatých rastlín (*Coniferopsida*). Tento prvok v našich zberoch úplne chýba. Aj F. Němec (1960) z Nižného Skálnika uvádza len jeden exemplár odtlačku ihlic *Pinus* sp. Na neprítomnosť odtlačkov ihličnatých rastlín v oblasti južného Slovenska upozornil už V. Sitár (1967). Naproti tomu P. Snopková (1961) a E. Planderová (1960) uvádzajú v peľových spektrách veľké zastúpenie hlavne čeľade *Taxodiaceae*. Napr. *Glyptostrobus europaeus* (Brongn.) Ung. je hojný takmer vo všetkých známych lokalitách vnútorných neogénnych kotlín stredného Slovenska. Podobne je to aj s druhom *Byttneriophyllum tiliaefolium* (Al. Br.) Knobl. et Kvaček. Oba tieto druhy sú vyslovene barinaté prvky a vyskytujú sa hlavne v hnedouhoľných panvách. Z tohto vyplýva, že ekologické podmienky panónskej panvy boli trochu iné ako na severnejšom území.

Naproti tomu je nápadné veľké zastúpenie rodu *Cedrela*. Formy tohto rodu zasa chýbajú vo fosilnej flóre vnútorných kotlín. na južnom Slovensku (V. Sitár 1967) aj v maďarskom sarmate (G. Andreánszky 1959, É. Kovács 1957) sú v neogénnych sedimentoch časté. Podobne aj druh *Cercidiphyllum crenatum* (Ung.) Brown je skôr zastúpený v južnejších flórach ako vo vnútorných kotlinách Západných Karpát.

Do tlače odporučila E. Planderová.

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V. Sitár – I. Dianiška

Flora in Late-Tertiary volcanic rocks at Vyšný and Nižný Skálnik

Summary of Slovak text

The authors present results of the study of fossil flora recorded at the localities Nižný and Vyšný Skálnik at the north of Rimavská Sobota. Plant impressions are in finegrained and tuffitic claystones forming the basal part of the volcanic complex denoted as 1 by O. Fusán et al. (1962).

The following were recorded at both localities: *Equisetum parlatorii* (Heer) Schimp., *Smylax* sp., *Poacites* sp., *Cercidiphyllum crenatum* (Ung.) Brown, *Juglans acuminate* A. Br., *Cayra denticulata* (Weber) Ilj., *Pterocarya castaneifolia* (Geopp.) Schlecht., *Alnus crebrinervis* É. Kovács, *Carpinus grandis* Ung., *Carpinus kisseri* Berger, *Betula prisca* Ett., *B. macrophylla* (Geopp.) Heer, *Fagus herthae* (Ung.) Ilj., *Castanea atavia* Ung., *Ulmus longifolia* Ung., *Zelkova zelkovaefolia* (Ung.)

Božek et Kostl., *Zelkova praelonga* (Ung.) Berger, *Platanus platanifolia* (Ett.) Knobl., *Salix tenera* Al. Br., *Populus populina* (Brongn.) Knobl., *Rosa* sp., *Robinia* sp., cf. *Diospyros brachysepala* Al. Br., *Cedrela caucasica* Kutuzk., *Rhus pyrrhae* Ung., *Vitis teutonica* Al. Br., *Sapindus falcifolius* Al. Br., *Cornus* sp.

Whilst in sediments at Nižný Skálnik predominant are *Fagus herthae* (Ung.) Ilj., *Zelkova*, *Alnus*; at the locality Vyšný Skálnik most frequent are the genera *Cedrela* and *Zelkova*. No Coniferae were found. The entire assemblage and a comparison with fossil flora from the Hungariann territory or with the localities in Southern and Central Slovakia are indicative of the Sarmatian age of the sediments.

Translated by E. Jassingerová.

Vysvetlivky k tabuľkám XXXIII – XXXVIII

Tab. XXXIII

- Obr. 1 *Equisetum parlatorii* (Heer) Schimper (Nižný Skálnik)
- Obr. 2 *Ulmus longifolia* Unger (Nižný Skálnik)
- Obr. 3 *Alnus crebrinervis* É. Kovács (Nižný Skálnik)
- Obr. 4 *Cereidiphyllum crenatum* (Ung.) Brown. (Nižný Skálnik)

Tab. XXXIV

- Obr. 1 *Zelkova praelonga* (Ung.) Berger (Vyšný Skálnik)
- Obr. 2 *Salix tenera* Al. Braun (Nižný Skálnik)
- Obr. 3 *Zelkova zelkovaefolia* (Ung.) Bůžek et Kotl. (Nižný Skálnik)
- Obr. 4 *Pterocarya castaneifolia* (Goepp.) Schlecht. (Vyšný Skálnik)

Tab. XXXV

- Obr. 1 *Pterocarya castaneifolia* (Goepp.) Schlecht. (Vyšný Skálnik)
- Obr. 2 *Betula macrophylla* (Goepp.) Heer (Nižný Skálnik)
- Obr. 3 *Carya denticulata* (Weber) Ilj. (Vyšný Skálnik)
- Obr. 4 *Juglans acuminata* Al. Braun (Vyšný Skálnik)

Tab. XXXVI

- Obr. 1 *Castanea atavia* Ung. (Vyšný Skálnik)
- Obr. 2 *Castanea atavia* Ung. (Nižný Skálnik)
- Obr. 3 *Carpinus grandis* Ung. (Nižný Skálnik)
- Obr. 4 *Fagus herthae* (Ung.) Ilj. (Nižný Skálnik)

Tab. XXXVII

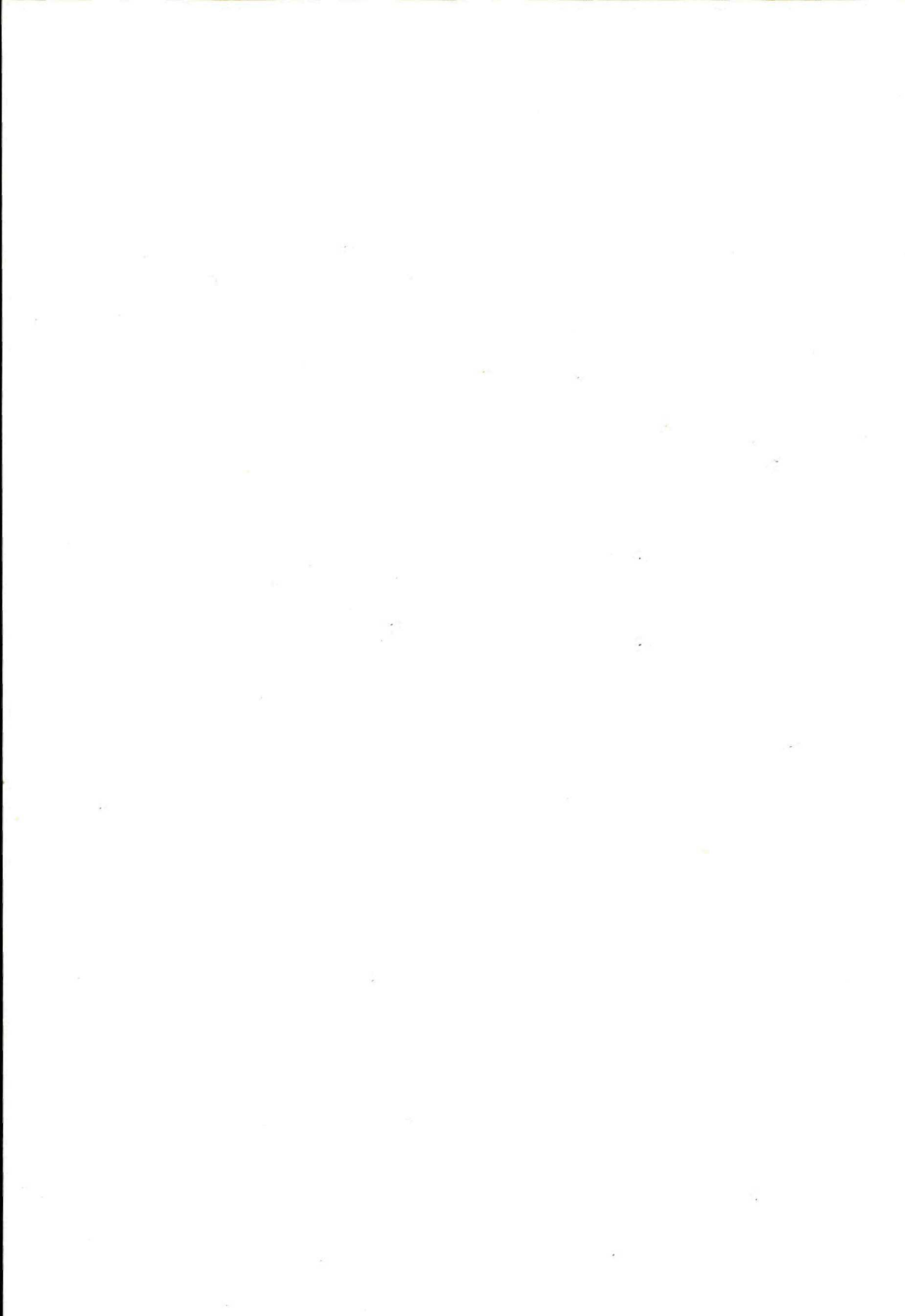
- Obr. 1,2 *Cedrela caucasica* Kutuzk. (Vyšný Skálnik)
- Obr. 3 *Castanea* sp. – jadro plodu (Nižný Skálnik)
- Obr. 4 *Zelkova zelkovaefolia* (Ung.) Bůžek et Kotl. (Vyšný Skálnik)

Tab. XXXVIII

- Obr. 1 *Vitis teutonica* Al. Braun (Vyšný Skálnik)
- Obr. 2 *Populus populina* (Brongn.) Knobl. (Nižný Skálnik)
- Obr. 3 *Sapindus falcifolius* Al. Braun (Vyšný Skálnik)

Všetko v prirodzenej veľkosti

Foto: L. Osvald



Ružena Lehotayová

***Pontosphaera cornifera* n. sp**
in thanatocenoses of sediments from drill hole LU-2 (Horehronie)

1 Pl. (XL)

At the study of calcareous nannoflora from sediments from the drill hole LU-2 (locality Lubietová – Horehronie) by the scanning electron microscopy we have frequently found a new species (Genus *Pontosphaera* Lohman, 1902).

***Pontosphaera cornifera* n. sp.**

Plate XL, Fig. 1–5

Holotype: scanning – electron micrograph N 3000, Pl. 1, Fig. 1; deposited in collections at D. Štúr Institute of Geology in Bratislava.

Paratypes: 3034, 3053, 3095, 3056

Locus typicus: Lubietová – Horehronie drill hole LU-2, depth: 98,8 m

Stratum typicum: Central Slovakia, Czechoslovakia

Derivatio nominis: according to a distinct corny projection

Diagnosis: a broad – oval lopadolite with a large central opening on proximal side. On its distal side – in basal part are oval depressions and a distinct corny projection.

Description: Broad oval lopadolite consisting of proximal disc and high marginal wall. Proximal disc is thin, compact, slightly depressed, surrounding large central opening. On the periphery of the opening are often remains of central reticulation. The wall of the lopadolite consists of very narrow lamellae. On the base of distal wall are oval depressions (about 20). From the narrower part of the lopadolite a long corny projection grows out. Its basal part is broad and extends from the central opening to the margin of the lopadolite wall, and narrows gradually. The length of the projection is approximately 1,5 of the lopadolite length. The corny projection has granular microstructure.

Dimension: Length 8–10, Width 6–7

Remarks: The species is similar to that quoted by M. Báldi (1973) from the Hungarian Oligocene as *Discolithina latelliptica*. It only differs by smaller dimensions and distinct conical projection.

Stratigraphical range: Oligocene? Horehronie – Central Slovakia. M. Báldi (1973) quoted the species as *Pontosphaera multipora*, p. 82, Pl. III, Fig. 1 a, b. from the Oligocene of Hungary, loc. Novay.

Scanning electronmicrographs

Plate XL

Pontosphaera cornifera nov. spec. drill hole LU-2, 98,8 m (Lubietová)

Fig. 1 proximal side, magn. 2500 x

Fig. 2 distal side, magn. 2500 x

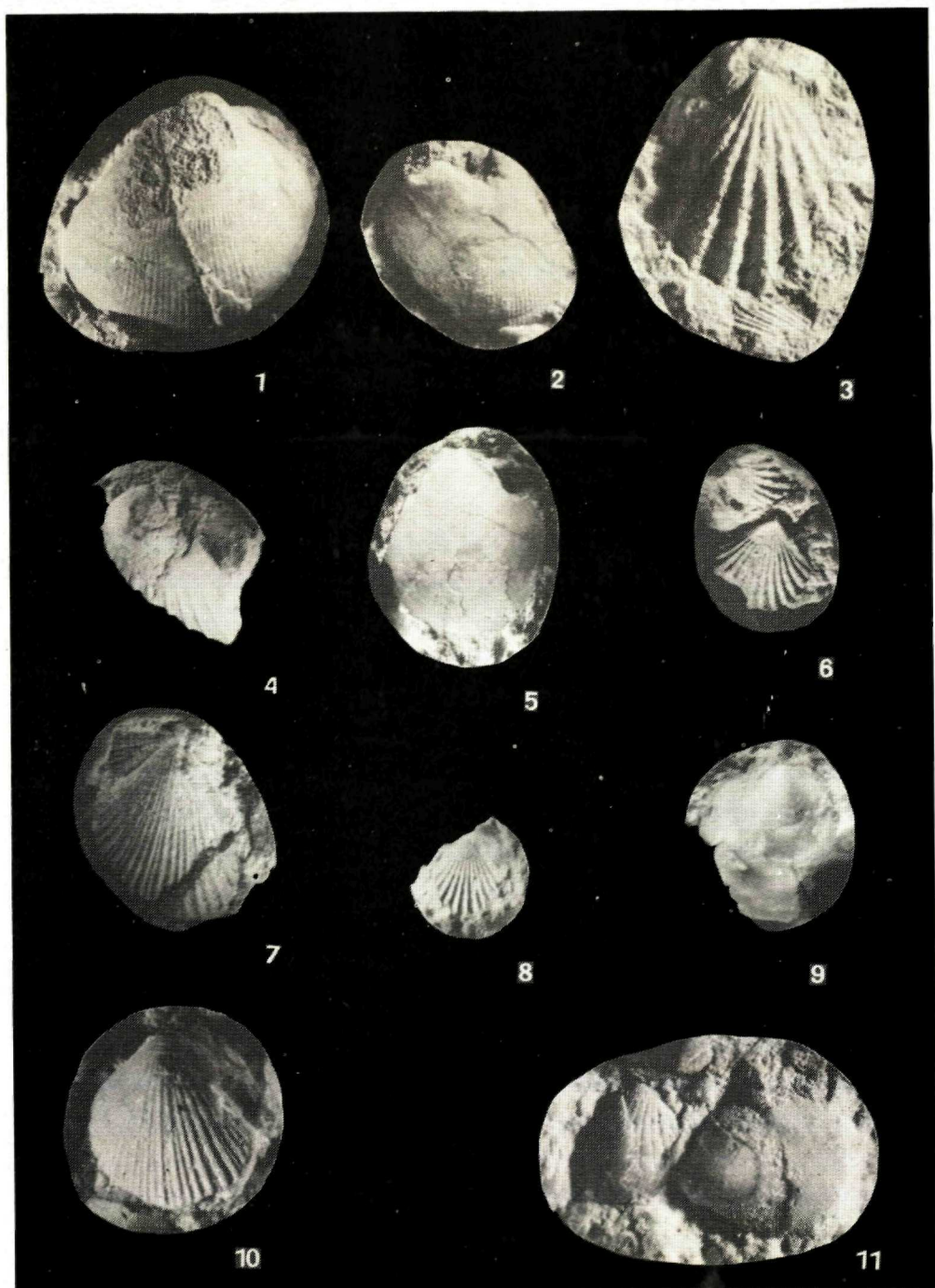
Fig. 3 lateral side, magn. 3000 x

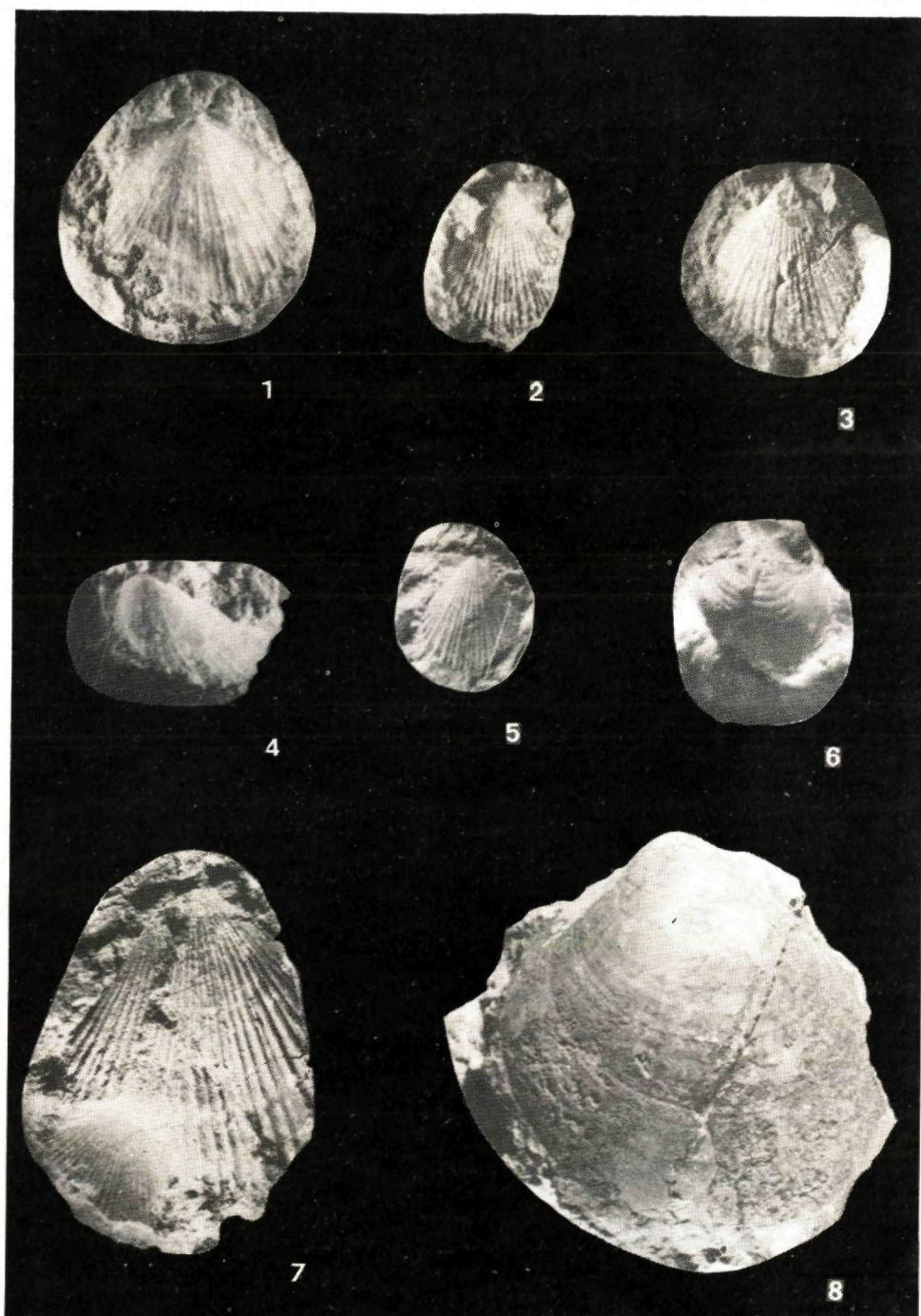
Fig. 4 distal and lateral sides, magn. 3000 x

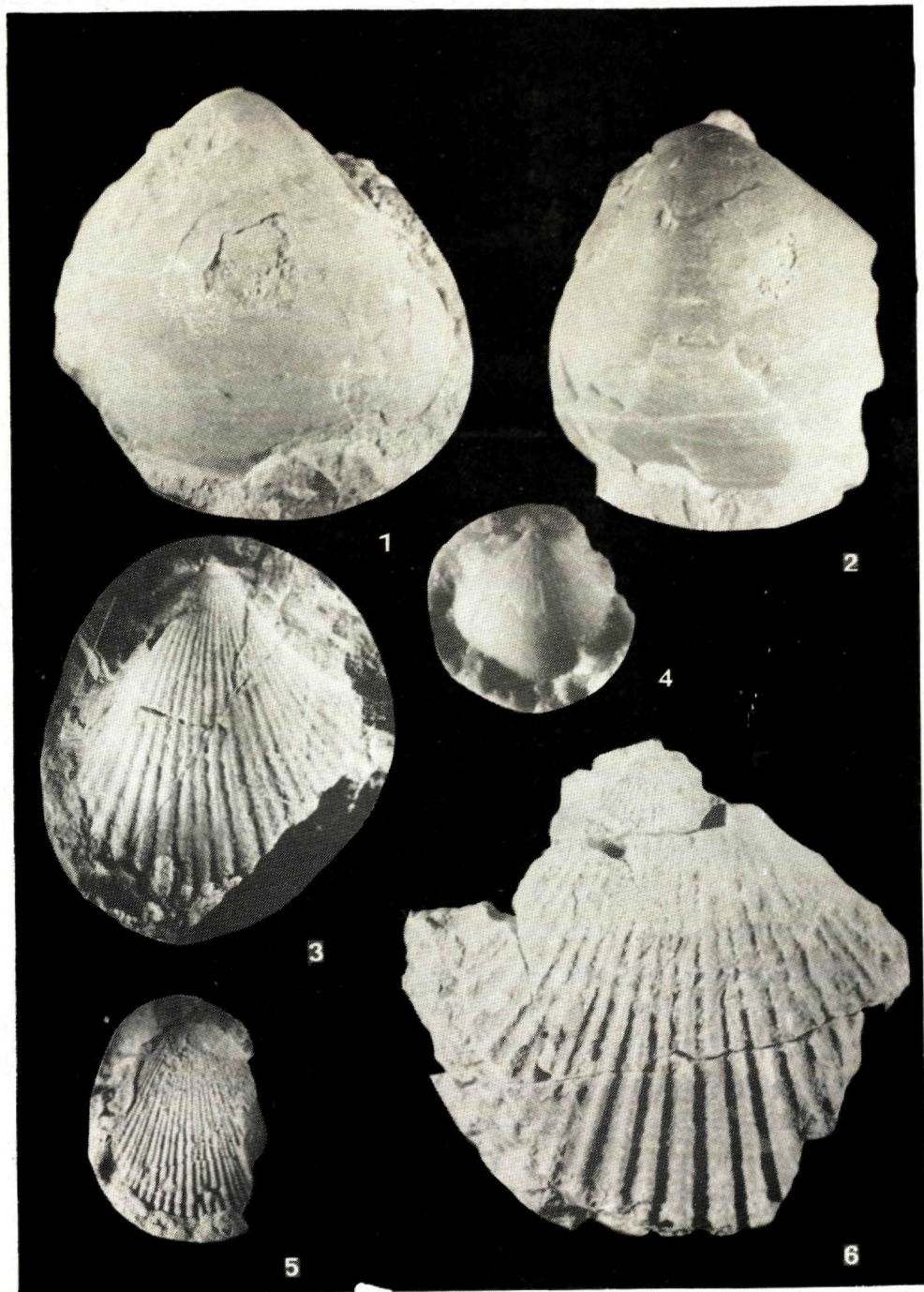
Fig. 5 distal side, magn. 2500 x

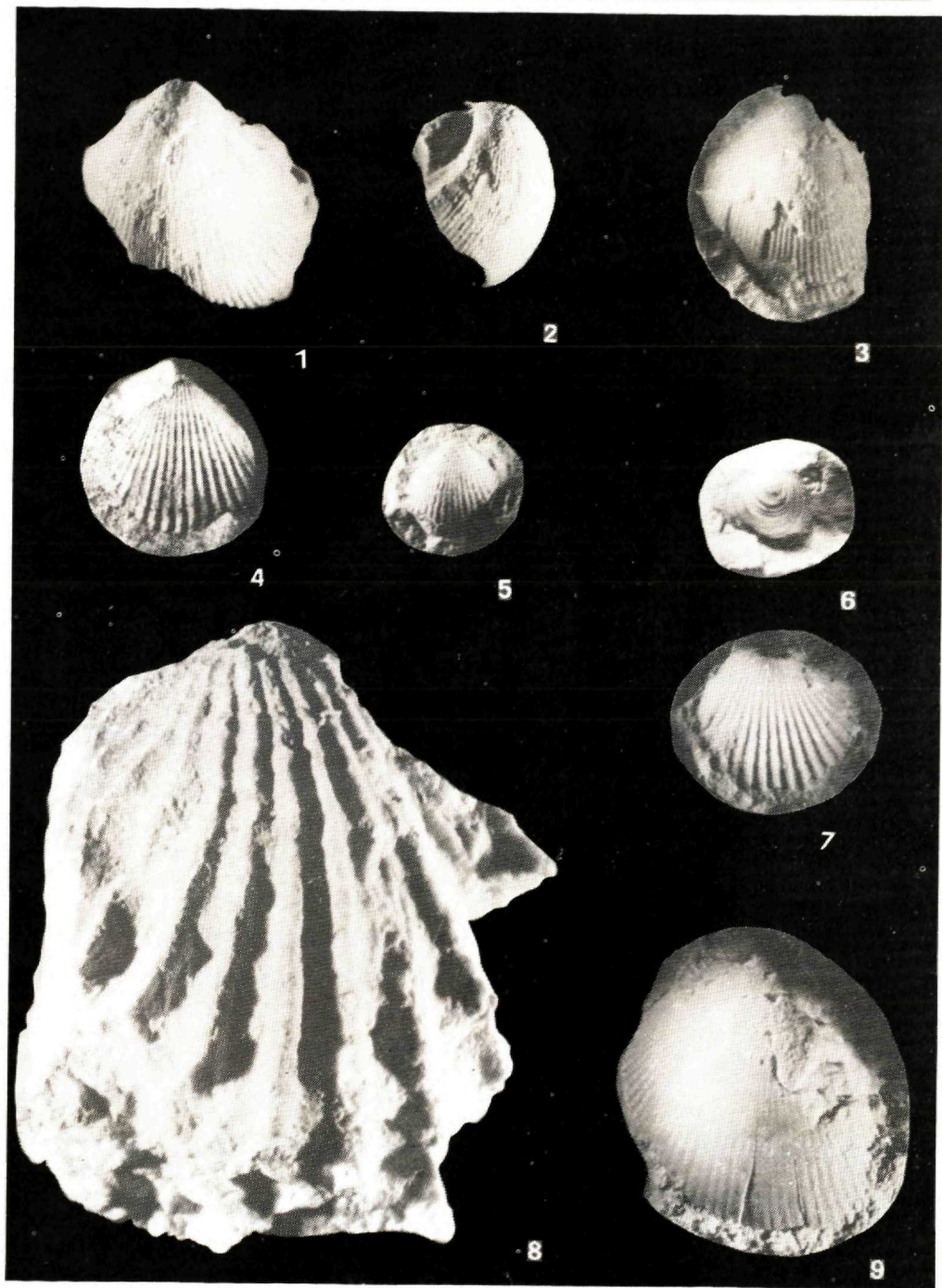
Note: The taxon is from Oligocene nannoassociations. So far it is not whether it is in the Oligocene in situ or allochthonous in Miocene sediments.

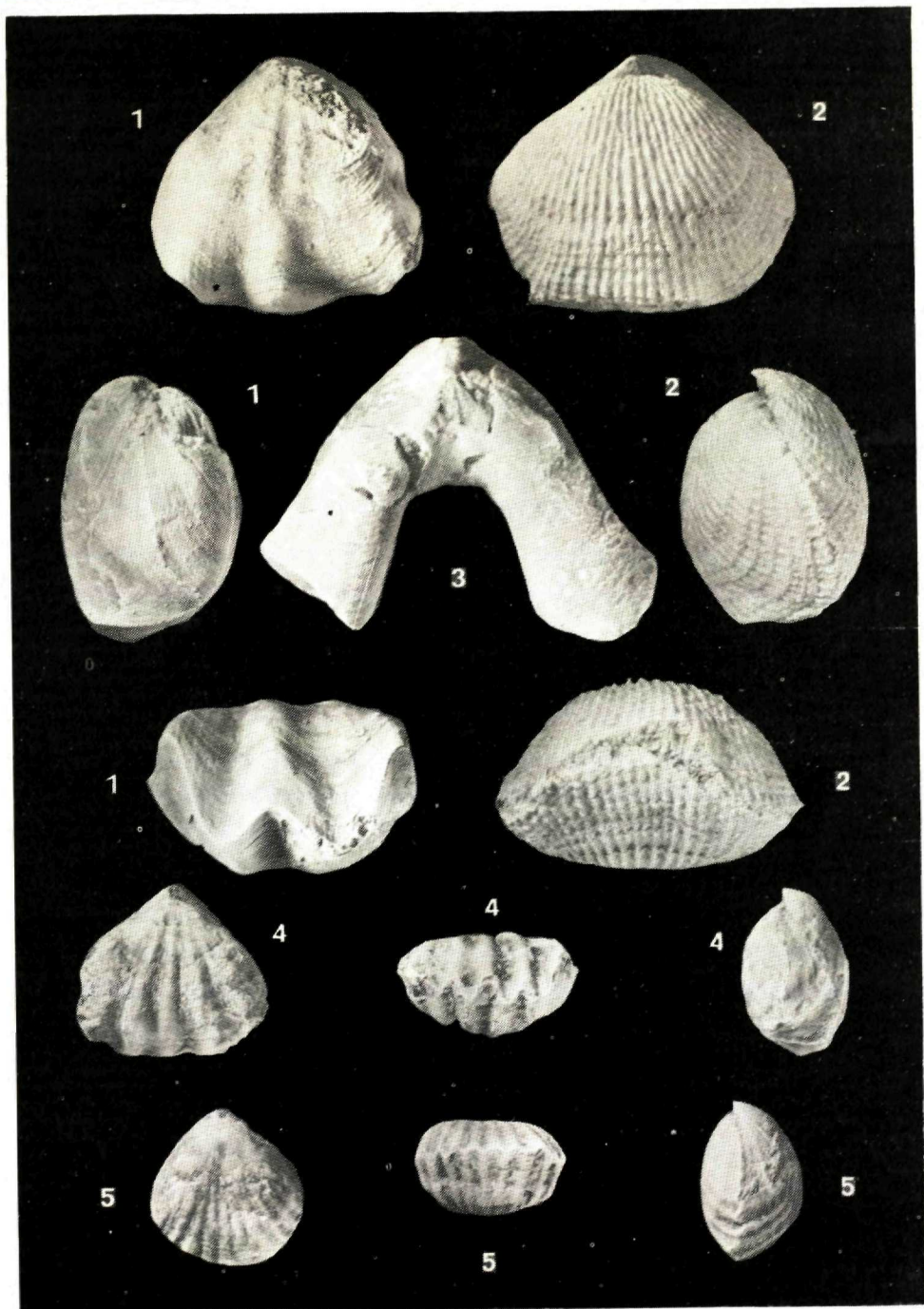
FOTOGRAFICKÁ PRÍLOHA
PHOTOGRAPHS
I-XL



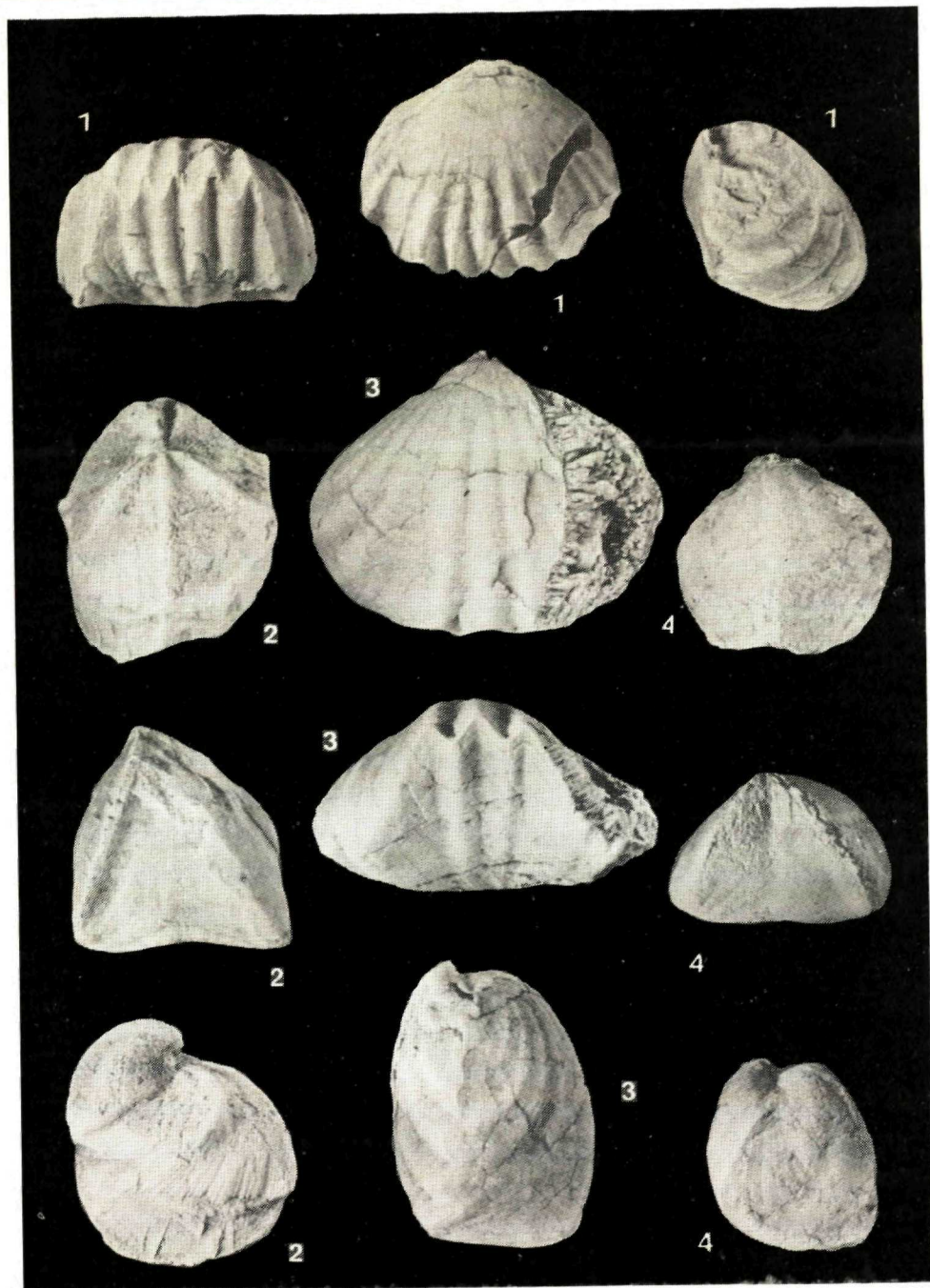


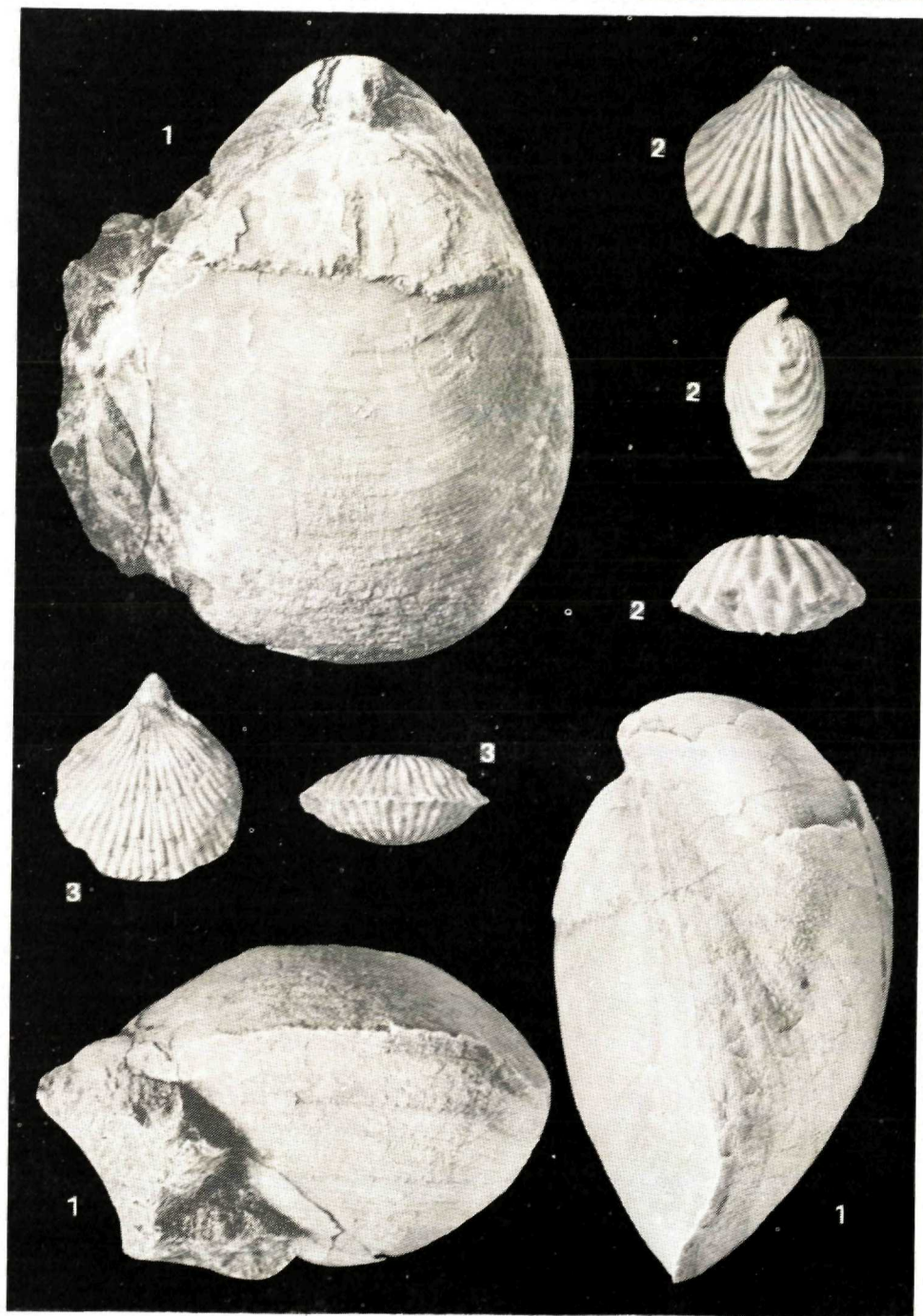


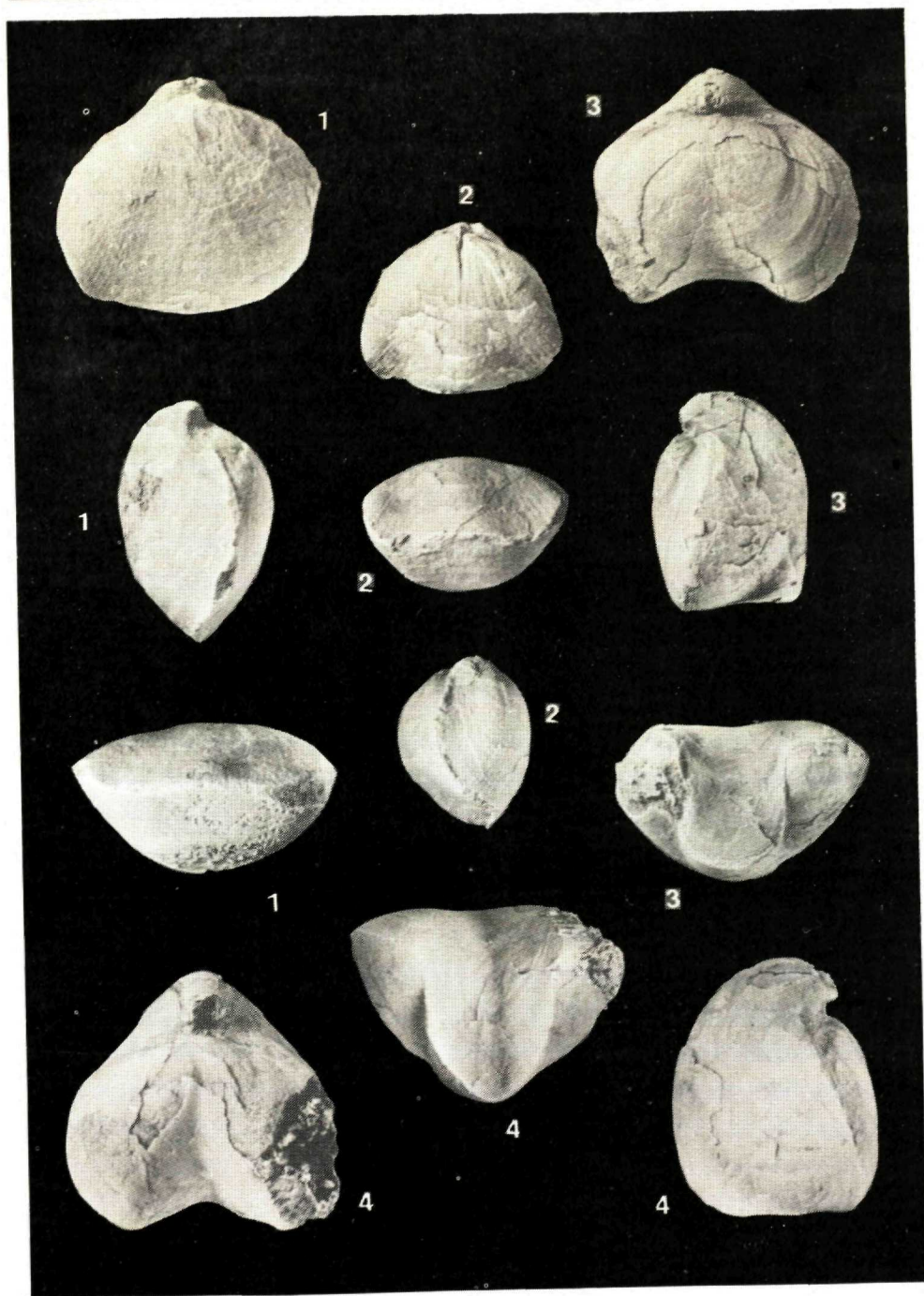


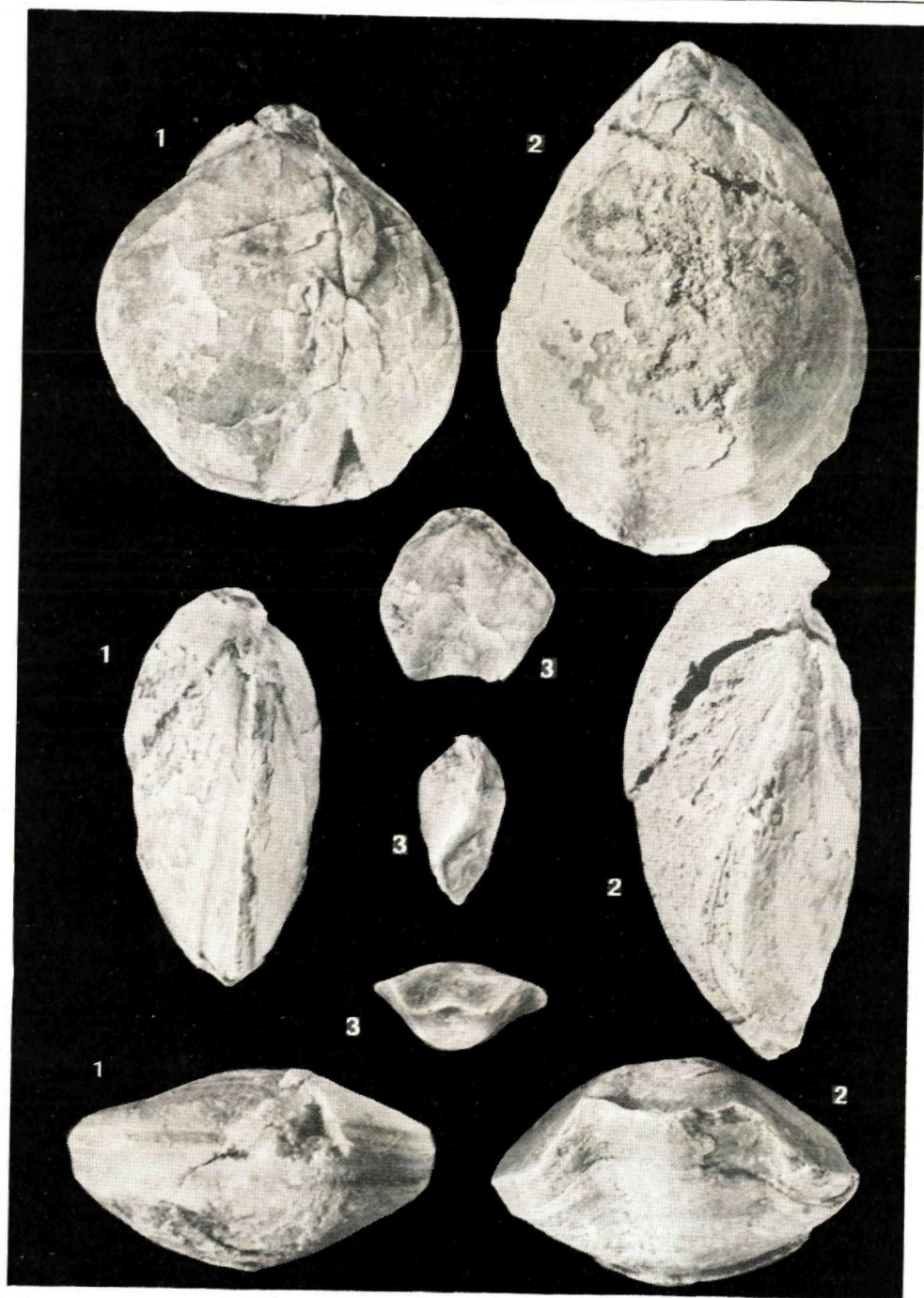


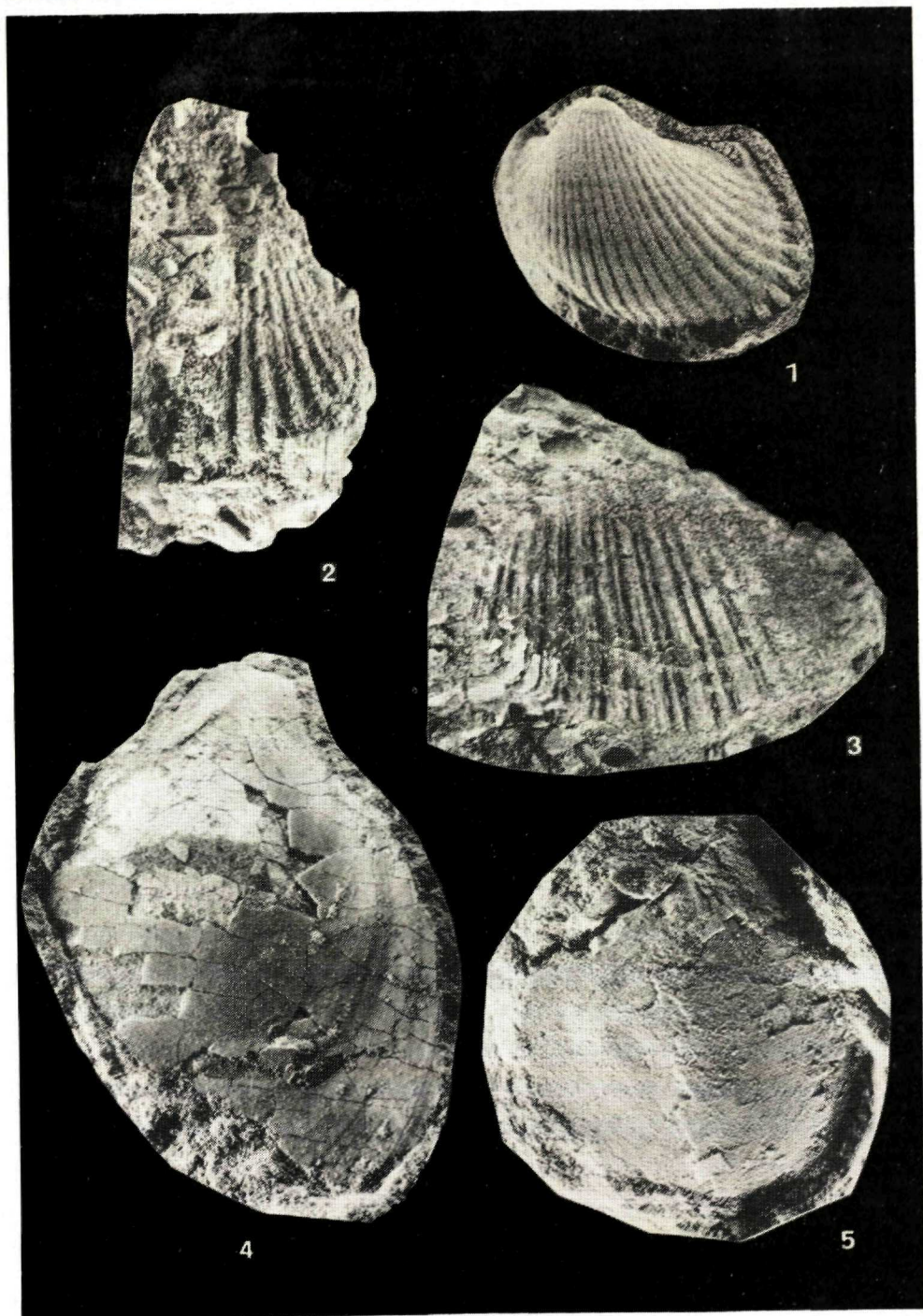




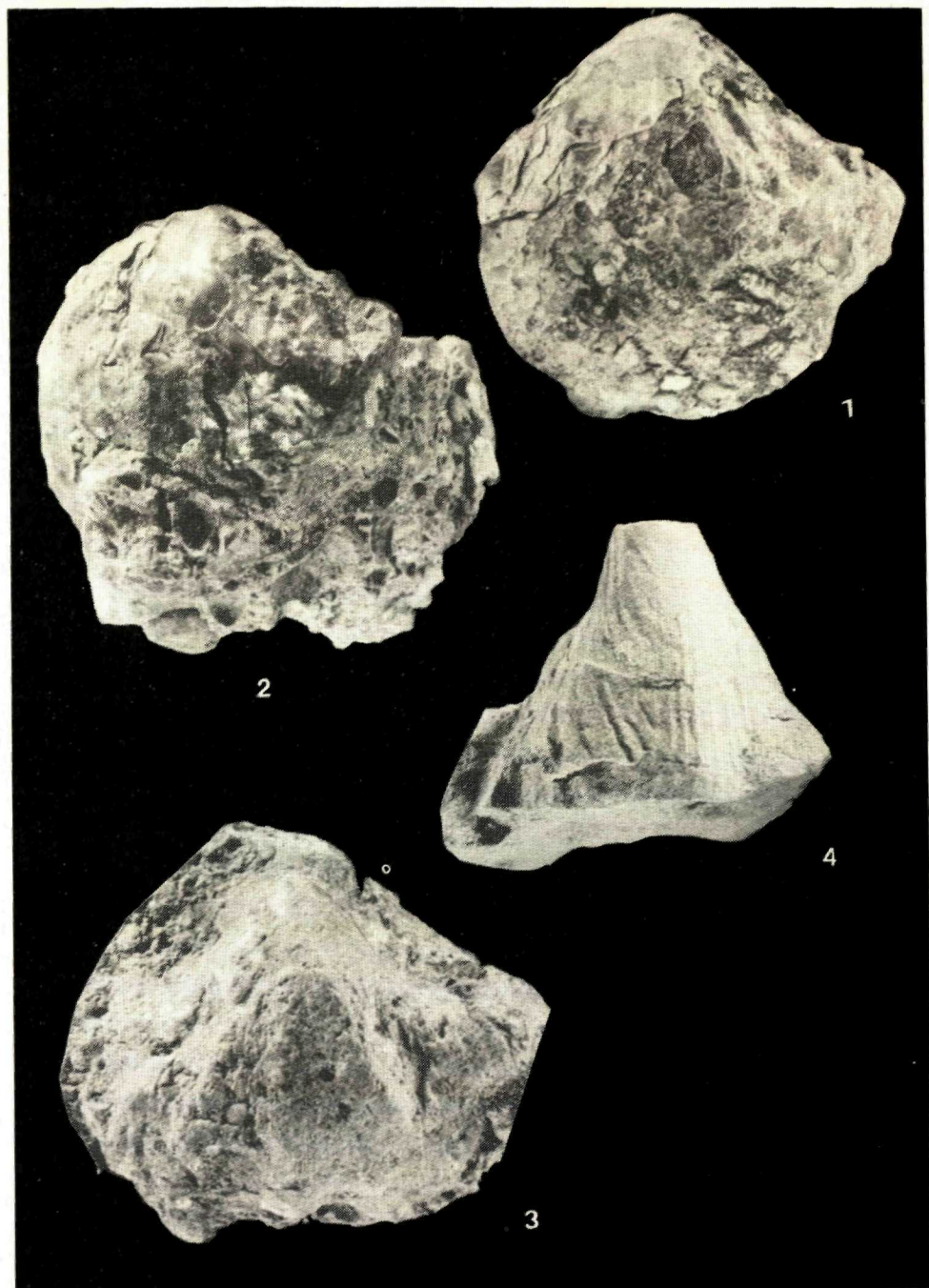


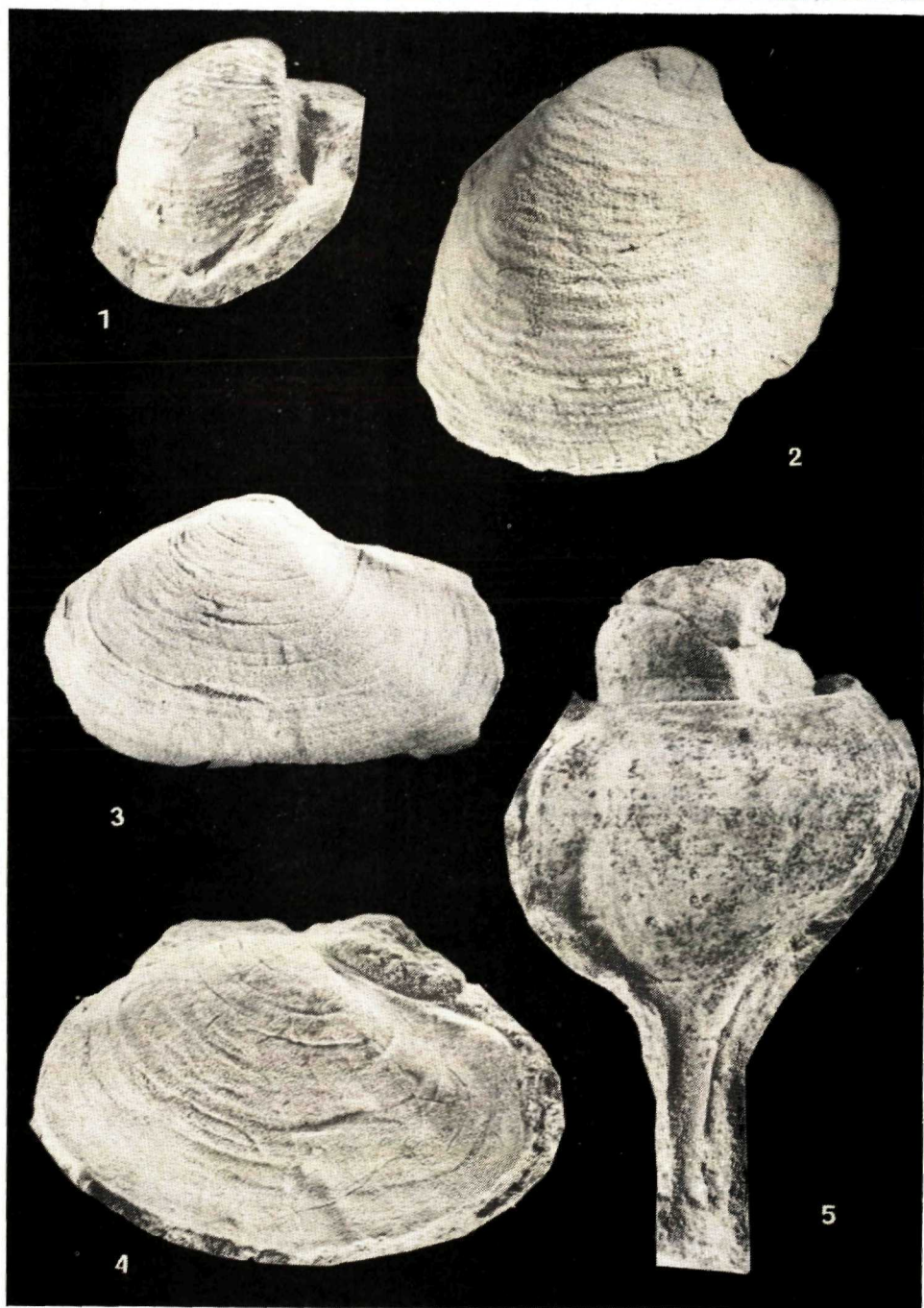


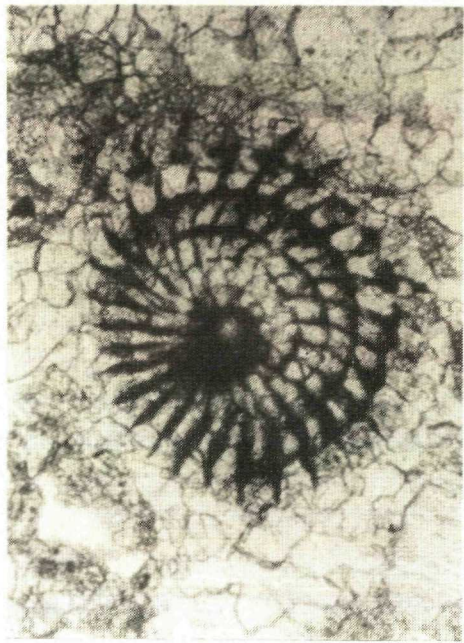








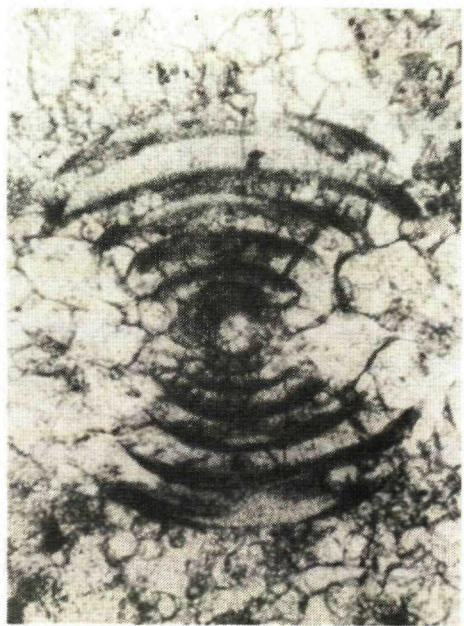




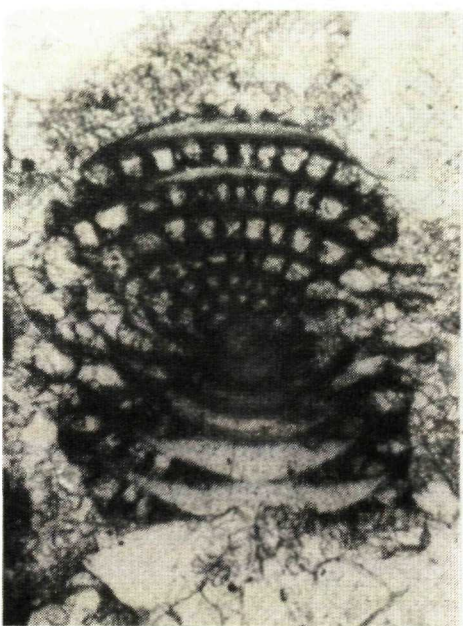
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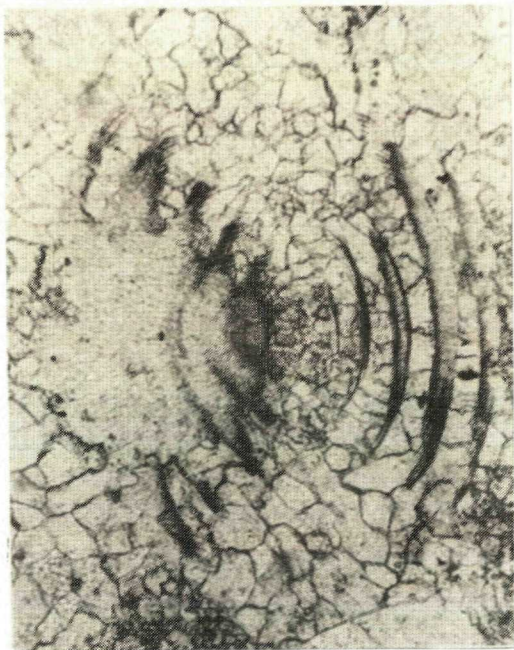
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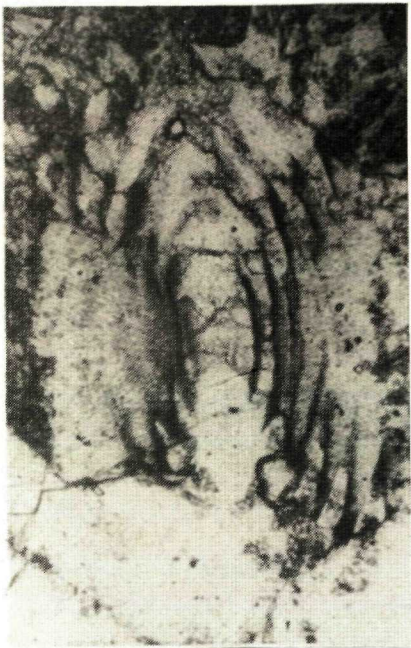
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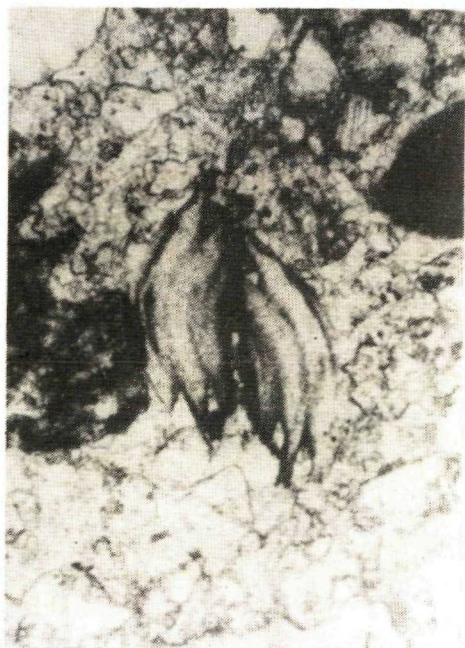
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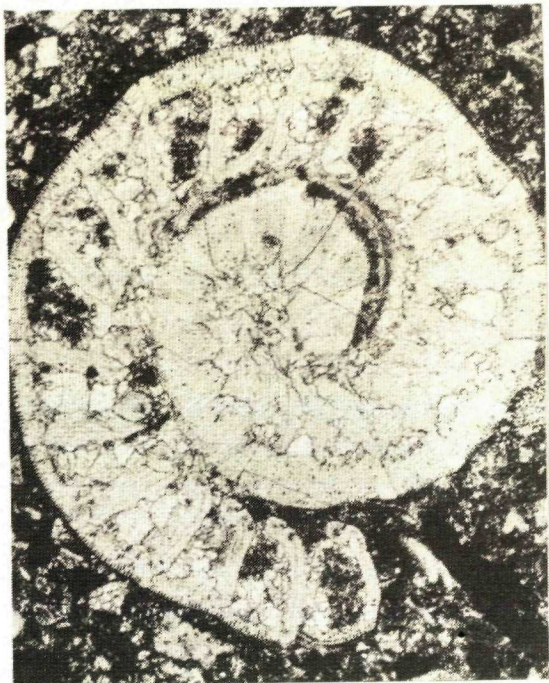
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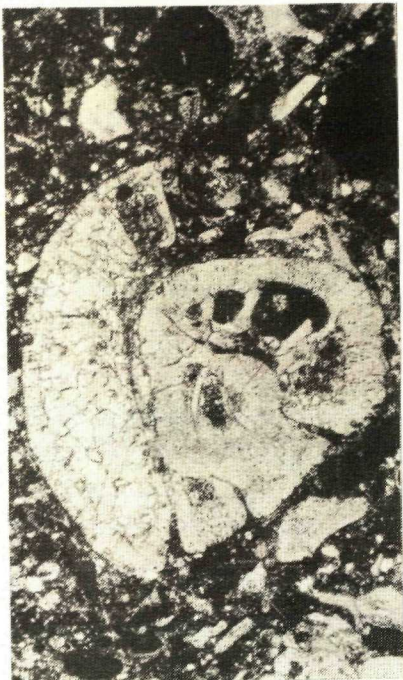
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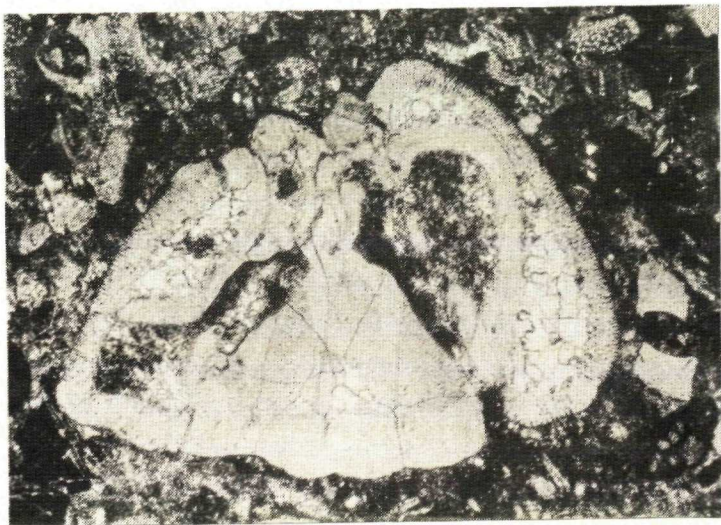
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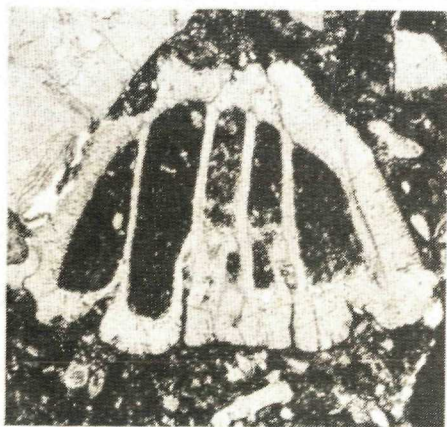
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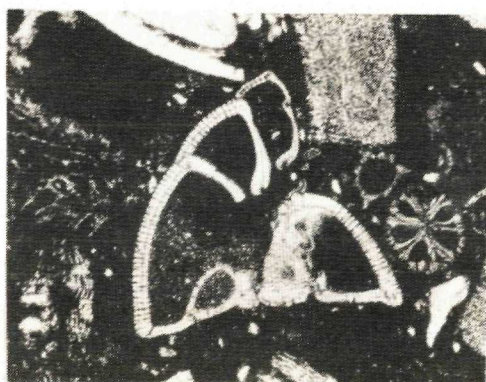
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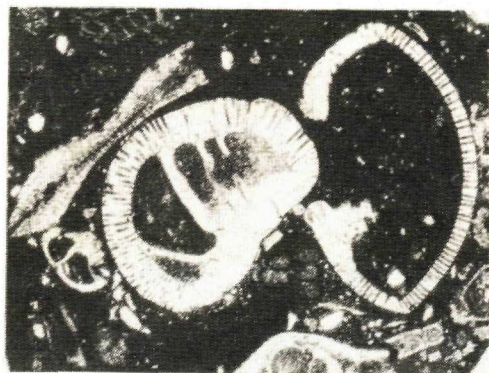
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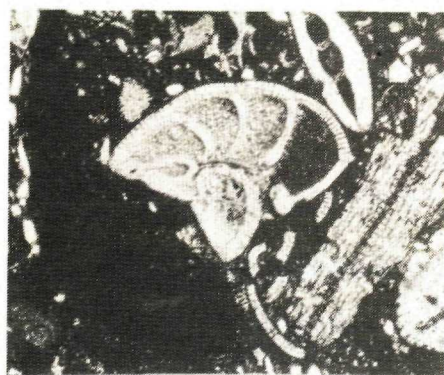
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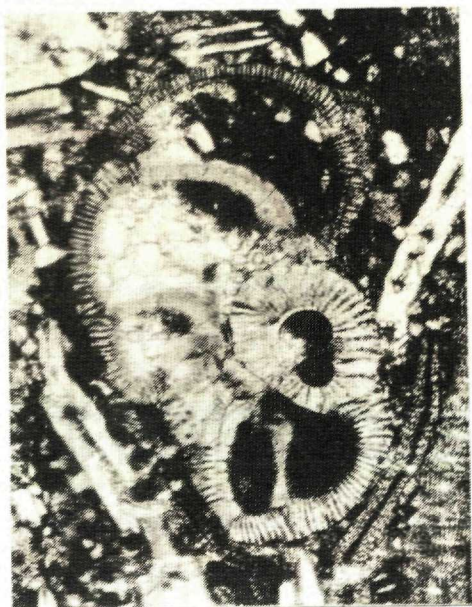
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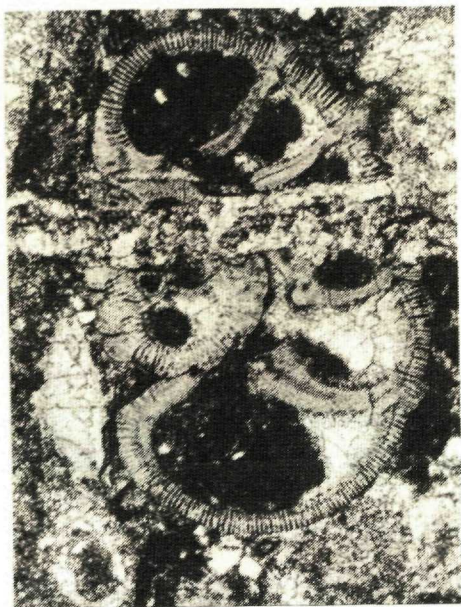
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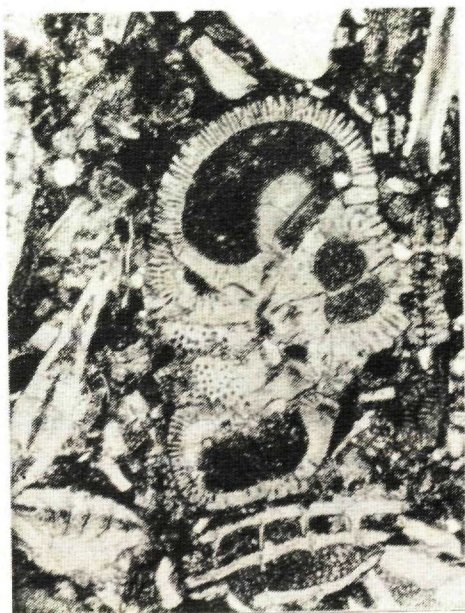
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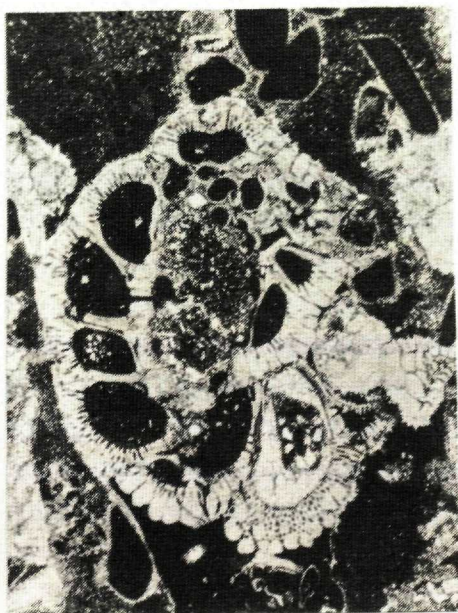
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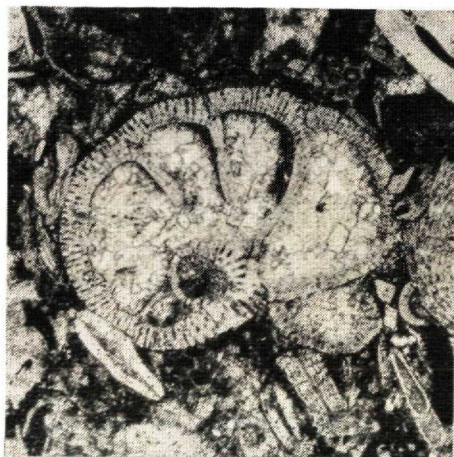
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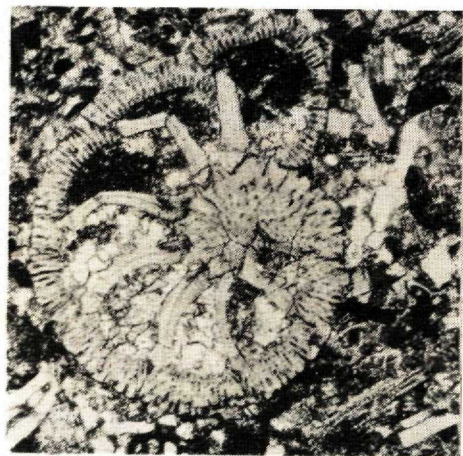
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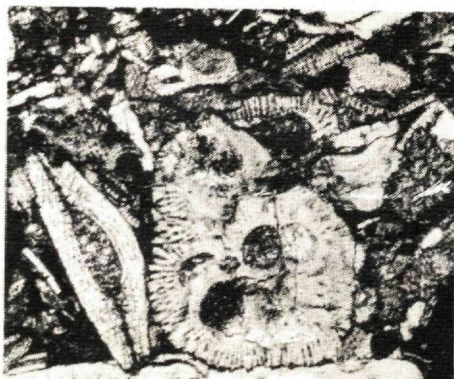
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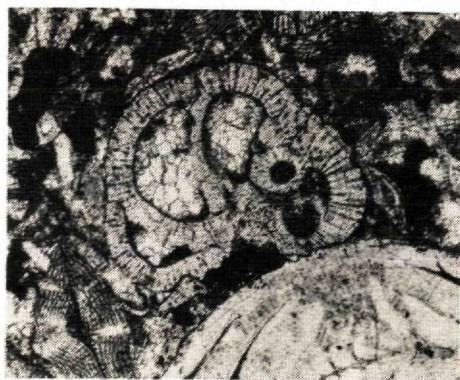
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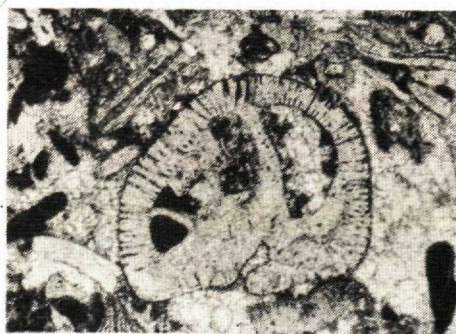
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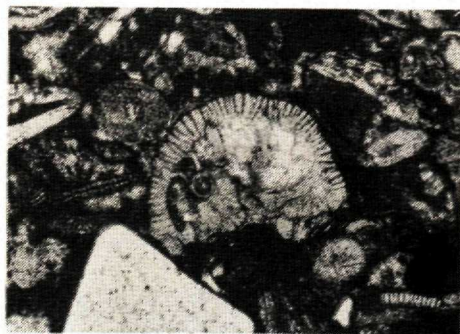
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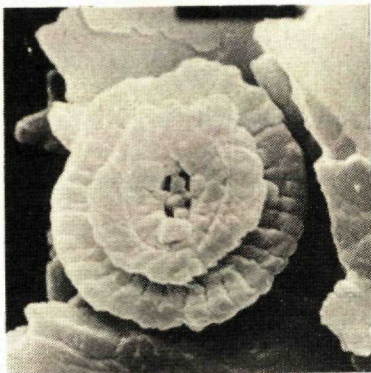
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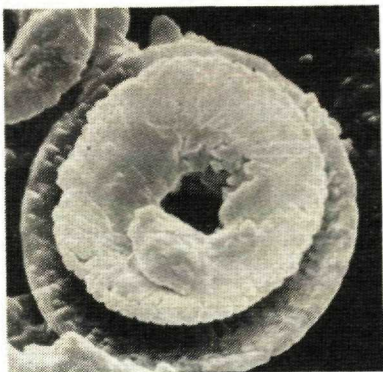
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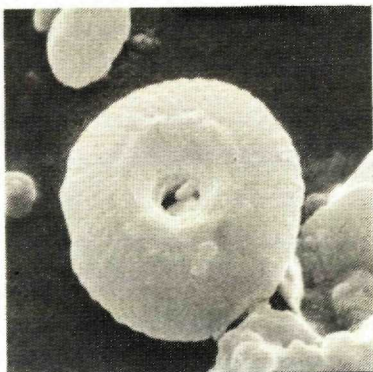
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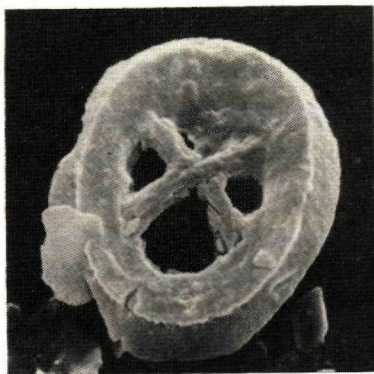
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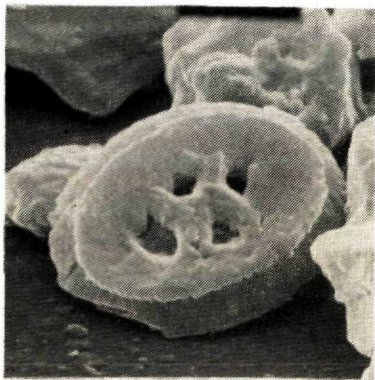
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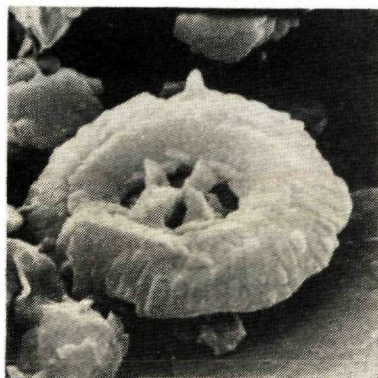
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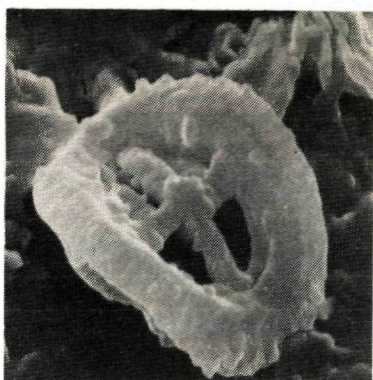
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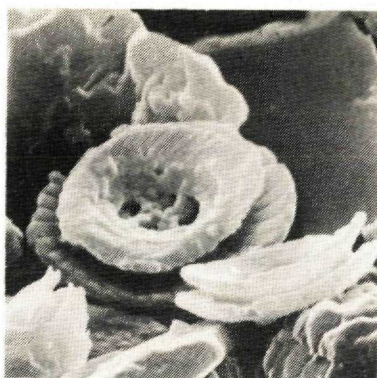
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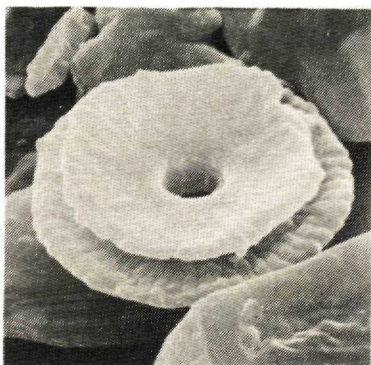
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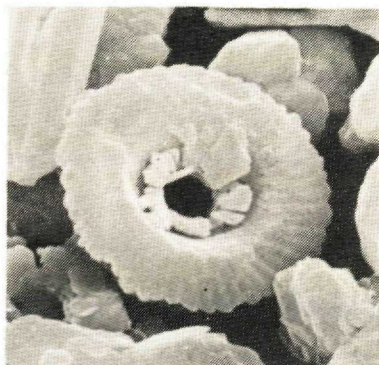
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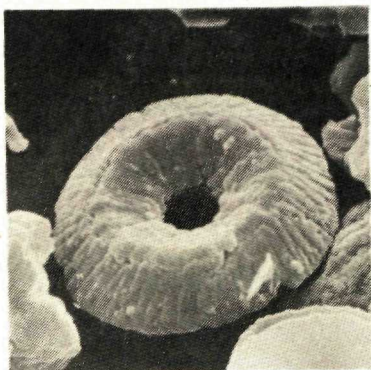
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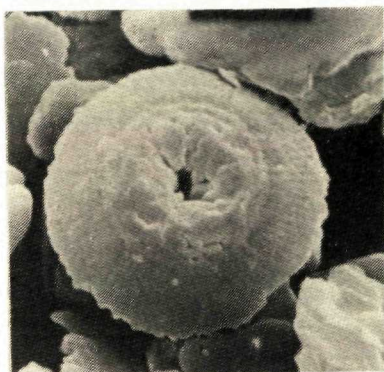
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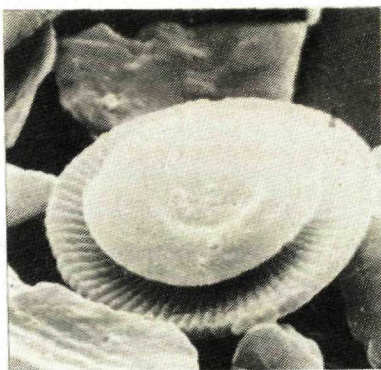
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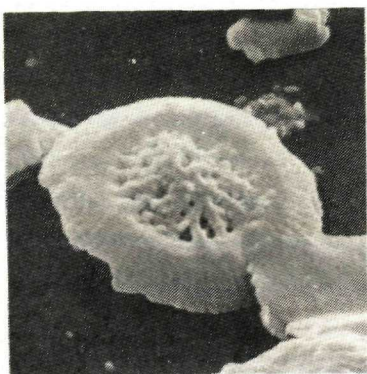
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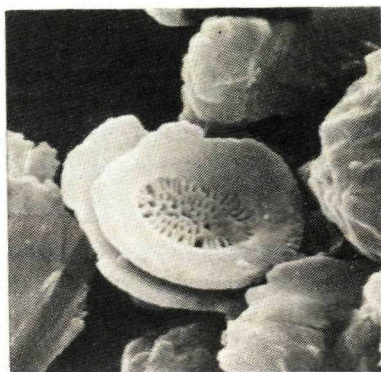
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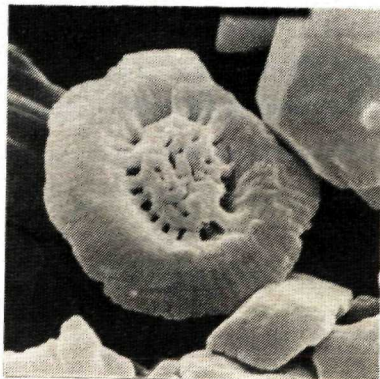
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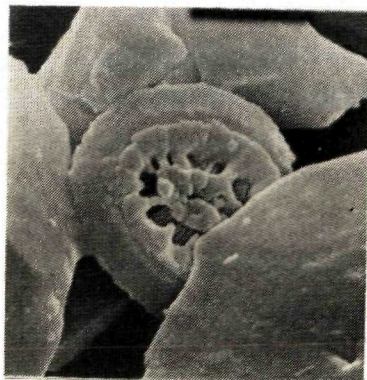
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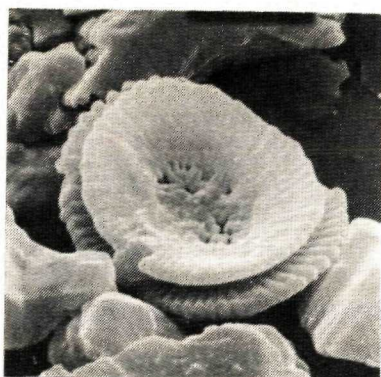
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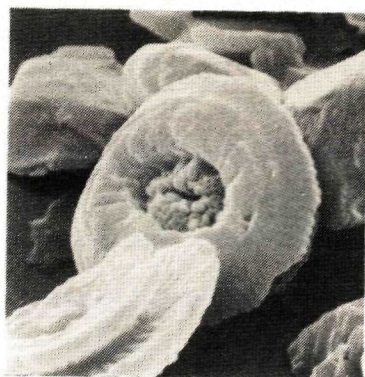
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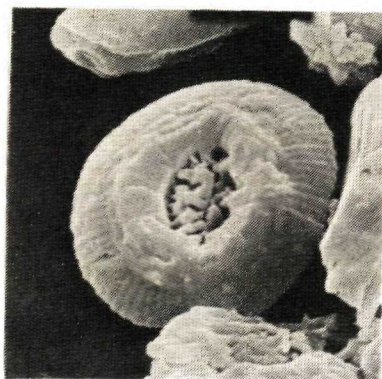
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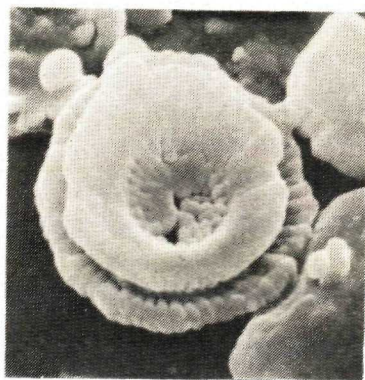
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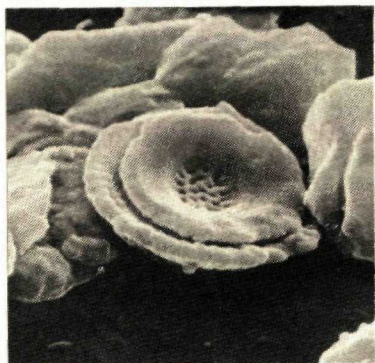
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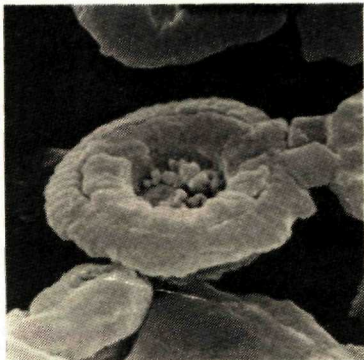
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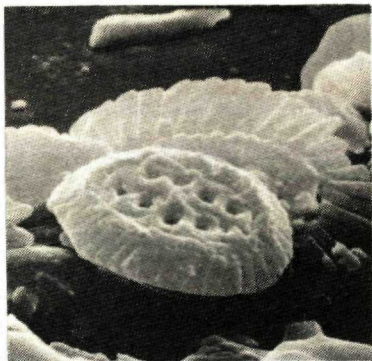
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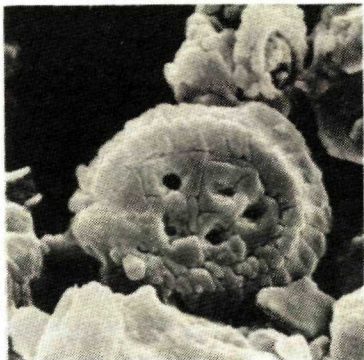
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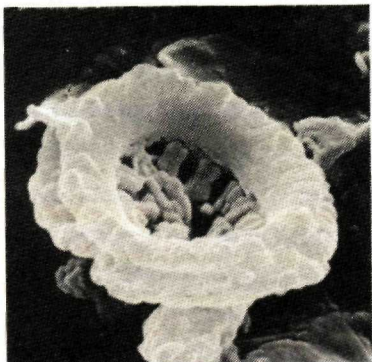
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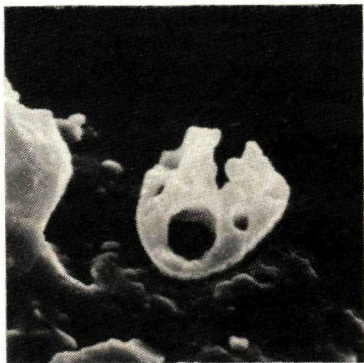
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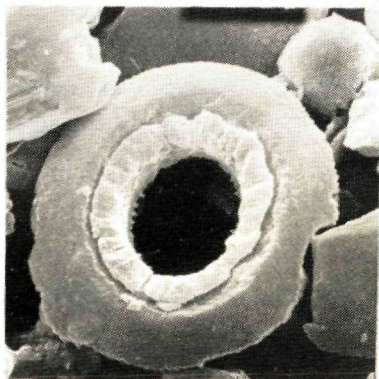
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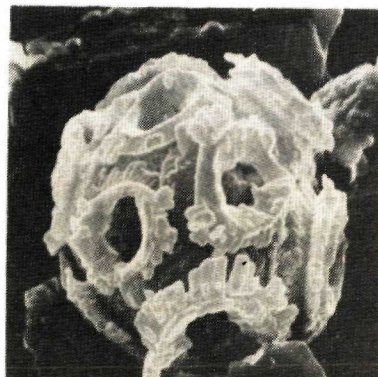
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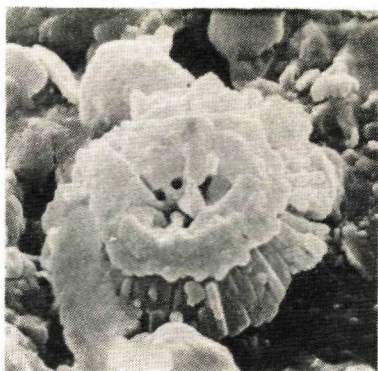
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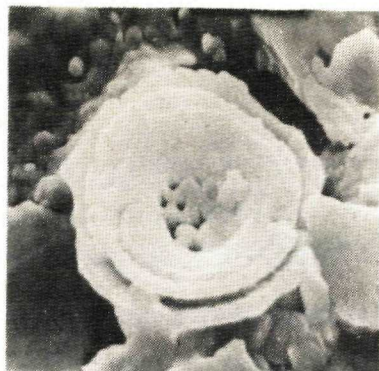
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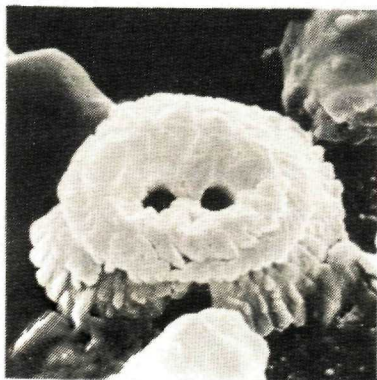
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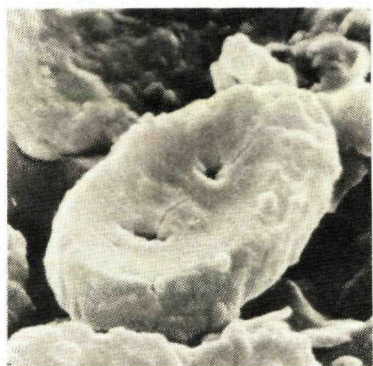
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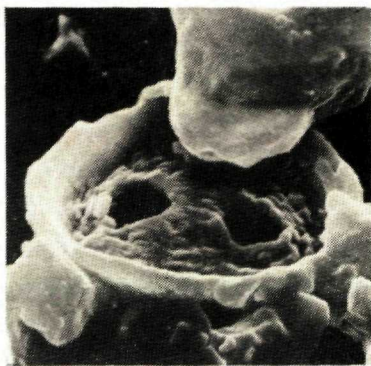
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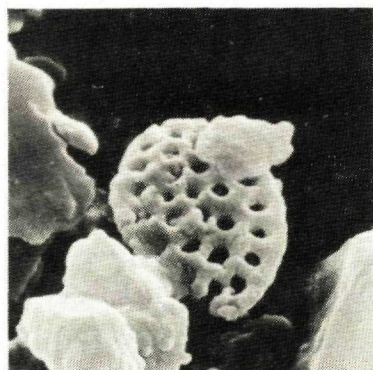
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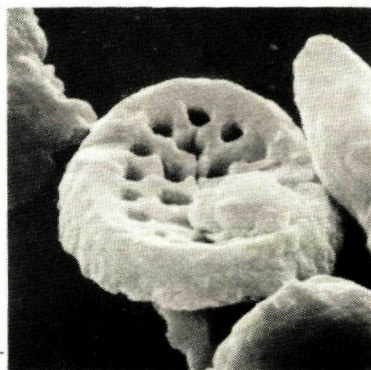
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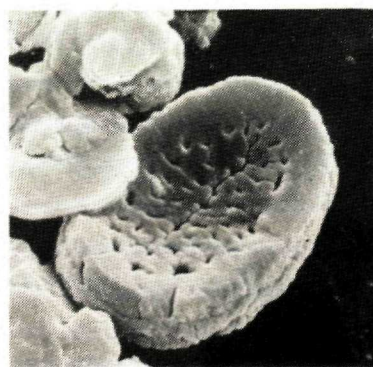
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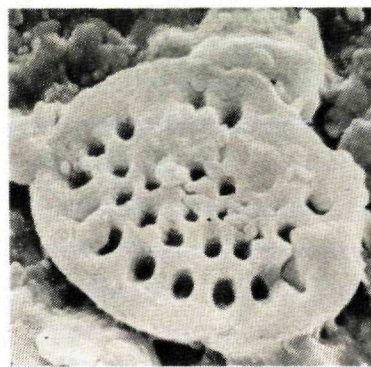
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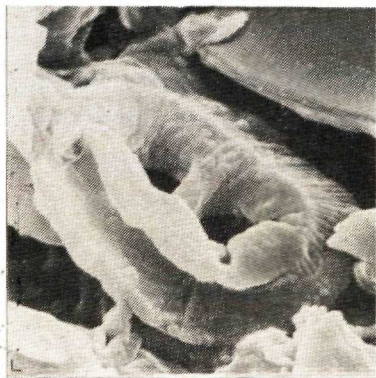
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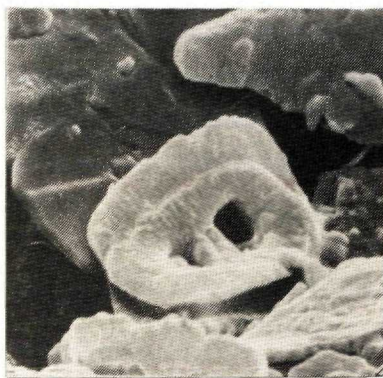
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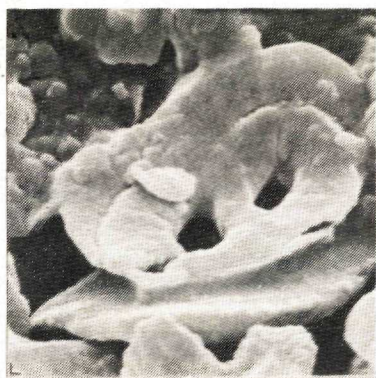
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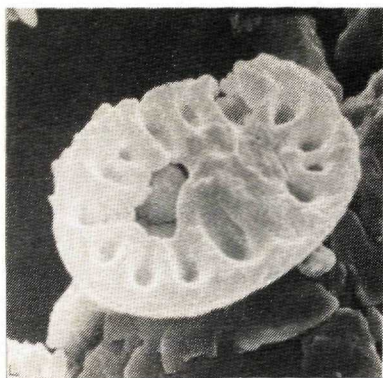
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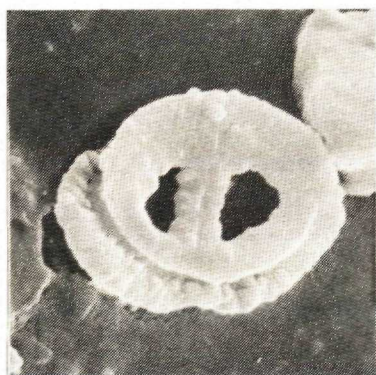
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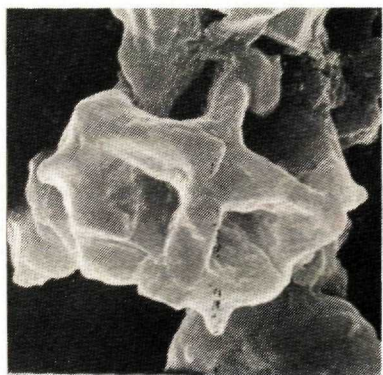
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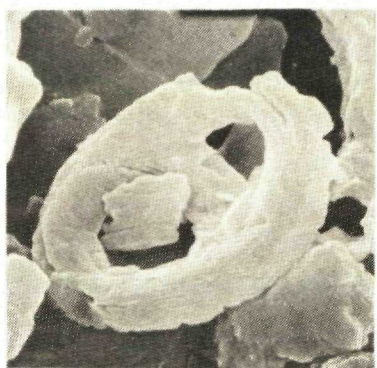
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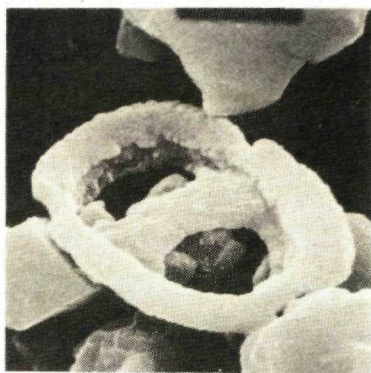
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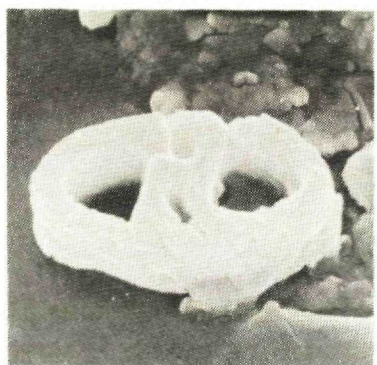
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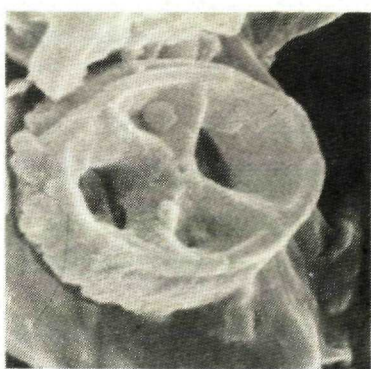
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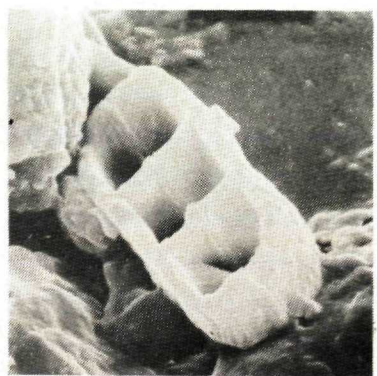
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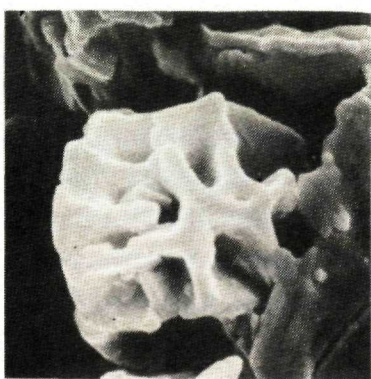
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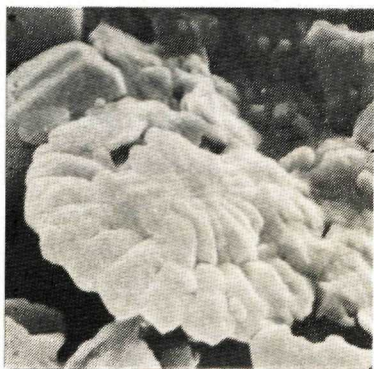
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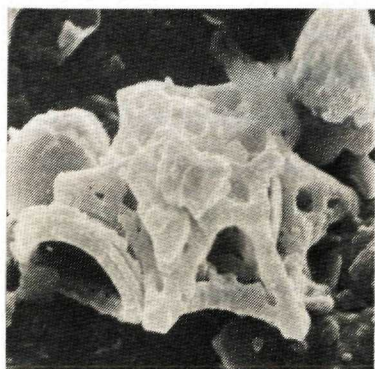
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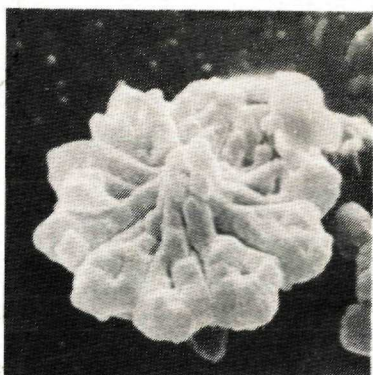
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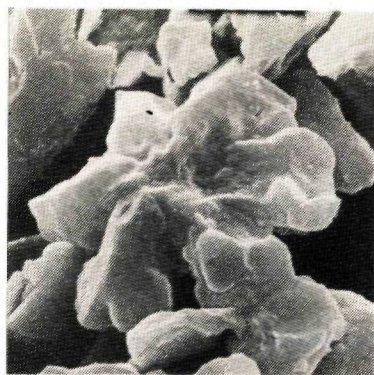
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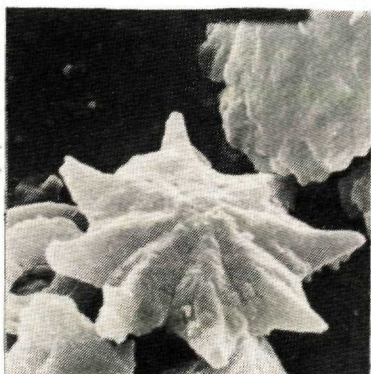
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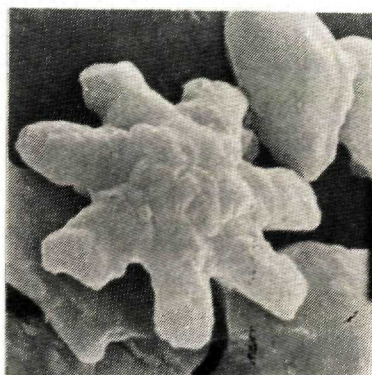
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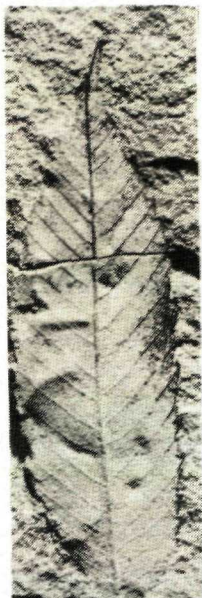
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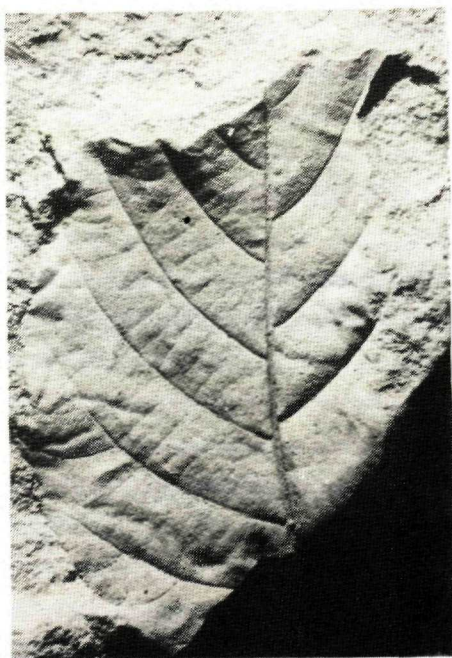
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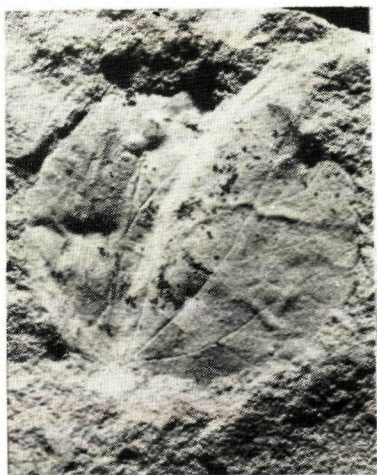
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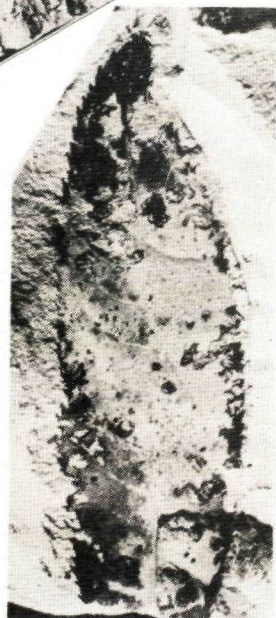
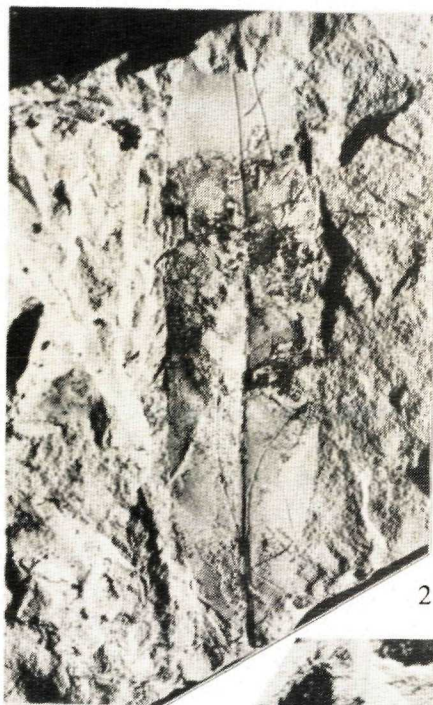
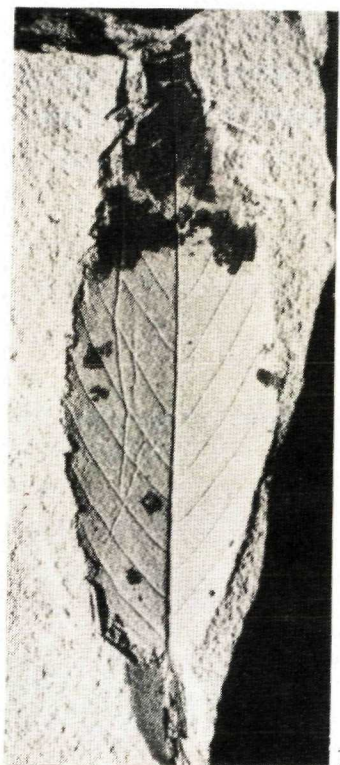
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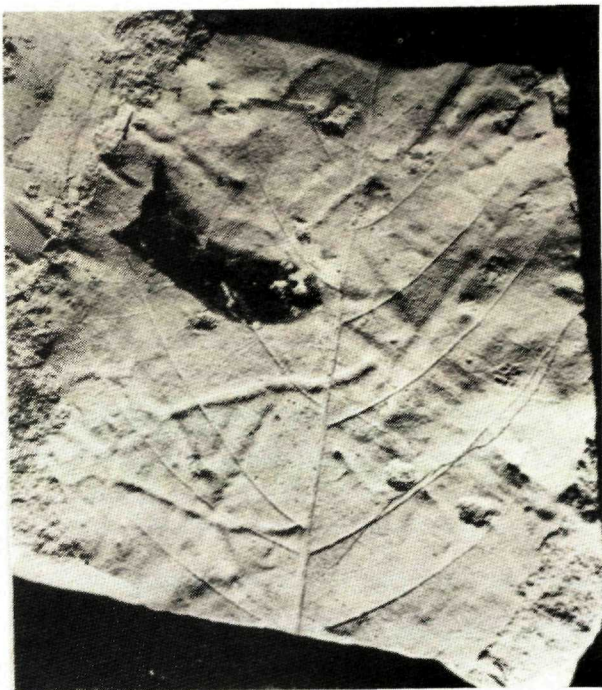


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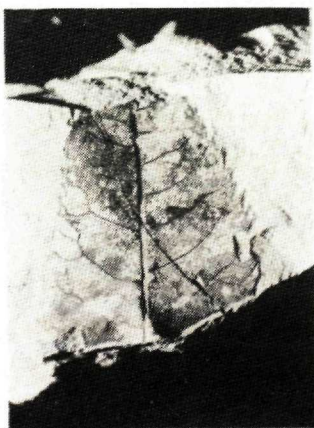




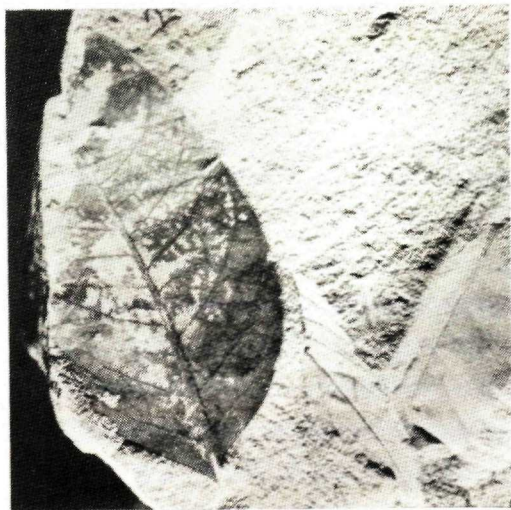
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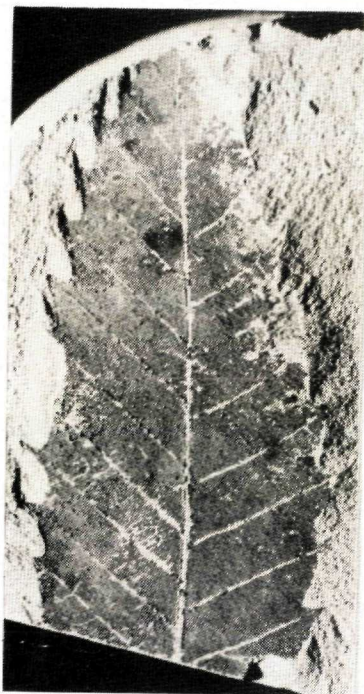
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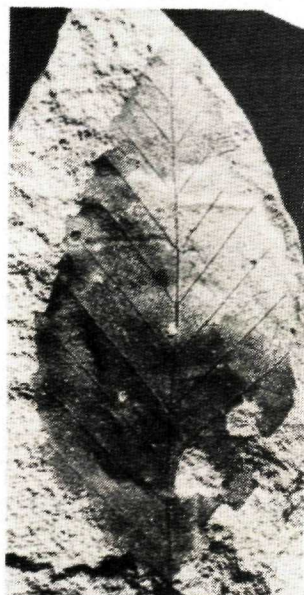
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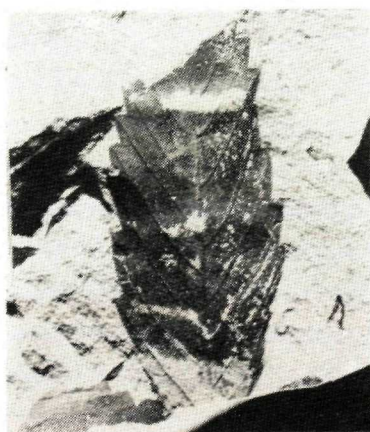
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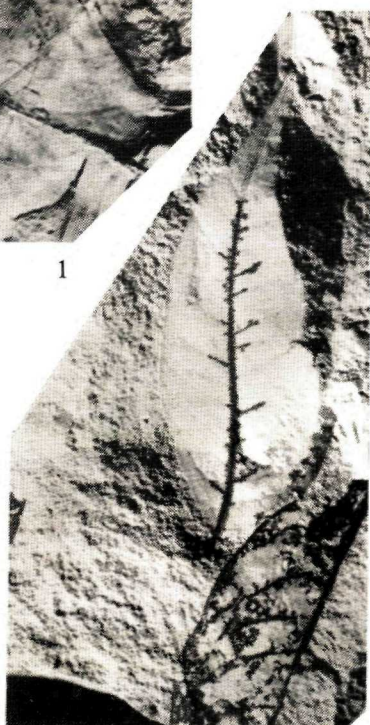
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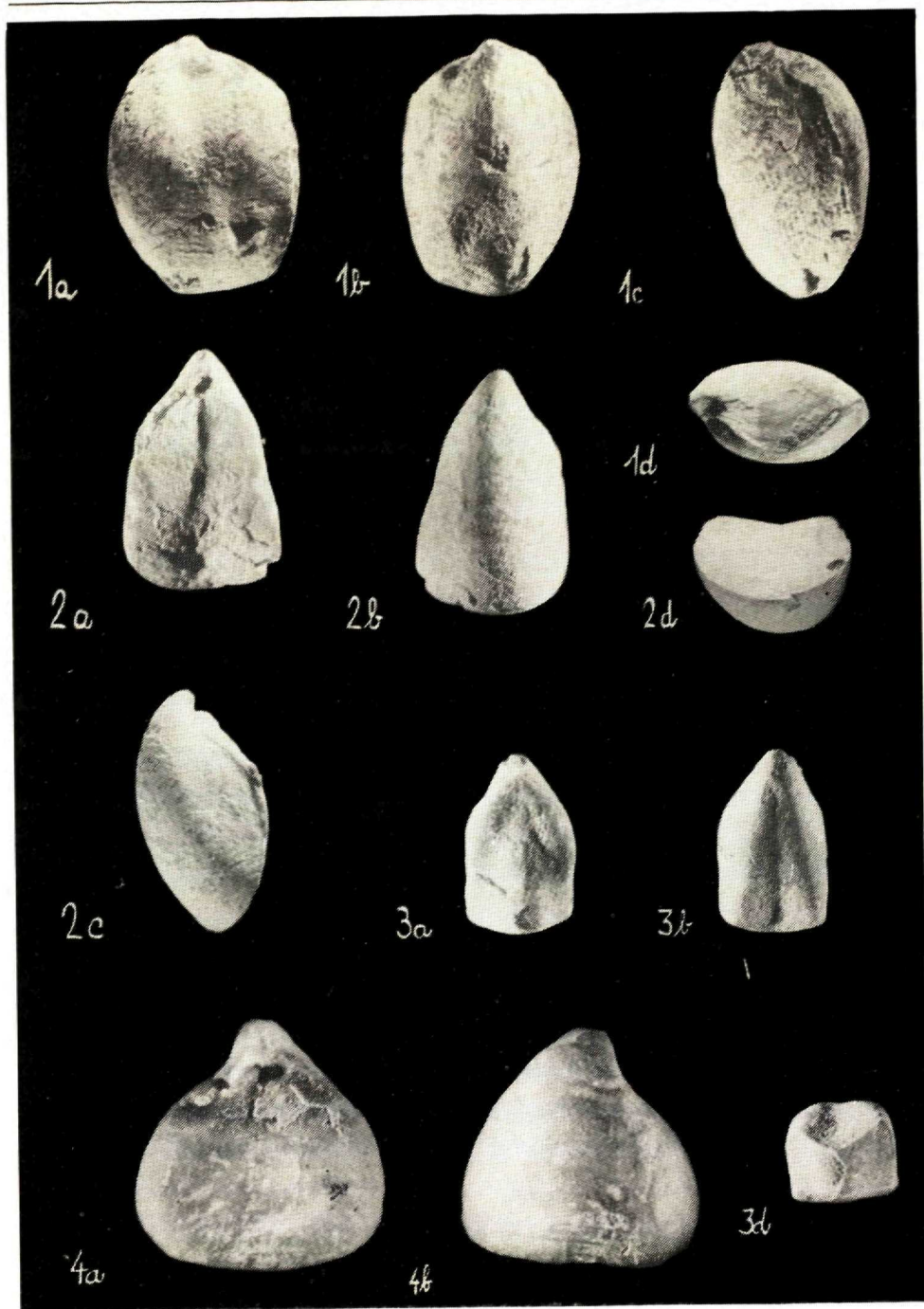
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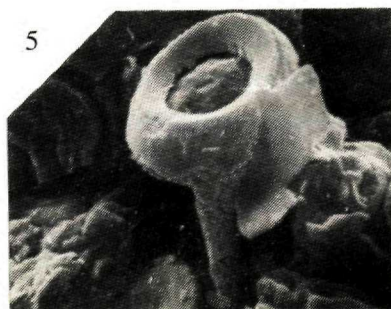
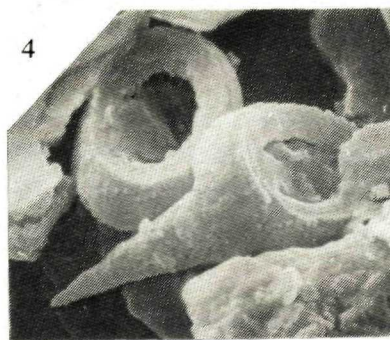
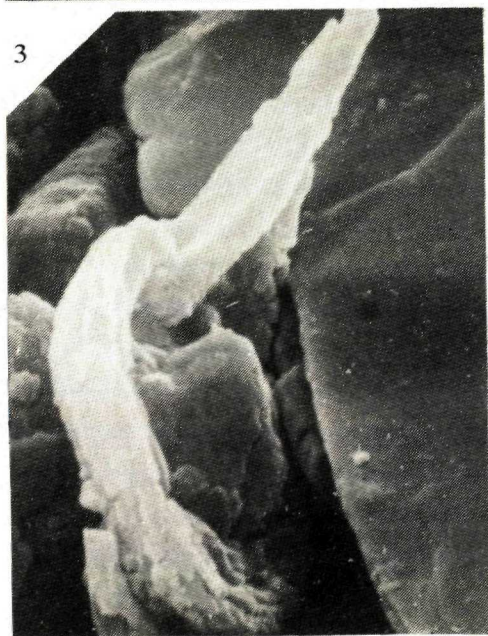
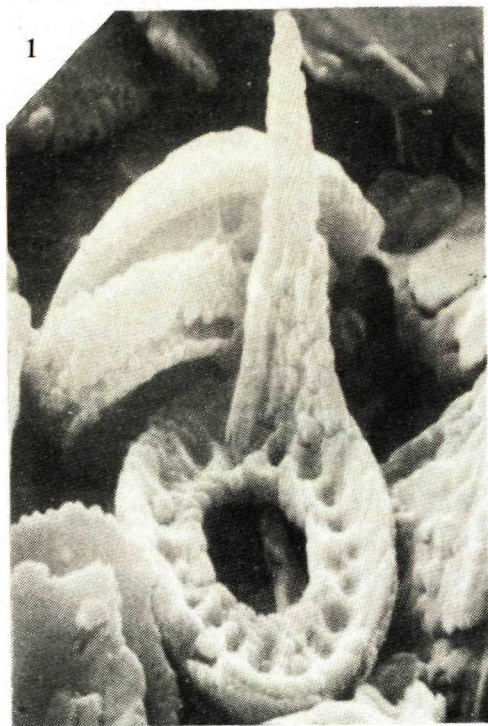
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ZÁPADNÉ KARPATY

séria paleontológia 4

Vydal Geologický ústav Dionýza Štúra vo vydavateľskom oprávnení Vedy, vydavateľstva Slovenskej akadémie vied v Bratislave roku 1979. Rukopis schválený edičnou radou GÚDŠ 18. 10. 1977.

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